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Journal of Applied Economic Sciences

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Instability in the Basic New Keynesian Model under Limited Information[1]

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Asbtract

New solutions to the basic standard New Keynesian model are explored. I extend De Grauwe's model (2012), distinguishing two types of agents and different expectations rules. The central bank fixes the rate of interest. Families and firms determine aggregated demand and supply. Neither of them follows the hypothesis of perfect rational expectations. However, Popper's principle of rationality is applied. From a situation of limited information, even though they learn through rational processes, they are unable to understand their mutual behaviour. Therefore, the expectations in the three equations do not coincide. As a result, the solution does not tend to a single, stationary equilibrium.

This conclusion does not depend on the hypothesis of the "animal spirits". Finally, the possibility of a successful learning process is studied. It is considered whether the central bank could learn from the data, finally reaching a stationary optimum equilibrium. The answer is: It would be unable. The New Keynesian model seems to be basically unstable, when agents have limited information. The problem lies in the impossibility to get adequate coordination.

Keywords: business cycles, imperfect information, learning, monetary policy.

JEL Clasiffication: D83, E10, E32, E52.

Introduction

The basic New Keynesian model has been proposed, among other authors, by Woodford (2001a, 2003), Gali (2008a, 2008b), De Grauwe (2012). This model is one of the contemporary mainstream macro models. In general, New Keynesian theory puts together two ideas, the structure of the Real Business Cycle theory, with the Keynesian proposal that there are imperfect competition and nominal rigidities (Milani 2012). Consequently, these models try to give coherence to two completely heterogeneous ideas. One is equilibrium and markets clearance. The economy being in this equilibrium, the business cycle should come from exogenous stochastic shocks. The other, staggered wages, price contracts and the relevance of monetary policy (De Vroey and Malgrange 2011, 18-19).

In this paper, I consider De Grauwe`s (2012) model. In order to give reason of business cycles, De Grauwe develops the hypothesis of animal spirits (conceptually similar to the hypothesis of sunspots). The animal spirits hypothesis attempts to explain the economic cycles in GDP and employment on the basis of economic agents that have imperfect information and bounded rationality. Self-fulfilling non-fundamental stochastic shocks to beliefs are proposed to give reason of endogenous economic cycles, for example, Farmer and Guo (1994) and Benhabib and Farmer (1994). First, agents would apply simple rules to predict the future. Then they would check their results: they would compare them with data. The predictions would be modified according to the achieved success. Finally, the agents would move through waves of optimism/pessimism.

I analyse the solution of a modified De Grauwe's model (2012). First, only the deterministic model is taken into consideration. Second, two types of agents are distinguished. Third, these agents follow different expectations rules. Fourth, expectations in the formation of interest rates are introduced. Now these rates are neither moved by actual output gap, nor by inflation rate; but by the expected output gap and inflation rate (Galí 2008, 79).

Deterministic model means that this New Keynesian standard model is analysed to study the business cycles that it would generate by itself, without the need to introduce the hypothesis of the animal spirits. Even removing the random disturbances. In De Grauwe's (2012) model, expectations are not formed rationally and there are waves of optimism and pessimism. This assumption does not intervene in this work, which analyses the model and does so based on the two simple ways of predicting that De Grauwe (2012) considers.

There are fundamentalist and extrapolative rules. Therefore, the hypothesis of rational expectations is not used: Agents' subjective expectation could be different from objective probability. A fundamentalist rule is one that expects the variable to reach equilibrium at t + 1. An extrapolative rule is one which determines what will happen to the variable in t + 1 from what happened in t - 1.

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[1] Presented at the 20th Anniversary Conference of the Association for Heterodox Economics, 5-7th July 2018, De Montfort University, Leicester, UK.

There are two types of agents, each of which decides some equations of the model. Each type of agent uses a different formation of expectations. They ignore how the other makes decisions, though they try to anticipate these rules. Therefore, an agent believes the other one follows the same structure of decision. All in all, agents only know their own expectations, and they expect everyone else to be using the same rule.

From this initial point, it is studied if the model generates a single, stable and stationary equilibrium. Consequently, if the model induces cushioned cycles that lead to that equilibrium over time. Mitra and Bullard (2007): the monetary policy rules should generate models with a determinate rational expectations' equilibrium. Also, when the agents, and crucially the central bank, perform a learning process, and they do not follow rational expectations, their recursive learning process should generate this rational expectations' equilibrium (Mitra and Bullard 2007).

Therefore, I consider the existence of learning processes which could modify the conclusions obtained. Both sets of agents can learn: they try to contrast the evolution of variables with what they expected to happen. They learn through econometric estimation, as in Sargent (1993).

2. Basic New Keynesian model and the specification in De Grauwe (2012)

The basic New Keynesian model consists of an aggregate demand equation (IS curve, derived from the Euler equation for consumer optimization), an aggregate supply equation (price setting rule for the monopolistic firms) and a rule for setting the interest rate, usually a formulation of the Taylor rule (e.g. Evans and Honkapohja, 2003; Taylor, 1999). Within this family of models is the De Grauwe's system (2012, pp. 3-4).

$$y_t = a_1 E_t y_{t+1} + (1 - a_1) y_{t-1} + a_2 (r_t - E_t \pi_{t+1}) + \xi_1 \tag{1}$$

$$\pi_t = b_1 E_t \pi_{t+1} + (1 - b_1) \pi_{t-1} + b_2 y_t + \xi_2 \tag{2}$$

$$r_t = c_1 (\pi_t - \pi^*) + c_2 y_t + c_3 r_{t-1} + \xi_3 \tag{3}$$

Where y_t is the output gap, E_t means expectation, r_t is the nominal interest rate, the inflation rate, the target inflation rate (normalized to 0). ξ is white noise (normally distributed, mean zero, constant standard deviation). Hetzel (2013) analyses the ECB's policy with a similar model. White noise will be excluded from the analysis.

In the New Keynesian model, equations (1) and (2) determine the evolution of the inflation rate, given the development of the output gap. As well as the movement in this output gap based on the change in the real interest rate (Galí, 2008, p.49). The differences between Galí (2008) and De Grauwe (2012), in these equations, are given in De Grauwe's introduction of the lagged variables. In addition, De Grauwe dispenses with the natural interest rate. In Galí (2009), for example, the natural interest rate is subtracted, together with the expectation of future inflation, to the current interest rate (p.3). This type of natural interest is introduced because the output gap appears as the difference between observed and natural. Natural output gap would be the level prevailing if all prices were flexible (Gali 2008b, 48) and markets were clearing. Equation (3) contains the fixation of the nominal interest rate by the monetary authority.

The natural interest rate seems to vary (Carlstrom and Fuerst, 2016) and a possible solution is to subtract from the interest rate only the expectation of inflation, given that, in the calibration of the model, the variables appear in terms of variables without trend. In theory, it is feasible. In practice, it requires the employment of the exact procedure to remove the trend. But this choice is theoretical and not testable (Kikut and Muñoz, 1994, p.5). This discussion is not the object of this work. Anyway, this election does not change the conclusions obtained here.

3. The modified model

In equation (3) the interest rate ceases to depend on π_t and y_t, to become dependent on $E\pi_{t+1}$, Ey_{t+1}. Double expectation is introduced regarding inflation and output gap.

$$r_t = c_1 (E_t \pi_{t+1} - \pi^*) + c_2 E_t y_{t+1} + c_3 r_{t-1} + u_t \tag{3'}$$

Now the model has three non-predetermined variables: output gap, inflation rate and interest rate[2]. For example, among others, Woodford (2001b), Galí (2008, 79-81), Clarida, Galí, and Gertler (2000) estimate a forward-looking Taylor rule where inflation and output gap expectations are introduced (p.150). Also, Mitra and Bullard (2007, 8), who consider that expectations are formed in the same way in all equations That is, all agents

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[2] Following Buiter (1983): a non-predetermined variable is one for which its current value is a function of the expectation we have in the present, about the future values of endogenous and exogenous variables. Then they can respond instantly to changes in expectations. Any modification in expectations generates immediate adjustments in output gap, inflation and interest rate.

share them, and use identical calculation algorithms to learn and reformulate those expectations (pp. 9 and pp. 24). Expectations could be formed in four ways (current data, data with delays, expectations regarding the future, expectations regarding the present).

4. Two types of agents

There are two types of agents. On the one hand, the planning agent or central bank (CB), which establish the monetary policy: it sets the nominal interest rate. On the other hand, the representative agent (RA) that decides the aggregate supply and demand. Therefore, the model differentiates between those who decide monetary policy (CB) and those who develop supply and demand decisions (RA). Both can follow different rules for predicting the relevant macroeconomic variables. They do not have rational expectations. Or, at least, not necessarily.

The model can be classified as a 'bottom-up model' (De Grauwe 2010): all agents have cognitive limitations and limited information. Although they learn from experience.

5. Expectations

Agents do not form expectations rationally. Where rational expectations mean that subjective probability distribution is equal to objective probability distribution, weak form (Tesfatsion 2018, 2). Additionally, agents know all the information available to the modeller (strong form, op. cit., p.4). That is, agents would have every relevant piece of information about expectations, deterministic exogenous variables, properties of the probability distributions, values for all endogenous variables and stochastic exogenous variables (p.4).

Evans and Honkapohja (2003) classify the rules for setting interest rates between rules based on fundamentals and rules based on expectations. The rules based on fundamentals are fixed in relation to white noise processes and, sometimes, lagged output gap. The rules based on expectations also suggest a relationship with the expected output gap and inflation rate. It is not exactly the distinction of this work, since the expectations are fixed previously, and they decay into some rule of formation of those predictions. Evans and Honkapohja (1999) distinguish three learning rules. Eductive learning, adaptive learning and rational learning. Eductive is conditional on the continuous application of rational expectations hypothesis (applying the true mathematical conditional expectations), so the solution converges towards rational expectations. Adaptive learning depends on iterative regression procedures. There is no guarantee to reach that rational expectations solution.

I propose a model where agents neither form expectations rationally (in this sense), nor know every relevant factor necessarily. A model where limited information is a central characteristic. The two types of agents try to make the best forecasts, attempting to anticipate the other agents' expectations, but without having an exact knowledge of them. Instead, Popper's principle of rationality applies: "The rationality principle states that each agent acts adequately or appropriately to her situation as she sees it, given her aims" (Frederick 2013, 62, explaining Popper's ideas). In this sense, a rational agent is able to improve his initial theory, or even to act in a way which conflicts with this initial theory, in order to adapt more efficiently to the situation (op. cit., p. 66).

Following De Grauwe (2012), there are two rules to determine the evolution of economic variables. Fundamentalist rule: the agents estimate the steady state value of the output gap (normalized at 0) and they use it to predict the future output gap.

$$E_t^F \, y_{t+1} = y^* = 0 \tag{4}$$

In relation to the inflation rate, the announced inflation target is considered to be credible. They believe the objective will be attained.

$$E_t^F \, \pi = \pi^* \tag{5}$$

Extrapolative rule. The agents do not know or do not believe in the steady-state output gap. They extrapolate the previous observed output gap into the future. This is a type of adaptive expectations. They predict by inductive experience.

$$E_t^e \, y_{t+1} = y_{t-1} \tag{6}$$

$$E_t^e \, \pi = \pi \tag{7}$$

The CB hesitates between three policies: applying a fundamentalist rule regarding the output gap and inflation rate, or applying it only to one of those two variables. It may fix the interest rate on the basis of confidence: controlling the inflation rate, the national income can be maintained close to its trend or natural value. Or it may deem the evolution of the output gap to be the only relevant task. The inflation target would be immediately achieved, due to the CB's credibility. I analyse the three possibilities.

The RA builds expectations by the extrapolative rule. There is no confidence that the CB will maintain any fundamentalist objective. They thus take into account the past evolution in order to determine the aggregate supply and demand. But the interest rate continues to be decided by the CB. CB and RA are not aware that they do form their expectations differently. They do not know the real rule of formation of expectations, although they understand that it is possible that it does not coincide with the assumptions.

6. Some additional considerations about the scientific literature: The New Keynesian model and the effectiveness of monetary policy

When the private sectors of the economy are forward looking, there are two difficulties that the monetary policy of the central bank must face (Evans and Honkapohja 2003, p.7). First, that the rules of monetary policy and the expectations of agents can generate a disequilibrium. Second, that those rules could lead to the indeterminacy of equilibrium: multiple equilibria with rational expectations. The economy would not reach the optimum. However, these authors conclude that if the interest rate rule is carefully designed, there is no indetermination or disequilibrium.

Galí (2008) analyses the mathematical conditions so that the standard New Keynesian model has a determinate equilibrium. The model proposed here differs from that structure, because it follows De Grauwe (2012), and also because the expectations of equation (3)' may not coincide with the expectations of the other two equations (1) and (2).

Evans and Honkapohja (2003), based on the fact that agents do not have perfect rational expectations, consider whether a stable and optimal equilibrium is attained. That is, if that equilibrium is achieved and if it is the same as what would exist if all the agents had perfect rational expectations. The answer they obtain is the following, if the CB sets rules based on expectations and the expectations of the private agents are correctly considered, that optimal equilibrium is necessarily reached.

There is an open debate about the effectiveness of monetary policy regarding the output gap. Applying a Taylor rule, Galí (2008) comes to a double conclusion, similar to Woodford (2001b). A very active policy to control the output gap reduces the utility of the representative consumer, because it increases the variance of the output gap and inflation (p. 83). This variance is stronger when the coefficient takes values as high as unity (p. 84). Second, the monetary authority achieves lower welfare losses when it responds only to movements in the inflation rate, and the less the greater that response. "Hence, and at least in the context of the basic New Keynesian model considered here, a simple Taylor-type rule that responds aggressively to movements in inflation can approximate arbitrarily well the optimal policy" (p.84). The central bank or planner would not take into account the state of the economic cycle in the national income. In the same way, Mitra and Bullard (2007) recommend monetary policies with little or no reaction to the output gap (p.5). Clarida, Galí and Gertler (2000) consider that the coefficient that multiplies the inflation rate must be higher than 1, otherwise the policy would open the possibility of 'bursts of inflation and output that result from self-fulfilling changes in expectations' (p.178).

De Grauwe (2008, 28-30) considers this possibility. Unlike Galí (2008) and Woodford (2001b), De Grauwe concludes that the intensity of the economic cycle increases. This would be due to the animal spirits hypothesis. Consequently, De Grauwe (2012) defends that a monetary policy that considers only the control of inflation is not an optimal policy ("strict inflation targeting is unlikely to be optimal", p. 69).

Modifying Taylor's equation by introducing expectations regarding the future, together with the fundamentalist formation of these expectations of the CB with respect to the output gap, is equivalent to centering the CB's performance around exclusively the objective of the inflation rate, within an economy that moves through extrapolative movements.

The conclusion reached in this work is: A monetary policy which is active regarding inflation and neutral with respect to the output gap, could produce, in the context of the New Keynesian analysis, practically recurrent economic cycles. It is necessary for the CB to place the output gap also as the objective of its control. Therefore, I obtain a conclusion similar to De Grauwe (2012). On the otrher hand, in a New Keynesian model, a policy considering the control of output gap, but not the evolution of the inflation rate, could produce explosive cycles (without a stable solution).

Finally, monetary policy should be considered in the context of a complex social and economic system, where agents make decisions with limited information. Equilibrium is not assured. Learning is not a feasible solution, since agents may face a serious problem of omitted variables. Agents should reconsider the variables in que equations, but nothing guarantees this will be the result.

7. Calibration and data

The values used are usually: $a_1 = 0.5$. $a_2 = -0.2$. $b_1 = 0.5$. $b_2 = 0.05$. $c_1 = 1.5$. $c_2 = 0.5$. $c_3 = 0.5$ (De Grauwe, 2012, Galí 2008, among others). Mitra and Bullard (2007) lower $b2$ to 0.024. Taylor's (1993) initial estimates were 1.5 ($c1$) y 0.5 ($c2$). With a constant coefficient of 0.04 and a 2% inflation target.

Mitra and Bullard (2007), in a model without lagged variables use the following calibration in relation to $c1$ and $c2$: They must be between 0 and 4. If the coefficient that multiplies the inflation rate is greater than 1, it would be an active rule (p.13). The value of the coefficient of response to inflation should be above 1, so that the original model has a certain solution (Gali 2008b, 22). The values of 1.5 and 0.5 (0.5/4 for quarterly values) would be approx. Consistent with the variations observed in the type of the Federal Reserve in the Greenspan period (Gali 2008b, 52). However, 'Response to inflation deviations (...) should be 1.5, and the response to output deviations (...) should be 1' (Carlstrom and Fuerst 2016, p.2).

The introduction of the exchange rate (with a delay) appears in many researchs as a relevant factor (Nelson, 2001). In this paper, it is not important to introduce new variables, given that the object of study is the evolution of the model and its stability, rather than the strict econometric adjustment to data.

Next, I simulate the cyclical behavior of the UK economy. Data from the Bank of England[3]. The Hodrick-Prescott filter is applied in such a way that the output gap, the inflation rate and the interest rate equal zero on average (1830-1900). De Grauwe and Ji (2016) also use this HP filter and find a high correlation among the GDP growth rates of the eurozone countries. The behaviour of the three variables is simulated from 1900 on.

8. The solution generated by the model

When values are given to expectations operators, the general model becomes concrete (decays) and takes specific values. The initial model has non-predetermined variables, but once the expectations in past or present values are specified, the model stops having them. As expectations can be fundamentalist or extrapolative (adaptive), the model lapses into six basic cases.

Determinate solutions are considered in the models: if the solution is unique, stable and stationary, for the three endogenous variables considered, output gap, inflation rate and interest rate. The condition is that all eigenvalues are in the unit circle (Galí 2008).

Case A, the model contains rational expectations. In consequence, expectations coincide with the actual values.

$$y_t = a_1 y_t + (1 - a_1) y_{t-1} + a_2 (r_t - \pi_t) + \xi_1 \tag{1a}$$

$$\pi_t = b_1 \pi_t + (1 - b_1) \pi_{t-1} + b_2 y_t + \xi_2 \tag{2a}$$

$$r_t = c_1 (\pi_t - \pi^*) + c_2 y_t + c_3 r_{t-1} + \xi_3 \tag{3a}$$

Case B. All expectations are resolved in an adaptive way: extrapolative.

$$y_t = y_{t-1} + a_2 (r_t - \pi_{t-1}) + \xi_1 \tag{1b}$$

$$\pi_t = \pi_{t-1} + b_2 y_t + \xi_2 \tag{2b}$$

$$r_t = c_1 (\pi_{t-1} - \pi^*) + c_2 y_{t-1} + c_3 r_{t-1} + \xi_3 \tag{3b}$$

Case C. All expectations are fundamentalists.

$$y_t = (1 - a_1) y_{t-1} + a_2 (r_t - \pi^*) + \xi_1 \tag{1c}$$

$$\pi_t = b_1 \pi^* + (1 - b_1) \pi_{t-1} + b_2 y_t + \xi_2 \tag{2c}$$

$$r_t = c_3 r_{t-1} + \xi_3 \tag{3c}$$

The following three cases distinguish between types of agents. Private agents (RA) decide on the IS and Phillips curve equations and they do so extrapolatively. They do not believe that the CB manages to maintain the objectives of the monetary policy and prefer to value the past data. The CB decides on the third, setting the interest rate according to different definitions of expectations.

In case D, the CB is fundamentalist, with respect to the inflation rate and output gap.

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[3] Three Centuries of Data, http://www.bankofengland.co.uk/research/Pages/onebank/threecenturies.aspx. DD is domestic demand, in constant 1900 prices, from Mitchell (1988). RAT is Bank of England Rate. CPI is consumer prices index, from ONS (O'Donoghue et al (2004)).

$$y_t = y_{t-1} + a_2 (r_t - \pi_{t-1}) + \xi_1 \tag{1d}$$

$$\pi_t = \pi_{t-1} + b_2 y_t + \xi_2 \tag{2d}$$

$$r_t = c_3 r_{t-1} + \xi_3 \tag{3d}$$

Case E. The CB is fundamentalist with respect to the output gap.

$$y_t = y_{t-1} + a_2 (r_t - \pi_{t-1}) + \xi_1 \tag{1e}$$

$$\pi_t = \pi_{t-1} + b_2 y_t + \xi_2 \tag{2e}$$

$$r_t = c_1 (\pi_t - \pi^*) + c_3 r_{t-1} + \xi_3 \tag{3e}$$

Case F. The CB is fundamentalist in relation to the inflation rate.

$$y_t = y_{t-1} + a_2 (r_t - \pi_{t-1}) + \xi_1 \tag{1f}$$

$$\pi_t = \pi_{t-1} + b_2 y_t + \xi_2 \tag{2f}$$

$$r_t = c_2 y_t + c_3 r_{t-1} + \xi_3 \tag{3f}$$

Assuming that the values are normalized to $\pi^* = 0$, for example accepting the trend calculated by HP filter as the inflation rate target, model A contains the following solution.

$$\begin{pmatrix} a_1 & a_2 & -a_2 \\ -b_2 & b_1 & 0 \\ -c_2 & -c_1 & 1 \end{pmatrix} \begin{pmatrix} y_t \\ \pi_t \\ r_t \end{pmatrix} = \begin{pmatrix} a_1 & 0 & 0 \\ 0 & b_1 & 0 \\ 0 & 0 & c_3 \end{pmatrix} \begin{pmatrix} y_{t-1} \\ \pi_{t-1} \\ r_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{1t} \\ \varepsilon_{1t} \end{pmatrix} \tag{4}$$

$$A z_t = B z_{t-1} + \xi \tag{5}$$

$$z_t = A^{-1} B z_{t-1} + A^{-1} \xi \tag{6}$$

Calibrated models A, B and C have vectors $A^{-1}B$ with eigenvalues less than unity. This generates damped oscillations, and the system tends to a stable and unique equilibrium in $y_t = 0$, $\pi_t = 0$. I simulate the values over the next 50 years, from the values in 1900 for the British economy. DD * is the cycle of the output gap once the trend calculated by the HP filter has been subtracted. CPI* is for the inflation rate. RAT* for the nominal interest rate.

Figure 1. A Model. Rational expectations
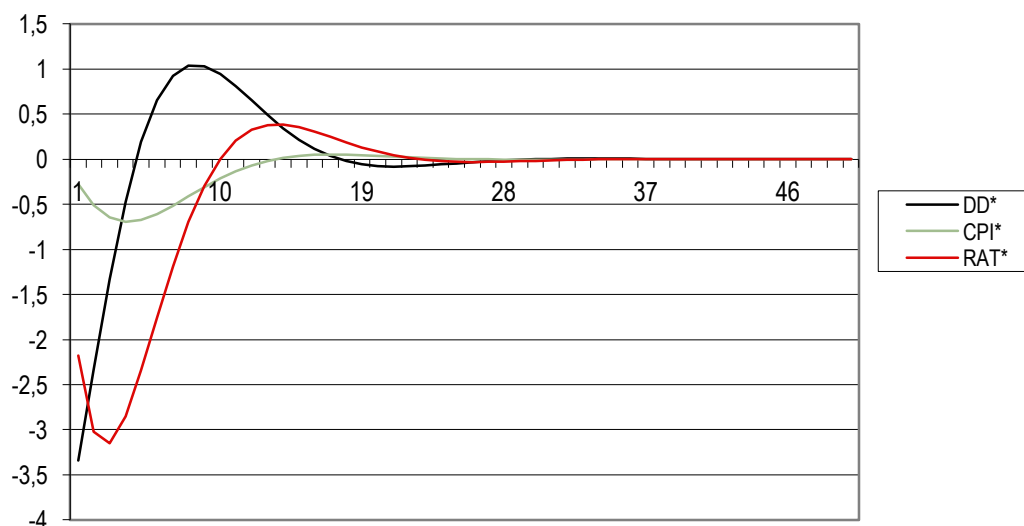
However, if monetary policy ceases to have the simultaneous control over the evolution in the output gap ($c_2 = 0$), then explosive cycles are generated.

Figure 2. A model, c2 = 0
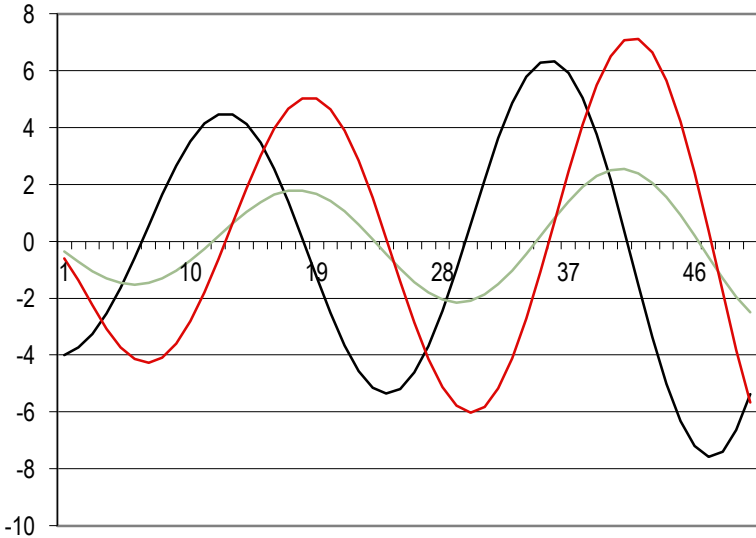
Model B follows exactly the same dynamic, with a stationary equilibrium solution, unless monetary policy ignores the evolution of the output gap. Model C shows that if everyone followed fundamentalist expectations, the economy would quickly drift towards a stable equilibrium.

Figure 3. C model. Fundamentalist expectations
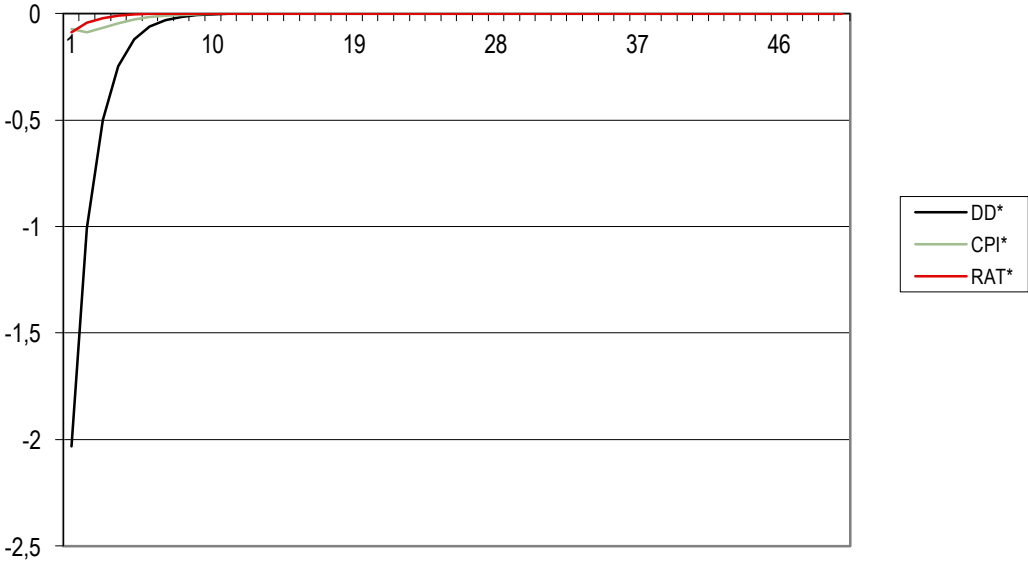
The model D leads to an explosive solution. The system does not tend to a stationary equilibrium.

Figure 4. D Model - Fundamentalist CB
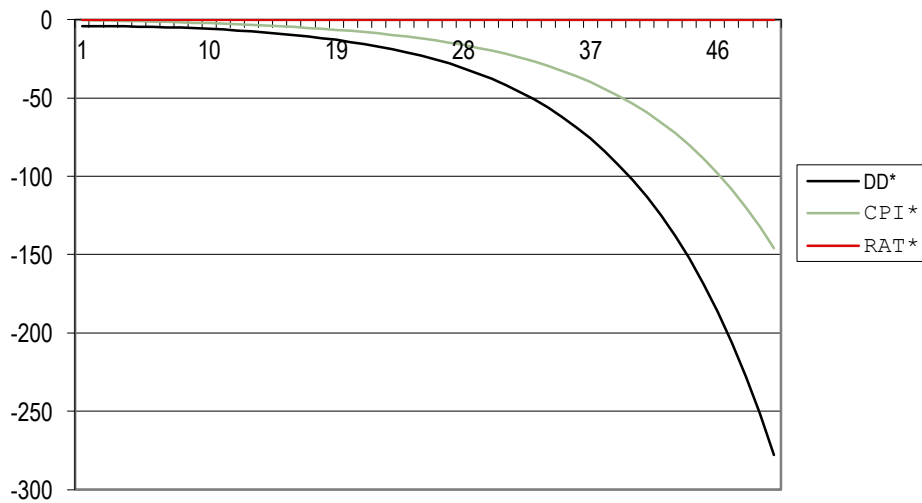
One of the three eigenvalues is greater than one. The system is explosive when interest rates do not depend on the inflation rate and the output gap, and yet private agents have no confidence in that monetary policy and its effectiveness. Therefore, the New Keynesian model discards a policy of constant, autonomous growth of the money supply and prefers an active policy (Galí considers this type of monetary rule to be non-adequate in front of monetary demand shocks, 2008, pp. 84-85).

Cases E and F. The CB's sole objective is either the inflation rate (E) or the output gap (F).

Figure 5. E model - Fundamentalist CB for output gap
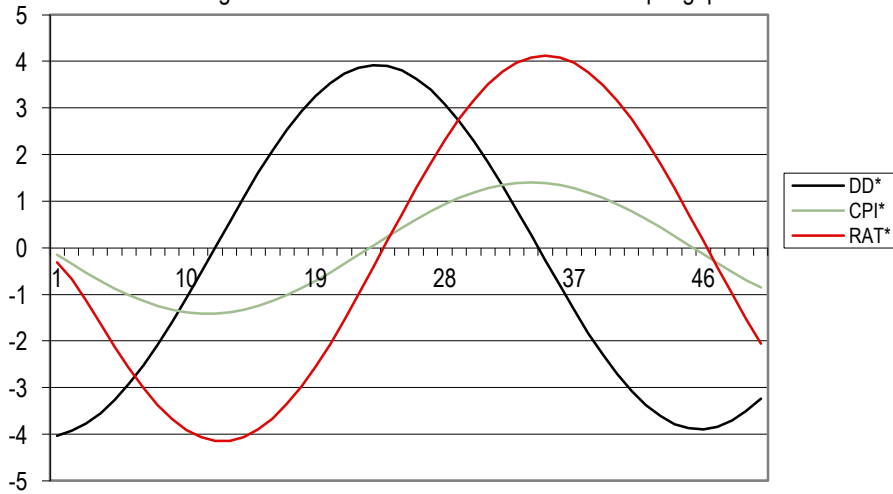
Figure 6. F model. Fundamentalist CB for inflation rate
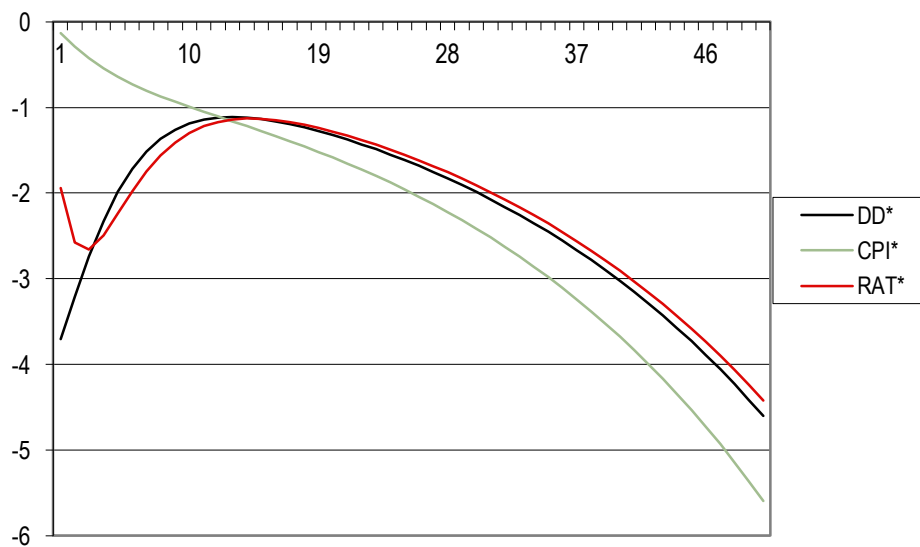
When the CB pursues only the inflation target (E model), recurring cycles can be produced. Since two of the eigenvalues of the matrix take a value of approximately 1 (0.99971). If the CB establishes an objective of output gap (F model), it can cause values of output gap and rate of inflation that progressively move away from equilibrium. In addition, in the E model, if the CB increases the weighting of the lagged interest rate, softening its monetary policy more, then the matrix of the E model happens to have two eigenvalues above 1. Not so for F model.

Three conclusions. First, the New Keynesian model is stable under rational expectation, under the usual calibration. This is under the assumption that all agents are the same, since all of them know the exact model (De Grauwe 2008, 42). Second, the New Keynesian model must set monetary objectives of inflation rate and output gap. Because it is possible that monetary policy is not credible and economic agents maintain rules such as extrapolative, among other possible. Third, the New Keynesian model can generate unstable situations, with a progressive distancing from an equilibrium situation in output gap and inflation. This is due to the possible lack of coordination among economic agents. This is a similar situation to that considered by Evans and Honkapohja (2006, 25): if agents try to forecast through adaptive learning, but the central bank applies a rule based on the presumption of being in the stationary rational equilibrium.

9. The impact of learning. Convegence toward the rational expectations equilibrium?

I focus on models E and F. The difference of agents and expectations rules may generate recurrent cycles, even explosive ones. A possible solution would be found in learning. The possibility of reaching a single stationary equilibrium through experience must be analysed. If the agents understood their different patterns of behaviour, and then they could make decisions with all this information, approaching the real behaviour of the other agents, the end would be the stability under the rational expectations equilibrium: A model.

Evans and Honkapohja (2003) establish a double criterion for valuing learning models. First, if with rational expectations, the system gives a single stationary solution. If so, then the model is determinate. Second, if with adaptive learning, usually by simple regression, this stationary solution would be stable, reached asymptotically through this learning process. The learning process is considered by Evans and Honkapohja (2006) as the minimisation of a quadratic loss function: To obtain the minimal values for the deviations of the output gap and the inflation rate, once a discount factor is applied. This type of learning is necessarily based on the knowledge of every relevant factor working in the economic system. If there is just one factor not considered, the minimisation cannot be succesful, since it is trying to get a minimal value of a deviation whose determinants are not known. A completely different approach from the point of view maintained in this work. I consider the possibility of uncertainty over the variables taking place in the system, due to unknown expectations.

The analysis carried out of the New Keynesian model has shown that, if rational expectations are maintained, it is determinate under a usual calibration (A model). When it is assumed that the agents are able to accurately anticipate the expectations of the other agents: their subjective expectation equals objective facts.

This second question is the one posed here for cases E and F, in which the CB, based on a situation of limited information, has decided not to react to the output gap, or to the inflation rate. Not taking into account thar

the RA is reacting to the lagged output gap and the lagged inflation rate, CB's model forgets relevant variables and CB tries to know and control the whole economic system with this omission of variables.

Here, the agents know the general model's structure. However, they do not know the exact value of the parameters, nor do they know what other agents will do and so they try to predict the reciprocal expectations rules. In addition, they do not have a complete list of variables, because the variables depend on the expectations rules. In this context, the CB's role in deciding monetary policy is crucial.

Learning is given by econometric methods (Marcet y Sargent 1988): the different agents perform estimate by simple linear regression or by two-stage least squares. For example, the agents could learn in other ways, minimising the differences between the expected and the perceived values. But the most powerful method must be the result of the econometric theory. The objective is to know if, applying the best methods, the agents manage to approximate the balance of rational expectations.

The agents estimate from their original assumptions. It makes no sense that their estimation is made on factors not considered or from a different structure. This would be an attack on the assumption of limited information. Economic theory must study real agents in actual conditions, not omniscient individuals. Therefore, individuals are rational in the sense that Popper's principle is applied: they adapt in the best way facing a situation of limited knowledge.

In model E, taking into consideration 20 simulated data, the agents reach the following estimate. The RA estimates:

$$y_t = y_{t-1} - 0.2\ (r_t - \pi_{t-1}) \tag{7}$$

$$\pi_t = \pi_{t-1} + 0.05\ y_t \tag{8}$$

$$r_t = 1.5\ \pi_{t-1} + 0.07389\ y_{t-1} + 0.5\ r_{t-1} \tag{9}$$

Table 1 - Estimation by simple linear regression[4]

Y = DDE	Coefficient	t Student	Y = CPIE	Coefficient	t Student	Y = CPIE	Coefficient	T Student
X(1) = RATE-LAG1[CPIE]	-0.2	-3624974551	X(1) = LAG1(CPIE)	1	11470054239	X(1) = LAG1[CPIE]	1.4926108	366733003
X(2) = LAG1[DDE]	1	2.319E+10	X(2) = DDE	0.05	1419710077	X(2) = LAG1[DDE]	0.0738916	428474123
						X(3) = LAG1[RATE]	0.4926108	357242109
N	20			20			20	
RSS	0			0			0	
R2	1			1			1	
R*2	1			1			1	

This model is called, in the scientific literature, the perceived law of motion (PLM). The E model, as such, is the ALM (actual law of motion). The problem is about minimising the distance between the data and the prediction from the theoretical equations that express what you believe it is happening. This is equivalent to trying to reduce business cycles.

The CB estimates, on the other hand:

$$y_t = 0.998980\ y_{t-1} - 0.132125\ r_t \tag{10}$$

$$\pi_t = \pi_{t-1} + 0.05\ y_t \tag{11}$$

$$r_t = 1.5\ \pi_t + 0.5\ r_{t-1} \tag{12}$$

Table 2 - This is its PLM, with a very significative regression (simple linear regression)

Y = DDE	Coefficient	t Student	Y = CPIE	Coefficient	t Student	Y = CPIE	Coefficient	t Student
X(1) = LAG1(DDE)	0.998980	3,397.44	X(1) = LAG1(CPIE)	1	11,470,054,239	X(1) = CPIE	1.5	2,853,592,722
X(2) = RATE	-0.132125	-531.15	X(2) = DDE	0.05	1,419,710,077	X(2) = LAG1[RATE]	0.5	2,784,056,642

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[4] Easyreg program. 2SLS does give very similar results.

Y = DDE	Coefficient	t Student	Y = CPIE	Coefficient	t Student	Y = CPIE	Coefficient	t Student
N	20		20			20		
RSS	0.00021		0			0		
R2	1		1			1		
R*2	1		1			1		

From the estimation, private agents would continue to be extrapolative, believing that the CB reacts actively against deviations of the inflation rate and very gently against deviations of the output gap with a delay. For its part, the CB has estimated a system of recurrent cycles, so that it would decide a more active monetary policy: it would increase the coefficient c_1 that relates the inflation rate with the interest rate. Because the matrix of its system of equations indicates that the cycles become more cushioned as that value increases. Assuming that c_1 takes a value of 15, for example, there is an improvement, although the agents do not agree about what is happening, and the monetary policy would not be optimal.

Figure 7. Second round. E model, C1 = 15.
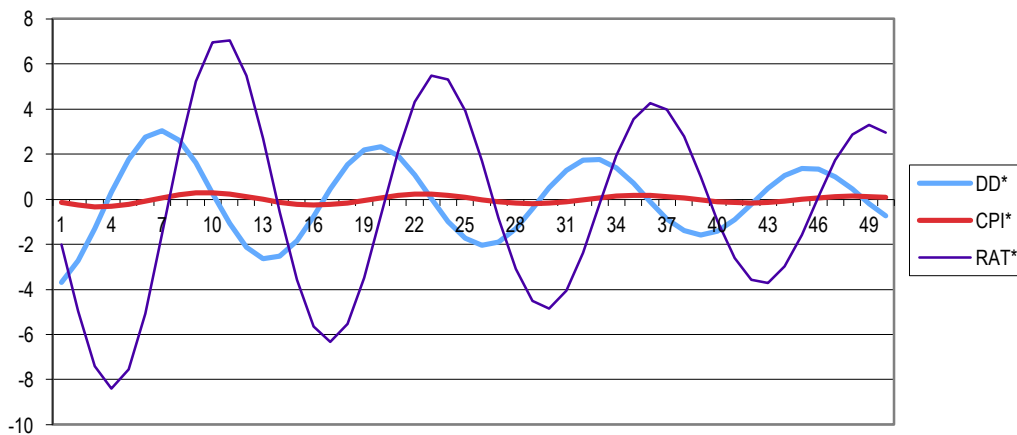
It is, of course, possible for the CB to rectify and add an objective for the output gap, until an optimal monetary policy is reached. But nothing guarantees that an agent includes unknown factors.

In F model, the solution from learning is more complex. It would necessarily imply changes in the variables considered, because when the CB tries to estimate its fundamentalist model, it finds that the estimated equations have serious problems.

Table 3. Estimated coefficients with an incorrect sign

Y = DDF	Coefficient	t Student
X(1) = LAG1(DDF)	0.6384921	6.631
X(2) = RATF	0.2925965	2.763
N	20	
RSS	0.2045	
R2	0.9694	
R*2	0.9677	

After 20 simulated data, this problem makes clear to the CB that its model and its monetary policy both are erroneous. So finally it would be possibly forced to include the inflation variable, especially with a delay: it offers an optimal adjustment.

This is possible, but not for sure. Economic agents can not find new variables, they can prove, but they can not find them inductively. Then the solution to the problem lies in breaking the assumption of limited knowledge. Imagination can cause new unknown factors to be introduced, but since it is not a matter of data perception or reasoning, the result is uncertain. "Intellectual intuition and imagination are most important, but they are not reliable" (Popper, 1962, p.28).

Assuming that CB's estimation includes a new variable, the logical question is: Would CB decide to modify its monetary policy? Evidently yes, because the matrix has an eigenvalue greater than 1, and the solution is explosive. However, controlling only the output gap can not reach equilibrium and must necessarily expand its objectives to include the inflation rate. If, for example, $c_2 = 0.5$ and $c_1 = 1$, then we can reach that equilibrium situation.

In conclusion, in the first case analysed, learning would lead to a better situation. Although not optimal. In the other model, the analysis make agents know they are erroneous. The solution would imply breaching the assumption of limited knowledge, so that agents can spontaneously include relevant variables. There is not a necessary and rational process that leads with certainty to this innovation. Coordination between agents is desirable, but not a compulsory conclusion.

As a matter of fact, the situation in which the agents find themselves is that of omissions of relevant variables (Clarke 2005, 342). This is an unsolvable problem. To consider new variables could not be a solution if there is a continuity of omitted factors. However, "by including additional control variables in our specifications, we could very easily be making the bias on the coefficient of interest worse", and "knowing for sure requires knowing much more than we typically do in practice. In the absence of this kind of omniscience, we need an approach to achieving convincing experimental control that has fewer debilitating side effects" (op. cit., p. 350). Therefore, in this context of rational agents trying to establish the best decisions within the context of limited information available, the problem of omitted variables is very serious, and it can cause strong biases in predictions. The consequent monetary policies could make very important mistakes.

Conclusions

First, heterogeneous agents with uncertain expectations rules must be considered as a possibility to build models and crucially to design possible monetary policies. As De Grauwe (2008) says, the model builder can limit the rules that agents can use to make forecasts by "imposing the condition that forecasts must be consistent with the underlying model" (p, 6). It is compulsory to test the results when this condition is relaxed.

Second, the New Keynesian model can generate explosive cycles when there are different agents forming expectations with different rules, and they have a situation of limited knowledge. That is, when they are not able to coordinate, even if they are rational and they try to learn from experience. Explosive cycles mean disequilibrium.

Third, learning is not a solution, because there is not inductive or deductive procedure to rationally find omitted variables. It is possible, but not for sure. However, omitted variables are a consequence of different expectations rules. There is no certainty that a learning process can lead to determinate, stable and stationary solutions to the model.

Fourth, the absence of determination in a New Keynesian model, in that situation, depends neither on random exogenous variables, nor on the formation of self-fulfilling expectations. The lack of coordination among agents, with limited knowledge and different expectations, can cause this situation.

Fifth, the CB must follow active policies to control the inflation rate and the output gap, closely monitoring whether the result of the policies is a volatile situation or not. The reason is the economic agents may not be coordinating their expectations. This result is similar to Mitra and Bullard (2007) who contemplate indeterminate results when expectations are formed on delays.

Sixth, I mentioned the open debate about the effectiveness of monetary policy regarding the output gap. The result obtained in this work is the CB should pursue active policies considering objectives both with respect to the inflation rate and the output gap.

Monetary policy must be aware that it faces an uncertain economic system, with multiple agents pursuing hard-to-know objectives. And, for this reason, the CB should always contemplate the possibility that there are omitted variables, of difficult or even impossible knowledge. I leave for successive works if that monetary policy should be one of commitment (rules), or it should resort to discretionary measures when considered necessary.

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Entrepreneurship, Innovation and Business Cycles in Turkey

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Abstract:

The objective of this study is to investigate the effects of entrepreneurship and innovation activities on business cycles in Turkey. On account of this aim, the related data which is the period of 2000-2016 in Turkey are analyzed using the ARDL model. The estimation results of the model for the period show that innovation activities are pro-cyclical. In other words, innovation activities have a positive relationship with the cycles. Accordingly, the increasing of innovation activities contributes to the expansion of the economy. On the contrary, the entrepreneurship activities have a negative sign with the cycles, that is, they are counter-cyclical. In other words, it has indicated that these activities increase in the recession period and decreasing in the expansion period of the cycles.

Keywords: entrepreneurship; innovation; business cycles; ardl modeling; Turkey.

JEL Classification: C51; C52; E32; L26; O31.

Introduction

Due to cyclical crises and depressions since the 18th century, one of the most discussed issues in the economic literature has been business cycles. In this context, a large number of theories have been put forward on the causes of these fluctuations, how they spread and what kind of fluctuations will be described as cyclical.

In the mainstream economic thought in which called "laissez-faire" tradition, it has been argued that economy has a self-equilibrating mechanism. According to the theories in this tradition, macroeconomic fluctuations are temporary "road accidents" caused by entirely monetary or real external shocks[6]. Therefore, the causes of crises and cyclical fluctuations are tried to be explained by factors such as misapplication of economic policies, the failure of macroeconomic bases, structural problems of the financial system, internal and external political influences.

Even though he was in this tradition, one of the most diverse and dynamic business cycle analysis was made by Schumpeter. He states that the form of capitalist production has an evolutionary character because of changes in the social and natural environment and that capitalism is never a static economic method or production form due to the nature of the process. According to him, the main driving force that gives this character to capitalism are the innovations realized by entrepreneurs. Creative innovations such as the production of new consumer goods, the development of productions technics and transportation methods, the opening of new markets and the finding new sources, constantly demolish the old structure and replace it with a new one. This Creative Destruction Process is a fundamental fact of capitalism, and in such a system, "equilibrium" is rarely seen in historical times. The system passes through the conjectural phases which are called the neighborhoods of equilibrium (Schumpeter 1935, 4; Schumpeter 1939, 63-64, 82-85, 140-141; Schumpeter 1943, 82-86).

The reason why the economy is going through cyclical stages is that it does not show the continuity of the innovations and the application of them, it is clustering or intensifying in certain periods in the economic process. Business cycles occur as a result of the disproportionate and repeated fluctuations seen in the rate of innovation and their usage intensities (Kuznets 1940, 259; Schumpeter 1935, 6; Schumpeter 1939, 82-84, 98-100). Although it has dealt with the dynamic mechanism of the capitalist market economies in a different way, Schumpeter's business cycle analysis has not taken an important place in the tradition of laissez-faire.

However, as national economies felt the effects of global competition during the globalization process, efforts to explore alternative sources of economic growth have concentrated, and entrepreneurship and innovation activities have started to take place in the focus of both academic and political interest. As a result, while

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[6] In detailed, Blaug, 1978, 59, 153-156; Kydland and Prescott 1982; Lucas 1975; Lucas and Rapping 1969; Ricardo 1817, 120; Shaikh 2009, 127-128; Schumpeter 1954, 738; Smith 1776, 349-350.

governments are implementing policies[7] for the development of entrepreneurship and innovation activities, academic studies have started to focus on the impact of entrepreneurship and innovation activities on economic growth and cyclical fluctuations (Scholman *et al.* 2014, 4).

While significant steps have been taken in the field of economic policy in Turkey, a small number of academic studies have carried out on the impact of entrepreneurship and innovation activities. In addition, these studies were mostly conducted on the firm scale or limited to the theoretical field. Furthermore, in the empirical studies on the causes of cyclical fluctuations, the effects of external macro variables such as money supply, bank loans, short-term capital flows, supply and demand shocks are focused.[8] This study will contribute to the literature by examining the impact of entrepreneurship and innovation activities on cyclical fluctuations. Indeed, this paper is the first study in Turkey on the subject. In the study, data for the period after 2000 in Turkey were used. Firstly, the theoretical and empirical literatures are briefly summarized, then ARDL method is used for the data and the obtained results are explained. Finally, the study is concluded with an overview.

1. Literature review

The history of theoretical debates on entrepreneurship and innovation activities goes back to the time of Richard Cantillon, who considered entrepreneurship as an economic actor in the early 18th century. According to Cantillon, there are three types of economic actors: landowners, entrepreneurs, and employees. His opinion is about entrepreneurs are people who benefit from profit opportunities created by differences in supply and demand in the market (Wennekers and Thurik 1999). From Cantillon to the present day, there is no single precisely accepted definition of entrepreneurship in the literature, but a large number of definitions whose entrepreneur's different dimension has put forward. In the study conducted by Herbert and Link (1989, 41), it was noted that 12 different approaches to the concept of entrepreneurship and three basic traditions could be separated. According to this study, an entrepreneur is a person who is innovative, decision-maker, industrial leader, manager or superintendent, organizing and coordinating economic resources, owner, employer, contractors, pursuing arbitrageur, person distributing resources among alternative uses, risk taker, a supplier of the financial capital. In addition, the three basic traditions are the German tradition of von Thünen, Schumpeter, Baumol, and the neoclassical tradition of Marshall, Knight and Schultz as also named the Chicago tradition, and lastly Austrian tradition pioneered by Menger, von Mises, and Kirzner.

In German tradition, the entrepreneur is seen as an innovator in economic life, and focuses on the features of creative destruction and creating instability. The neoclassical tradition draws attention to the entrepreneur's role in stabilizing markets through its activities while focusing on the entrepreneur's ability to assess profit opportunities in the Austrian tradition. Additionally, in the Austrian tradition, the entrepreneur is treated as a person who combines resources to meet current needs or eliminate the inefficiency of markets (Wennekers and Thurik 1999, 31-34).

Hebert and Link (1989, 47) describe the entrepreneur as "a person specialized in making decisions that affect the use, location, and format of goods, resources or institutions" based on the arguments in these three traditions. This definition is a synthetic definition for them because it encompasses historical dimensions of entrepreneurship such as risk, uncertainty, innovation, perception ability, and change. Moreover, this definition expands the scope of entrepreneurship in the market system through coordination, arbitrage, property, speculation, innovation and resource allocation.

However, Wennekers and Thurik (1999, 46-47) argue that this definition is not sufficient because it does not take into account the impact of entrepreneurship on the economy. According to them, in the definition to be made, the dynamics of entrepreneurship towards the creation and acquisition of new economic opportunities and competitive dynamics should take into consideration. In their view, entrepreneurship is not a person or a small company, and basically it is the behavioral characteristics of individuals. It should also define by taking into account both the size of firm and industry as well as the national level. In this context, entrepreneurship is to show the willingness and ability to create and win new economic opportunities, such as new products, new production methods, new institutional schemes, and new product-market combinations, by making decisions on issues such as the use of resources and the shape, location of institutions, and the use of resources in the face of uncertainty and the other obstacles in.

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[7] Some of these policies are such as credit guarantee funds, technology transfer and innovation programs, employment support programs, consulting small and medium-sized firms, direct subsidies to innovative companies, tax reductions on AR-GE expenditure (Congregado *et al.* 2009, 1).

[8] The prominence of the empirical study of cyclical fluctuations in Turkey respectively: Özatay (1986), Oğuz (1995 and1999), Alp *et al.* (2012), Alper (1998, 2000 and 2002), Özata (2007), Özkan and Erden (2007), Alp *et al.* (2012), Apaydın (2015).

As stated by Wong *et al.* (2005, 337-339), this definition makes it possible which the entrepreneurship and innovation can consider as two different factors affecting the economy on the contrary of Schumpeter tradition. When the concept takes into account in this way, it is presented in a multi-faceted way, and beyond its innovative role, the establishment of new companies and new entrances to the market are considered as entrepreneurship. As mentioned above, using the concept of 'innovative entrepreneurship' in Schumpeterian tradition, risk-taking and managerial responsibilities of entrepreneurship other than innovation are pushed into the background. However, innovation is not just a specific phenomenon for the field of entrepreneurship. In the process of the development of modern markets, professional innovators and innovative organizations have emerged, which are controlled by large companies rather than entrepreneurs. Today, innovations are realized by manufacturers and innovative companies in competitive markets (Wong *et al.* 2005, 339). Thus, defining entrepreneurship in all aspects has created the possibility of associating entrepreneurship with macro variables independently of innovations.

On the other hand, although there are many business cycle theories in the literature, the number of theoretical and empirical studies involving entrepreneurship and innovation activities is not much. Here are a few of these studies:

Rampini (2004) develops a theoretical real business cycle model and clearly focuses on the relationship between the business cycles and entrepreneurs' share in total labor. The model assumes that economic actors avoid risk and can choose between paid worker and entrepreneurship. According to the study, entrepreneurship activities are pro-cyclical.

Wong *et al.* (2005) examines the effects of entrepreneurship and innovation on economic growth separately. The study was carried out within the context of the neoclassical growth model and the horizontal cross-section data of 37 countries for 2002 were used. According to the result of study, innovation is an important and meaningful determinant of economic growth. In this study, the entrepreneurship ratio is defined in four different ways, general/total entrepreneurship, opportunity entrepreneurship, necessity entrepreneurship and potential entrepreneurship, and it is stated that only potential entrepreneurship has a positive and meaningful effect on economic growth.

The study conducted by Congregado *et al.* (2009) investigates whether entrepreneurship has a hysteresis effect in Spain and the United States, and explores the causal relationship between business cycles and entrepreneurship rates. According to the study, entrepreneurship in Spain causes hysteria, whereas in the United States such an effect is not seen. Moreover, it has concluded that changes in business cycles in both countries have significant effects on future entrepreneurship rates. In other words, the existence of reverse causality between business cycles and entrepreneurship has determined.

Parker (2009) discusses whether newly opened firms in the United States are pro-cyclical. It also points out that the decline in wages during the recession encouraged the new firms openings and the entrepreneurship.

Koellinger and Thurik (2012) had examined the relationship among entrepreneurship, unemployment and GDP cycles in a panel data analysis for 22 OECD countries during the period of 1972-2007. For the 22 countries, the entrepreneurship was Granger causality of the business cycle even though it was not on the national level. In other words, as entrepreneurship had increased at the level of all countries, the conjuncture had entered the expansion period, but such a relationship had not seen at the country levels. Moreover, entrepreneurship at the national level was arising as a reaction to unemployment fluctuations rather than causing unemployment.

Fritsch *et al.* (2013) examines the relationship among entrepreneurship, unemployment and business cycles in Germany. It is found that there was a positive relationship between unemployment and new firm start-up activities in the study. Moreover, it has determined that the establishment of new firms was more during recession periods. In other words, it has found that the entrepreneurship was counter-cyclical. The authors also analyzed the periods of high and low unemployment and found that unemployment had a significant effect on entrepreneurship when the unemployment rate was below trend value.

Scholman *et al.* (2014) analyses the relationship between entrepreneurship activities, business cycles and unemployment in an open economy. The study was conducted using both quarterly and annual data from 1998-2007 of 19 OECD countries. According to the findings, if a country's business cycle is lagging the world's business cycle, then in the short run (after one quarter) the entrepreneurship increases in that country. However, if the country's business cycle is leading the world's business cycles, then the entrepreneurship activities in that country increases in the medium run (after one to two years). According to the authors, the position of the business cycle in a country according to the world conjuncture creates different types of entrepreneurial opportunities, depending on the time horizon considered. When these results apply to an open economy, openness has a role for entrepreneurship opportunities related to country's cyclical performance.

Faria (2015) claims to establish a theoretical model for the empirical results of Koellinger and Thurik (2012). The study examines the relationships between entrepreneurship, unemployment and output dynamics based on the Ramsey model. According to the study, during the periods of recession, unemployed people tend to entrepreneurship and can choose to enter the market by developing a technological innovation. This situation will increase capital stock by creating new jobs and encouraging the increase in output and consumption. As the economy expands and the unemployment rate declines, the number of new entrepreneurs will decrease, which will lead to a decline in technological innovation and capital stock. The process will result in a decrease in employment, output and consumption, and the cycle will start again (Llopis *et al.* 2015, 246).

Lechman and Dominiak (2016) argue that they have developed a new methodological approach to determining whether entrepreneurship is pro-cyclical, counter-cyclical or a-cyclical. Authors use quarterly data for the period 1995-2014 of Italy to exemplify their conceptual approach. According to the results obtained from the study, in the first quarter, self-employment demonstrates pro-cyclical behavior during the expansion phase of business cycle. In the third quarter, it shows pro-cyclical behavior during the recession phase. Self-employment illustrates the counter-cyclical behavior in the second and fourth quarters. But, this counter-cyclical behavior of self-employment arises during the contraction phase of the business cycle in the second quarter, and during the expansion phase of the business cycle in the fourth quarter.

Within the framework of all the above arguments, it is possible to summarize the effects of innovation and entrepreneurship activities on the conjuncture as follows. Innovations such as the production of new consumption goods, the development of new production and transportation methods, the opening of new markets and the availability of new resources have a positive impact on economic growth and conjuncture. When expressed in the terminology of the business cycle, innovations are pro-cyclical. As the innovations increase, economic growth revives and conjuncture is expanding.

On the other hand, entrepreneurship is expected to improve economic performance by creating innovations and increasing competition in the related literature (van Stel *et al.* 2005). However, as empirical studies have shown, the effects of entrepreneurship on economic growth and conjuncture may vary from country to country and the length or shortening of the period taken into account. Moreover, the effects of entrepreneurship can also change depending on whether the economy is in the recession or the expansion phase. This is especially important for the period of the recession. Because in this period, the phenomena that cause the increase or decrease of entrepreneurship can exist. During the recession periods, on the one hand, the entrepreneurship activities may reduce because the firms' potential income and wealth are decreasing. On the other hand, it can necessarily increase due to the lack of employment or potential job opportunities, in other words, 'necessity entrepreneurship' can experience. Moreover, as the unemployment rate increases and labor force becomes cheaper in this period, 'opportunity entrepreneurship' can also increase. These characteristic features of the recession period make the net effect on entrepreneurship uncertain (Farlie 2011, Wong *et al.* 2005).

2. Methodology

This study examines to the relations among GDP, entrepreneurship and innovation activities by using Autoregressive Distributed Lag Model (ARDL) which developed Pesaran and Shin (1999) and Pesaran, *et al.* (2001).

The main difference of this model from the methods developed by Engel and Granger (1987) and Johansen (1988) is that it is possible to test long-run relationships on values regardless of whether variables in the model are *I(0), I(1),* or co-integrated (Pesaran and Pesaran 1997, 302-303). However, while the dependent variable used in the ARDL model is *I(1),* the independent variables should not be stationary at *I(2)* or higher degree because to be able to generate the critical values necessary for comparison. On the other hand, the ARDL model can be applied to the studies consisted of few observations, and be estimated robust and consistent long-term coefficients. Because, according to the model, it is not important the number of observations while the length of the considered period is notable (Narayan and Narayan 2004). Additionally, each variable in the model can take a different lag length (Laurenceson 2005).

The effects on the cyclical fluctuations of the changes in entrepreneurship and innovation activities can formally express as follows:

$$gdp_t = \delta_0 + \delta_1 inov_t + \delta_2 selfemp_t + \varepsilon_t \tag{1}$$

In equation 1, gdp_t, $inov_t$ and $selfemp_t$, ε_t respectively represent for real gross domestic product, innovation activities, cyclical changes in the rate of entrepreneurship and the error term.

In the analysis, the entrepreneurship rate has calculated according to the definition of entrepreneurship in a broad sense that includes incorporated self-employed persons (owner-manager of firms) and unincorporated self-employed individuals with and without employees and excludes unpaid family workers.[9] Therefore, the share of employers and self-employed in the total labor has accepted as the entrepreneurship rate. Because the R&D data in Turkey is both inadequate and annual, the total number of patents, utility models, industrial designs, and trademarks have used as innovation activities. Since real GDP used as the reference variable in the business cycle analysis, in this study, the GDP data of 1998 prices published by Turkish Statistical Institute (TURKSTAT) has considered as the reference variable. The quarterly data used in this study have obtained from the Turkish Patent Institute (TPE), and Turkey Statistical Institute (TURKSTAT) for the period 2000-2016 in Turkey.

On the other hand, all variables related to production and employment were eliminated seasonal effects by using Census X-12 method and used in natural logarithm values except the entrepreneurship rate. The Hodrick-Prescott (HP) filter was used to separate the variables into cyclical components, and the smoothing parameter λ was accepted 1600 which suggested by Hodrick and Prescott (1997) quarterly data set. The cyclical changes in real GDP have shown in Figure 1. As seen, two significant decreases have observed in GDP due to the 2001 and 2008 crises. Therefore, a dummy variable was added in 2001: Q4 and 2009: Q1 to include the effects of the crises in the model.

Figure 1. Cyclical fluctuations for the period of 2000-2016
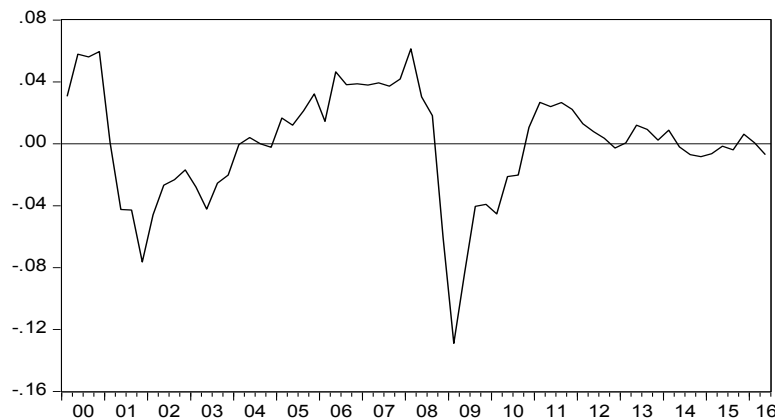
3. Econometric tests and results

3.1 Unit Root Tests

The ARDL approach allows variables with different integration degree to be included in the same model and to test long-run relationships between variables. However, since variables should not be *I(2)* in ARDL model, it is necessary to perform unit root tests.

To test the stationary of the variables, first the ADF test was applied, and then the results were checked with the Phillips-Perron (PP) (1988) test. The main difference of the PP test from the ADF test is that ADF test consists of lagged values of error terms including autocorrelation and heteroscedasticity while it is modified test statistics in PP test to eliminate autocorrelation. According to the test results shown in Table 1 and Table 2, all variables are stationary at the level in the ADF test. However, the results of the PP test showed that the GDP taken as the dependent variable in the model is difference-stationary. In this case, since GDP is *I(1)* and the other variables are *I(0)*, it is decided to use ARDL model for co-integration instead of the traditional methods.

Table 1. ADF test results

Variables	Level			
	Test Format *	Test Statistic	Critical Value ** (5%)	Conclusion
Gdp	(1,c,t)	-3,686	-3,481	I(0)
Inov	(0,c,t)	-4,003	-3,480	I(0)
Selfemp	(0,c,t)	-4,580	-3,480	I(0)

Note: *The expressions used in parentheses respectively represent lagged degree, the fixed term and the trend. **MacKinnon (1996) critical values.

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[9] Unpaid family workers are excluded in the entrepreneur's definition as Koellinger and Thurik (2012) stated.

Table 2. PP Test Results

Variables	Level			First Difference			Conclusion
	Test Format*	Test Statistic	Critical Value ** (5%)	Test Format*	Test Statistic	Critical Value ** (5%)	
Gdp	(c)	-2,611	-2,906	(c)	-6,455	-2,907	I(1)
Inov	(c, t)	-4,079	-3,480	-	-	-	I(0)
Selfemp	(c, t)	-4,607	-3,480	-	-	-	I(0)

Note: * Expressions used in parentheses represent constant terms and trends, respectively. ** MacKinnon (1996) critical values.

3.2. Bound test or ARDL model

In the ARDL approach, the analysis of the relationships between variables has performed in two stages. In the first stage, it has tested whether there is a long-term relationship between variables. In the second phase, short and long-run parameters of the model have estimated if there is a long-run relationship.

Firstly, it is tested whether there is a long-term relationship among, providing variables a long-term relationship is found, in the second stage, short and long-term parameters for the model are estimated. Thus, the unrestricted error correction model (UECM) has established before application of the model. The model used in this study can point out as follows:

$$\Delta gdp_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\Delta gdp_{t-i} + \sum_{i=0}^{p} \alpha_{2i}\Delta inov_{t-i} + \sum_{i=0}^{p} \alpha_{3i}\Delta selfemp_{t-i} + \sum_{i=0}^{p} \alpha_{4i}\Delta dummy_{t-i}$$

$$+ \alpha_5 gdp_{t-1} + \alpha_6 inov_{t-1} + \alpha_7 selfemp_{t-1} + \alpha_8 dummy_{t-1} + u_t \qquad (2)$$

Here, p is the number of lags, and it is determined using AIC or SBC criteria. The lag providing the smallest critical value is considered to be the optimal lag length. However, if the model created according to the selected delay length contains autocorrelation, the delay length which provides the second smallest criterion is taken. If autocorrelation continues, the process is repeated to eliminate the problem.

The test results of lag lengths have presented in Table 3. In the test in which the maximum lag length was 8, the lag length was the determined basis on the smallest AIC value at which the likelihood of autocorrelation is the lowest, and the test results showed that the optimal lag length was 4.

Table 3. Optimal Lag Length

p	AIC	LM Test
1	-5,376645	0,6087
2	-5,422139	0,6087
3	-5,422394	0,6087
4	-5,515026	0,9660
5	-5,563362	0,5187
6	-5,691949	0,5187
7	-5,712988	0,7053
8	-5,684551	0,7053

For the determination of the long-run relationship in the ARDL model, in the equation (2), the lag coefficients of the dependent and independent variables set to zero ($H_0: \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = 0$) and the F test is applied. Obtained F statistic results are compared with the lower and upper critical values based on Pesaran *et al.* (2001). According to the bound test, if the F statistic is above the upper critical value, then it is decided that the variables are co-integrated. Conversely, if the test statistic falls below the lower critical value, then it is decided that there is no long-run relationship between the variables. Finally, if the statistic value falls between the upper and lower critical values, the result is unclear.

Table 4 reports the results of the bound test. The calculated value is higher than the upper critical value at all confidence intervals. Thus, the results imply that there is a long-run co-integration relationship between the variables.

Table 4. Bound test results

F Statistic	K	Critical Value					
		%1		%5		%10	
		I(0)*	I(1)**	I(0)	I(1)	I(0)	I(1)
7,425950	3	4,29	5,61	3,23	4,35	2,72	3,77

Notes: k is the number of independent variables. Limits of critical value in Pesaran et al. (2001: 300). * and ** denote lower and upper bound values, respectively.

Since the existence of the long-run relationship established, the ARDL (3,1,0,4) model has estimated and the results obtained are reported in Table 5.

Table 5. ARDL (3,1,0,4) Model estimation results

Dependent Variable : GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
gdp (-1)	0.650451	0.164830	3.946189	0.0002
gdp (-2)	0.255561	0.219616	1.163674	0.2501
gdp (-3)	-0.545710	0.177306	-3.077790	0.0034
Inov	0.108692	0.033468	3.247692	0.0021
İnov (-1)	0.060332	0.037234	1.620354	0.1114
selfemp	-1.725550	0.829508	-2.080209	0.0427
dummy	-0.036236	0.014424	-2.512272	0.0153
dummy (-1)	0.032417	0.017237	1.880641	0.0659
dummy (-2)	0.020354	0.015617	1.303355	0.1984
dummy (-3)	-0.055542	0.016668	-3.332211	0.0016
dummy (-4)	-0.044843	0.013199	-3.397458	0.0013
C	0.002418	0.002124	1.138569	0.2603
Diagnostic Tests:				

Diagnostic Tests:

R^2 : 0.86, $\overline{R}^2$: 0.83, F-statistic : 28.093, Prob. (F-Statistic) 0.000, DW : 2.0087

Breusch-Godfrey Serial Correlation LM Test:

$\chi_1^2 = 0.075[0.783]$, $\chi_2^2 = 0.089[0.956]$, $\chi_3^2 = 1.198[0.754]$, $\chi_4^2 = 5.739[0.219]$

Heteroscedasticity Test: ARCH-LM

$\chi_1^2 = 0.492[0.482]$, $\chi_2^2 = 0.443[0.801]$, $\chi_3^2 = 2.022[0.567]$, $\chi_4^2 = 2.275[0.685]$

Normality Test: Skewness: -0.017 , Kurtosis: 3.008 , Jarque-Bera: 0.0032 [0.998]

Stability: Ramsey RESET Test $\chi_1^2 = 0.286[0.595]$

Since the existence of the long-run relationship established, the ARDL (3,1,0,4) model has estimated and the results obtained are reported in Table 5. According to the diagnostic test results, there were no problems in the estimated model. Breusch-Godfrey LM test showed that the model did not contain autocorrelation, and the ARCH-LM test did not reveal the problem of heteroscedasticity. The Jarque-Bera statistic value result shows that the residuals have the normal distribution. The Ramsey RESET test shows that the model established correctly and that the coefficients are stable.

Table 6 shows the estimated coefficients of the long-run relationship. According to the table, independent variables are statistically significant except the constant term. Consequently, innovation activities have the positive effect on the changes in GDP. In other words, innovations are pro-cyclical. This result suitable to Schumpeterian tradition and also for general expectations. Therefore, the increases in innovation activities pioneer to the economic expansion and the decreases in innovations lead to the contraction of the economy.

Table 6. ARDL (3,1,0,4) Model Long Run Results

Dependent Variable: gdp				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Inov	0.264226	0.046946	5.628232	0.0000
selfemp	-2.697445	1.214576	-2.220894	0.0309
dummy	-0.131075	0.034421	-3.808028	0.0004
C	0.003780	0.003201	1.180725	0.2433

On the other hand, the entrepreneurship is counter-cyclical. That is the findings of entrepreneurship opposite the Schumpeterian tradition. Hence, the increases in entrepreneurship rates correspond with the recession periods, while the decreases in entrepreneurial activities characterized by the expansion stages. However, this is an

acceptable case when the characteristics of the recession periods taken into consideration because of that the potential job opportunities may decrease and individuals may opt for entrepreneurship. In a sense, it can state that Necessity Entrepreneurship in Turkey observed as a phenomenon. The findings also support this argument. Briefly, it may state that the entrepreneurship activities decrease during the expansion stage because of that there are more potential employment or job opportunities. For this reason, individuals will be able to avoid risk and prefer paid employment instead of entrepreneurship. In other words, the entrepreneurship may have a high opportunity cost in expansion periods.

The results of the short-term dynamics obtained from the error correction mechanism (ECM) in equation (3) are given in Table 7.

$$\Delta gdp_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i}\Delta gdp_{t-i} + \sum_{i=0}^{p_1} \beta_{2i}\Delta inov_{t-i} + \sum_{i=0}^{p_2} \beta_{3i}\Delta selfemp_{t-i} + \sum_{i=0}^{p_3} \beta_{4i}\Delta dummy_{t-i}$$

$$+\theta ECT_{t-1} + u_t \tag{3}$$

As it can be seen, estimated error correction coefficient is significant, has the negative sign and high adjustment speed to equilibrium after a shock. 63% of disequilibria from previous period's shock converge into long-run equilibrium in the current period. According to the results of the error correction model, the short run coefficients are in harmony with the long-term. Innovation activities in the short run have the positive sign on the gross domestic product at 1% confidence interval. Entrepreneurial activities are counter-cyclical in the short and long run. On the other hand, the two lagged changes in the gross domestic product play a leading role in the expansion in the current period at the 1% level.

Table 7. ARDL (3,1,0,4) Model Error Correction (ECM) Results

Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δ (gdp (-1))	0.290149	0.169018	1.716675	0.0922
Δ (gdp (-2))	0.545710	0.177306	3.077790	0.0034
Δ (inov)	0.108692	0.033468	3.247692	0.0021
Δ (selfemp)	-1.725550	0.829508	-2.080209	0.0427
Δ (dummy)	-0.036236	0.014424	-2.512272	0.0153
Δ (dummy (-1))	-0.020354	0.015617	-1.303355	0.1984
Δ (dummy (-2))	0.055542	0.016668	3.332211	0.0016
Δ (dummy (-3))	0.044843	0.013199	3.397458	0.0013
CointEq(-1)	-0.639698	0.106521	-6.005343	0.0000
Cointeq = gdp - (0.2642*inov -2.6974*selfemp - 0.1311*dummy + 0.0038)				

Conclusion

Since the entrepreneurship and innovations affected the employment and economic growth the positively, effects of entrepreneurship and innovation activities on the economy have become increasingly important issues both academic and political debates. Indeed, this study was conducted to see the effects of entrepreneurship and technological innovations in Turkey, and it has also demonstrated the results that support these arguments.

According to the results of the study, the increases in innovation activities have positive effects and significant contributions to the economic growth and recovery. Even though the share of these positive contributions is a little, it may regard as a hope for the future. The entrepreneurship has a significant and positive contribution to economic conjuncture in both short and long-run. Although these effects seem to be inversely proportional, they should interpret as an indication of the importance of entrepreneurship activities in the transition from recession to recovery. Finally, when all results considered together, it is the necessity that entrepreneurship and innovation activities take into account of issues in more systematic, scientific and institutional manner.

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Vertical Integration and Multi-Plant Operation: Evidence from Korea's Concrete Industry

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Abstract:

This study examines the effects of vertical integration on competition by studying a novel data set of Korea's concrete industry. I use the industry's considerable increase of vertical integration in the mid-2000s to estimate the effects of ownership change on retail prices. A simple comparison suggests that vertical integration is associated with low prices. But regression analysis reveals that reduction in prices is not due to vertical integration but to large scale multi-plant operation that is often observed in vertically integrated firms. I also find some evidence that multi-plant operations reduce direct costs of production but find no support for elimination of double markups or increased utilization of capacity.

Keywords: vertical integration; multi-plant operation; concrete industry

JEL Classification: L23; L40; L6

Introduction

Much theoretical research has been conducted to explore whether vertical integration is a tool to strengthen and transfer market power or it improves efficiency and social welfare. Some argue that vertical integration increases market power by raising rivals' costs or denying competitors access to essential resources. Others believe vertical mergers reduce markup or promote better coordination among firms to enhance efficiency. Despite accumulated research, no satisfactory consensus has been reached, which keeps this topic controversial (Riordan 2008). Empirical literature is relatively scant (Bresnahan and Levin 2012). Further empirical evidence would be valuable in resolving controversy and designing better competition policies.

This study analyzes a novel data set of Korea's concrete industry to examine the effects of vertical integration on retail prices. I argue that it is critical to control horizontal scale when estimating the effects of vertical integration. It is because vertically integrated firms are often of large horizontal scale and one may overestimate the true effects of vertical integration on efficiency. Korea's concrete industry is particularly suitable for this research question. Cement and concrete manufacturing are a typical example of vertical relationship: concrete is a mixture of materials such as sand, gravel, and water combined with cement as a binder. Products are largely homogeneous, simplifying the analysis. Key statistics such as output and capacity are routinely measured at a plant level. The industry recently witnessed a considerable increase of vertical integration in a relatively short period of time. It enables clean estimation in a way that is not feasible with cross-sectional data.

I find that vertical integration is strongly associated with horizontal scale, high capacity utilization rates, and low prices. Regression results, however, reveals that large scale multi-plant operation rather than vertical integration lowers prices and increases efficiency. Vertical integration itself does not promote nor hinder competition significantly. I have not found evidence for more efficient use of capacities or for elimination of double margins, which are often cited as improving efficiency under vertical integration. This study implies that pro- and anti-competitive effects of vertical integration may coexist offsetting each other or that neither of them is particularly significant, suggesting that extremely dogmatic attitudes towards vertical integration are difficult to accept.

1. Literature review

Since the pioneering work of Coase (1937), a large number of studies have explored the competitive effects of vertical integration, and the emergence of new theories changed competition policies to a significant extent. Early theoretical developments, often associated with the Chicago school, emphasized the efficiency of vertical

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integration. More recent theories have emerged showing rigorously that vertical integration may raise market power[11].

In contrast, empirical research on the competitive effects of vertical integration is relatively limited (Bresnahan and Levin 2012). Here I provide a short survey of notable studies. Gil (2015) took the 1948 Paramount case and analyzed change in movie ticket prices after the theater sector was separated from the studio. He found that vertically integrated theaters rapidly increased prices after the separation, which is consistent with the claim that vertical integration eliminates double markups. Hortacsu and Syverson (2007) studied cement and concrete industries in the United States and found that the price of concrete decreased as local markets became vertically integrated. It was concluded that increase in efficiency was from improved logistics coordination by large operations rather than from vertical integration. Hastings and Gilbert (2005) reported that wholesale gasoline prices paid by independent gas stations increased after vertical merger between large oil refineries and gas stations in California. It may be viewed as strategic behavior in which a vertically integrated gas station raised costs of rivals. Chipty (2001) analyzed the effects of vertical integration between program providers and distributors in the cable TV industry. Vertically integrated cable operators were more likely to offer their own suppliers' content.

However, he argued that vertically integrated markets provided higher quality programming, leading to an improvement in consumer surplus. Rosenberg and Meehan (1994) conducted an event study noting that if vertical merging had an anti-competitive effect, it would harm the profitability of vertically separated competitors. They found no evidence to support vertical foreclosure. Grimm, Winston and Evans (1992) studied railway lines operated by a single company. They found that interline competition to the mid-point had the effect of promoting welfare and that vertical integration was not socially desirable by eliminating interline competition.

Multi-plant operation has not been extensively studied in the industrial organization literature. It is probably because while multi-plant operation is a specific way scale economy is realized, economists tend to discuss economies of scale as a broader category rather than point to individual elements. Scherer and Ross (1990) noted that in industries with high transportation costs and uncertain demand, multi-plant operations would make it possible to utilize production facilities more efficiently. Markusen (1984) argued that in the context of multinational corporations, operation of multiple plants would increase efficiency by preventing duplication of common production factors. Okubo and Tomiura (2011), using Japanese manufacturing census, concluded that firms were more likely to operate multiple plants with the increase in size, productivity, and intensity in labor and intermediate inputs. Bernard and Jensen (2007) reported that US manufacturing plants belonging to multi-plant firms were less likely to exit than other plants, but that the likelihood of exit was higher after controlling for firm and plant characteristics. Kneller *et al*. (2012) found that plants belonging to multi-plant firms in the Japanese manufacturing industry showed superior performance but were more likely to be closed.

2. Korea's concrete manufacturing industry

Cement manufacturing and concrete manufacturing are a standard example of vertical relationship. Cement is a fine mineral powder manufactured by mixing and heating limestone and other minerals. Portland cement, the most common type of cement, is generally used as a basic ingredient of concrete.

Concrete is a mixture of sand and gravel bonded with fluid cement that hardens over time. In Korea, concrete manufacturers account for approximately 70% of total cement demand (Cho 2005). The structure of the two vertically adjacent industries is significantly different. The cement industry has relatively high barriers to entry due to initial investment and licensing rights, and 7 companies have long maintained a stable oligopoly[12]. The concrete industry appears less concentrated in which 600~700 relatively small companies exist nationwide. This is largely due to technological characteristics of the industry. Concrete mixer trucks cannot travel far as concrete begins to harden as soon as it is in the truck and that limits concrete firms' geographic scope of operation.

Table 1 groups concrete manufacturers according to whether they are vertically integrated with a cement company and whether they own more than one plant. No vertically integrated firm owns only a single plant and therefore concrete manufacturers belong to one of three categories:
- vertically separated and owning a single plant;
- vertically separated and owning multiple plants;

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[11] Riordan 2008 divided theories of vertical integration into five groups and summarizes key features of each of the five groups as "single monopoly profit," "eliminating markups," "restoring monopoly power", "raising rival's costs" and "facilitating collusion." See Riordan 2008 and Rey and Tirole 2007 for a complete survey of theoretical developments.

[12] Min 2011 estimated the elasticity-adjusted Lerner index of the cement industry to be 0.2~0.5 which is comparable to the level of markup in the 2~5 firm symmetric Cournot equilibrium. 7 cement makers include Dongyang, Ssangyong, Hanil, Hyungdai, Asia, Sungshin, and Koryo.

▪ vertically integrated and owning multiple plants.

Table 1 reports the number of firms and plants belonging to each category. The number of plants is in parentheses. As of 2002, there are 595 concrete firms and 749 plants nationwide. Of these, 549 are vertically separated single-plant firms, the most typical form of a concrete manufacturer. There are 39 vertically separated multi-plant firms which own 116 plants in total. Although a typical firm in this category owns approximately 3 plants, there is considerable heterogeneity: some own only 2 plants while large companies own more than 10 plants. Remaining firms are vertically integrated and own multiple plants. These firms are either a subsidiary or internal division of cement manufacturers. In this category, there are 7 firms and 84 plants, with an average of 12 plants per firm which is the largest among three categories. Vertical integration is strongly correlated with multi-plant ownership.

Table 1. Vertical integration and multi-plant ownership of concrete manufacturers in 2002

# of plants	Single-plant	Multi-plant					Total
	1	2	3~9	10+	Subtotal		Total
Vertically Separated	549 (549)	29 (58)	8 (34)	2 (24)	39 (116)		588 (665)
Vertically Integrated	0 (0)	0 (0)	4 (27)	3 (57)	7 (84)		7 (84)
Total	549 (549)	29 (58)	12 (61)	5 (81)	46 (200)		595 (749)

Note: The number of firms is reported in each cell and the number of plants is in parenthesis.

Table 2 compares annual production volumes and capacities for a typical plant in each of three categories.[13] The last column reports utilization rates defined as production over capacities. Utilization rates are low across the board, ranging from 31% to 43%. It is because of strong seasonality in which demand is low during summer and winter. The vertically separated, single-plant category is lowest not only in production and capacity but also in utilization rates. Plants belonging to multi-plant firms are not significantly different whether or not vertically integrated.

Table 2. Capacity utilization by ownership (2002~2005)

	A: annual production per plant (1,000m^3)	B: annual capacity per plant (1,000m^3)	A/B
Vertically separated, single-plant	142	452	0.31
Vertically separated, multi-plant	271	641	0.42
Vertically integrated, multi-plant	252	583	0.43
Total	174	495	0.35

Ownership in the concrete industry moved toward vertical integration in the mid-2000s. Table 3 summarizes this trend. First, the total number of concrete manufacturing plants increased from 749 in 2002 to 851 in 2005, reflecting the nationwide construction boom. At the same time, the composition of ownership also changed. No significant changes were observed in the share of single-plant firms. But the output share of plants belonging to vertically integrated, multi-plant firms increased from 16% in 2002 to 22% in 2005, while the output share of plants belonging to vertically separated, multi-plant firms decreased from 24% to 18%. This trend reflects strategic changes in large concrete companies. *For example*, Dongyang, one of the nation's largest cement makers, had only 6 concrete manufacturing plants in 2002, but the number increased to 24 in 2005. Eugene, the largest vertically-separated multi-plant company in 2002, became vertically integrated during this period. Some may find the change in Table 3 modest. But note that it is the change in national averages, underestimating fluctuation at regional market levels.

Table 3. Changes in the Number of Plants by Ownership (2002 - 2005)

	2002	2003	2004	2005
Vertically separated, single-plant	549 (0.73) [0.61]	571 (0.72) [0.60]	611 (0.74) [0.59]	629 (0.74) [0.60]
Vertically separated, multi-plant	116 (0.15) [0.24]	134 (0.17) [0.24]	101 (0.12) [0.19]	98 (0.12) [0.18]
Vertically integrated, multi-plant	84 (0.11)	89 (0.11)	116 (0.14)	124 (0.15)

[13] Following the industry convention, I compute annual production capacity as hourly processing capacity of batch plants times 8 hours per day times 250 business days per year. A batch plant is equipment that combines water, cement, gravel, and mixed materials at a predetermined rate when manufacturing concrete.

	2002	2003	2004	2005
	[0.16]	[0.16]	[0.22]	[0.22]
Total	749	794	828	851

Note: Numbers in parentheses are the fraction of plants belonging to each cell. Numbers in brackets are the output share of plants belonging to each cell

3. Data

Data used in this study track the Korean concrete industry, aggregated at a county level each year from 2002 to 2005[14]. The sample draws from two raw data sets. The first is the Statistical Yearbook of Ready-Mixed Concrete, published annually by the Korea Ready Mixed Concrete Industry Association, the nation's trade association of concrete makers. The Statistical Yearbook documents plant-level information such as company names, addresses, production volumes, and production capacities[15]. Production volumes and capacities are measured in physical unit. The Statistical Yearbook does not include prices or financial statement items such as revenues and expenses.

The second data source is the Mining and Manufacturing Survey, an official statistical survey of the government of Korea. It annually surveys all mining and manufacturing plants with 5 or more employees. This study uses plants belonging to the concrete manufacturing industry (Korea Standard Industry Classification Code 26322). The Mining and Manufacturing Survey complements the Statistical Yearbook by providing financial information such as revenue and costs. Since the Mining and Manufacturing Survey does not disclose the identity of individual plants, it is impossible to match plants in the Mining and Manufacturing Survey to those in the Statistical Yearbook. Instead, I aggregate two data sets at a county level. If the two data sets contain different number of concrete plants for a county, I consider the match unreliable and have removed the county from the sample[16]. The resulting sample for analysis consists of 417 county-year pairs which cover 1,848 concrete manufacturing plants.

Key variables are described in the following. But first it is worth noting that the unit of observation is a county-year pair. *REVENUE* is defined as the combined revenue of concrete plants in a county (unit: million won), and *QUANTITY* is the sum of concrete production in a county (unit: 1,000m³). *PRICE* refers to *REVENUE* divided by *QUANTITY*, which is interpreted as a price index. *CAPACITY* is defined as combined annual production capacities of concrete producers in a county. I follow the industry convention to calculate annual production capacity as hourly processing capacity of batch plants times 8 hours per day times 250 business days per year[17]. *COST* refers to the sum of direct costs of plants in a county, where a direct cost is a broad term including costs of raw materials, fuel, electricity, water, outsourcing, repair, payroll, pension, fringe benefits, rents, depreciation, taxes, bad debts, and others. *COST1* and *COST2* are individual components of *COST*. The cost of raw materials is denoted by *COST1* and the sum of other direct costs than raw materials by *COST2*. Monetary variables are converted to 2005 constant prices using the CPI in order to ease comparison across years. *HHI* is the Herfindahl-Hirschman index of a county, and *CAREA* is the previous year's gross construction area, used as a proxy for strength of demand from the construction industry. Due to data limitation, *CAREA* is available only at the province level. *VI*, *MULTI*, and *MANY* represent ownership forms of concrete plants. *VI* refers to the combined market share of vertically integrated plants located in a county. A concrete plant is deemed vertically integrated if it is a subsidiary or internal division of a cement company. Similarly, *MULTI* represents the combined market share of multi-plant firms in a county and *MANY* indicates the market share of firms that have more than 10 plants. While it may seem arbitrary for *MANY* to include firms owning 10 plants and more, I later present the results using other cutoffs than 10. *VI_F*, *MULTI_F*, and *MANY_F* are similarly defined but they are proportions of plants in numbers rather than in market shares.

Table 4 presents summary statistics for key variables. The average concrete production (*QUANTITY*) is 651,000m³, staying at a similar level in 2002 ~ 2004, and declining in 2005 due to decline in the construction industry. Production capacities (*CAPACITY*) increase annually, deteriorating the problem of low capacity utilization. The price index (*PRICE*) has an average of 55,640 won per m³, which suddenly rises in 2003 and returns to its

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[14] A county (*si/gun/gu* in Korean) is a mid-level administrative area, below provinces (*gwangyeokdanche* in Korean) and above towns (*eup/myeon/dong* in Korean). There are 17 provinces and 226 counties.

[15] I use names of concrete makers in the Yearbook and disclosure data of cement manufacturers to determine whether a concrete maker is vertically integrated.

[16] The Yearbook is a dedicated statistical of the concrete industry, annually collected by the trade association. I believe the Yearbook is unlikely to drop or misclassify plants. In contrast, the Mining and Manufacturing Survey may miss small plants or misreport plants' industry classification. Since even a mistake in one plant makes the entire county unusable, a considerable number of counties have been dropped from the sample. In the sample period, there are a total of 740 county-year pairs in which at least one concrete plant is located. Of these, discrepancies arise in 323 county-year pairs.

[17] A batch plant is equipment that mixes various ingredients such as sand, gravel, water, and cement to form concrete.

previous level thereafter. Ownership variables (*VI*, *MULTI*, and *MANY*) reflect a rise in vertical mergers during the sample period. *VI* increased considerably from 0.10 in 2002 to 0.18 in 2005 and *MANY* from 0.09 to 0.17 while *MULTI* stays roughly at the same level. While the standard deviation of *VI* is 0.26, its between and within standard deviations: 0.24 and 0.10. And the within standard deviations of *MULTI* and *MANY*: 0.07 and 0.10. These within variations in ownership variables are instrumental in estimating a fixed effects model in the next section.

Table 4. Summary statistics

Variable	2002~2005		2002	2003	2004	2005
	Mean	Std. Dev.	Mean	Mean	Mean	Mean
REVENUE (million won)	36,385.50	37,385.00	36,018.50	39,229.30	38,718.80	31,949.00
QUANTITY (thousand m^3)	651.10	637.20	651.90	681.30	679.80	596.00
CAPACITY (thousand m^3)	1,771.30	1,483.50	1,638.80	1,675.50	1,845.20	1,908.60
PRICE (thousand won per m^3)	55.64	9.97	55.47	58.24	54.85	54.11
COST1 (million won)	22,782.30	23,155.80	23,103.70	24,796.00	23,905.40	19,613.60
COST2 (million won)	10,037.70	9,757.00	9,214.60	9,985.90	10,520.80	10,368.50
COST (million won)	32,820.00	32,414.60	32,318.30	34,782.00	34,426.30	29,982.00
HHI	0.50	0.31	0.50	0.50	0.48	0.50
CAREA (million m^2)	7.86	8.47	5.71	9.15	8.91	7.60
VI	0.14	0.26	0.10	0.12	0.17	0.18
MULTI	0.30	0.37	0.29	0.33	0.30	0.29
MANY	0.14	0.26	0.09	0.12	0.17	0.17
VI_F	0.14	0.26	0.09	0.12	0.16	0.17
MULTI_F	0.30	0.37	0.28	0.33	0.29	0.28
MANY_F	0.13	0.26	0.08	0.11	0.16	0.16
Number of observations	417		99	103	103	112

4. Empirical results

Table 5 reports regression results of log (*PRICE*) on ownership variables and other factors. Column (1) includes *VI* and *MULTI*, but not *MANY* while controlling for county fixed effects and interactions between year and province effects. The coefficient for *VI* is -0.250 and statistically significant, which at first glance seems to suggest vertical integration lowers prices. To control for horizontal scale, column (2) adds *MANY* which represents the combined market share of concrete firms owning more than 10 plants. The coefficient of *VI* in column (2) reduces to less than half that of column (1) and loses statistical significance while the coefficient of *MANY* is significantly negative. This implies that price reduction in column (1) is not from vertical integration but from large scale multi-plant operation. Note that *MULTI* is not statistically significant: multi-plant operation on a smaller scale does not lead to a significant drop in prices.

Column (3) estimates an OLS without county fixed effects. Unlike column (2), *VI* is significant but *MANY* is not. It illustrates the significance of using ownership variations within a county. Column (4) omits interactions between year and province effects but includes *CAREA*, previous year's gross construction area. The results are similar in columns (2) and (4). So the interaction terms appear to capture the strength of demand from the construction industry. Column (5) takes the same set of regressors as column (2) and adds log of average cost, log (*AC*) where *AC* is *COST* divided by *QUANTITY*. The coefficient of *MANY* decreases to one third of column (2) and loses statistical significance once log (*AC*) is controlled. This implies that benefits of multi-plant operation are realized through enhanced efficiency such as a decrease in average costs.

Table 5. Regression of prices

	(1)	(2)	(3)	(4)	(5)
VI	-0.250**	-0.109	-0.101**	-0.052	0.020
	(0.114)	(0.099)	(0.046)	(0.076)	(0.052)
MULTI	0.209	0.233	0.015	0.138	0.024
	(0.195)	(0.196)	(0.044)	(0.134)	(0.058)
MANY		-0.232**	0.014	-0.214**	-0.078
		(0.099)	(0.035)	(0.086)	(0.050)
HHI	0.287	0.312	0.007	0.314	0.073
	(0.200)	(0.192)	(0.048)	(0.213)	(0.080)
CAREA				0.003	
				(0.003)	

	(1)	(2)	(3)	(4)	(5)
log(AC)					0.722***
					(0.047)
Constant	3.828***	3.816***	4.168***	3.819***	1.144***
	(0.108)	(0.106)	(0.062)	(0.111)	(0.187)
County Fixed Effect	included	Included	not included	included	included
Year Effect * Province Effect	included	Included	included	not included	included
R-squared	0.285	0.305	0.307	0.133	0.786
N	417	417	417	417	417

Note: The dependent variable is log (*PRICE*) in all columns. Standard errors are clustered at a county level and reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

The above results largely agree with the findings of Hortacsu and Syverson (2007) in the US concrete industry. I further extend the analysis in the following. To explore reasons for price reduction, I conduct more regressions using cost components as a dependent variable. All columns in Table 6 report regression results in which the dependent variables are average costs of one sort or another. In columns (1) and (4), the dependent variable is raw material costs per output (*COST1* divided by *QUANTITY*). Columns (2) and (5) use per output direct costs except raw materials cost, (*COST2* divided by *QUANTITY*). Columns (3) and (6) use the total direct costs per output, (*COST* divided by *QUANTITY*). Columns (1) to (3) control for county fixed effects and columns (4) to (6) estimate random effects models. First, log (q) has a significantly negative sign in all models. q is the output of a typical concrete plant in a county, that is, *QUANTITY* divided by the number of concrete plants. Negative coefficients imply economies of scale occur at the plant level. However, none of *VI*, *MULTI*, and *MANY* are statistically significant in columns (1) to (3). It is probably because county fixed effects absorb too much variation in dependent variables, leaving little for ownership variables to explain. In random effects regressions from columns (4) to (6), *MANY* is not significant with raw materials costs but it turns significantly negative with direct costs excluding raw materials and with total direct costs. Some argue that vertical integration eliminates double markups and lowers prices.

According to this argument, markups are added twice independently under vertical separation, once in the upstream and again in the downstream, which leads to a price level that is higher than under vertical integration. As cement is the most significant raw material in concrete manufacturing, the above result is not consistent with elimination of double markups. The result does not support the existence of buyer's purchasing power either. A significantly negative coefficient for *MANY* would imply that large scale buyers can negotiate for better terms with suppliers. However, note that evidence in Table 6 is statistically weak because the result does not stand in fixed effects models. Furthermore, wholesale prices in vertically integrated firms are merely transfer prices and may be subject to distortion for accounting reasons. But it is difficult to assess the severity of this issue with available data.

Table 6. Regression of average costs

	(1)	(2)	(3)	(4)	(5)	(6)
VI	-0.103	-0.149	-0.116	-0.114	-0.067	-0.100
	(0.121)	(0.136)	(0.112)	(0.071)	(0.097)	(0.064)
MULTI	0.188*	0.153	0.188	0.071	0.074	0.070
	(0.107)	(0.228)	(0.137)	(0.075)	(0.104)	(0.074)
MANY	-0.158	-0.242	-0.179	-0.045	-0.227**	-0.095*
	(0.139)	(0.160)	(0.134)	(0.058)	(0.094)	(0.055)
log(q)	-0.131*	-0.428***	-0.218***	-0.049	-0.226***	-0.122**
	(0.066)	(0.092)	(0.062)	(0.038)	(0.076)	(0.049)
constant	4.208***	4.877***	5.020***	3.835***	4.196***	4.674***
	(0.342)	(0.489)	(0.315)	(0.172)	(0.336)	(0.220)
county effect	fixed	Fixed	Fixed	random	random	random
year effect * province effect	included	Included	included	included	included	included
R-squared	0.365	0.353	0.323	0.341	0.331	0.297
N	417	417	417	417	417	417

Note: The dependent variable is *COST1/QUANTITY* in columns (1) and (4), *COST2/QUANTITY* in (2) and (5), and *COST/QUANTITY* in (3) and (6). Standard errors are clustered at a county level and reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

The next set of results considers utilization rates as a dependent variable. Columns (1) and (2) of Table 7 control for county fixed effects, columns (3) and (4) estimate random effects models, and columns (5) and (6) are

OLS results. Each model is estimated twice, first with interactions between year and province effects and then with gross construction areas. In conclusion, it is difficult to find evidence that ownership structure has a significant effect on utilization rates. None of *VI*, *MULTI*, or *MANY* is significant in columns (1) to (3). If any, it is *MULTI* that appears to raise utilization rates in columns (4) to (6). Multi-plant firms are high in utilization rates whether large or small. There exist no additional gains in large-scale multi-plant firms or vertically integrated firms. It is consistent with the pattern described in Table 2. However, note that the effect of ownership variables disappears as I begin to control county effects. Ownership variables are not significant with county fixed effects and barely significant even in random effects models.

Table 7. Regression of utilization rates

	(1)	(2)	(3)	(4)	(5)	(6)
VI	0.047	0.056	0.045	0.002	0.014	-0.133
	(0.066)	(0.080)	(0.052)	(0.061)	(0.054)	(0.086)
MULTI	-0.081	-0.086	0.045	0.105*	0.087**	0.171***
	(0.089)	(0.065)	(0.050)	(0.055)	(0.041)	(0.055)
MANY	-0.004	0.008	-0.015	0.031	-0.010	0.097
	(0.062)	(0.087)	(0.047)	(0.077)	(0.054)	(0.099)
CAREA		-0.001		0.003***		0.006***
		(0.002)		(0.001)		(0.002)
constant	0.440***	0.446***	0.240***	0.357***	0.223***	0.345***
	(0.021)	(0.019)	(0.060)	(0.016)	(0.064)	(0.018)
county effect	fixed	Fixed	random	random	OLS	OLS
year * province effect	included	not included	included	not included	included	not included
R-squared	0.554	0.332	0.541	0.296	0.649	0.311
N	417	417	417	417	417	417

Note: The dependent variable is a utilization rate defined as *QUANTITY/CAPACITY* in all columns. Standard errors are clustered at a county level and reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Finally, several robustness checks are conducted. Columns (1) to (3) in Table 8 have regressions of log (*PRICE*) as in Table 5 but define the variable *MANY* in different ways. *MANY* is originally defined as the combined share of concrete firms that own more than 10 plants. The cutoff of 10 is a reasonable choice given the plant number distribution but it is also arbitrary. I use a cutoff of 5, 15, and 20 in columns (1) to (3), respectively. Although statistical significance varies, the result has not changed much. In columns (4) to (6), I continue to use log (*PRICE*) as a dependent variable but replace ownership variables with *VI_F*, *MULTI_F*, and *MANY_F*. They are computed as proportions of plants in numbers not in market shares that belong to each group. The result is qualitatively same as the earlier result.

Table 8. Robustness checks

	(1)	(2)	(3)		(4)	(5)	(6)
VI	-0.154	-0.159	-0.137	VI_F	-0.265**	-0.110	0.025
	(0.113)	(0.122)	(0.102)		(0.116)	(0.104)	(0.054)
MULTI	0.227	0.204	0.212	MULTI_F	0.268	0.296	0.043
	(0.198)	(0.196)	(0.200)		(0.195)	(0.195)	(0.060)
MANY	-0.149	-0.096**	-0.194**	MANY_F		-0.253**	-0.088*
	(0.117)	(0.040)	(0.081)			(0.110)	(0.049)
HHI	0.290	0.289	0.285	HHI	0.283	0.312	0.073
	(0.198)	(0.200)	(0.199)		(0.199)	(0.190)	(0.081)
				Log(AC)			0.720***
							(0.047)
Constant	3.832***	3.824***	3.822***	Constant	3.815***	3.800***	1.147***
	(0.108)	(0.109)	(0.110)		(0.109)	(0.106)	(0.188)
County fixed effect	included	included	included	County fixed effect	included	included	included
Year effect * province effect	included	included	included	Year effect * province effect	included	included	included
R-squared	0.292	0.289	0.300	R-squared	0.291	0.315	0.787
N	417	417	417	N	417	417	417

Note: The dependent variable is log (*PRICE*) in all columns. Standard errors are clustered at a county level and reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Conclusion

This study analyzes the effect of vertical integration on retail prices in the concrete industry of Korea. I use a considerable change in ownership during the mid-2000s to estimate the effect of vertical integration on concrete prices. A simple cross-sectional comparison shows that vertically integration is strongly associated with large scale, high utilization rates, and low prices. However, after controlling fixed effects of counties, vertical integration itself does not promote nor hinder competition but large scale multi-plant operations reduce retail prices. Further analysis suggests that multi-plant operations reduce direct costs of production but that there is no evidence for elimination of double margins or efficient use of production facilities.

This is a new case study that adds to relatively thin empirical literature on competitive effects of vertical integration. Several general implications may be derived as follows. First, it is critical to properly control horizontal scale when analyzing the effects of vertical integration. If vertical depth and horizontal width of a firm are correlated, the effect of economies of scale may be misinterpreted as the effect of vertical integration. Since vertical and horizontal expansions are likely to be correlated in general as observed in Williamson (1985), this study's lesson may be extended beyond the concrete industry. Second, multi-plant operations receive little attention as an independent topic in the industrial organization literature. But this paper shows that its effect may exceed that of vertical integration. Further research is necessary to better understand how multi-plant operations raise efficiency. Finally, this study implies that two opposing effects of vertical integration may coexist offsetting each other or both are negligible at the same time, which may serve as a warning against excessively dogmatic attitudes towards vertical integration.

I briefly describe limitations of this study. The data set in this study is rich and detailed compared to other available data, but weaknesses are worth noting. First, I have to drop a number of counties in matching two data sets. Although there was no serious sample selection problem, missing observations raise a legitimate concern. Second, strong seasonality in the concrete industry may make it difficult to identify the effects of ownership. Demand is usually lower during summer and winter than in spring and fall. Logistical coordination is likely to matter most during peak seasons. Then yearly data is not ideal to uncover gains in logistical efficiency if any, as it averages across seasons. Future studies may address these issues with new data and research design.

Acknowledgement

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Does Commodity Improve the Welfare? Analytical Hierarchy Process Approach

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Abstract:

The objective of this study is to develop the strategy for local economic development (LED) based on coconut commodity. Previous studies did not explain in detail how should a commodity can improve welfare. By using Analytical Hierarchy Process (AHP), LED strategy resulting order of priority are to increase productivity, increased revenues, employment, institutional development and empowerment.

Keywords: coconut commodity; local economic development; analytical hierarchy process

JEL Classification: Q13; Q120

Introduction

Commodities should be able to encourage the growth and the development of variety of economic activities, employment opportunities and create wealth. However, not all commodity-producing regions are able to utilize the existence of certain commodities for welfare. Of his contribution to national revenue, can be said that the potential of coconut commodity has not been able to utilized by Indonesian coconut farmers (Allorerung *et al.* 2005).

The weak contribution of coconut to the Indonesian economy is correlated with the lack of local economic development (LED) strategy based on this commodity. The experts view of LED outline from the aspects of production and marketing. In the aspect of the production, LED activity focused on local entrepreneurship (D'arcy and Guissani 2006), the increase of labor productivity (Bartik 2003), the improve of human resources quality (Blakely and Bradshawn 2002), the diversified of local economic base (Utukaman 2010), the development of innovation (Norris *et al.* 2012), clusters and technology (Utukaman 2010). While the marketing aspect of LED activities focused on social networking and institutional structures (Sutthachaidee 2015, D'arcy and Guissani 2006), the development of partnerships and improving accessibility to markets (Utukaman 2010).

Besides the low of crop productivity, individually product management system is to be another Indonesia coconut problem. According to Karunakaran, (2016) research, low productivity due to the absence of product diversification and in stream plant, chemical pollution, declining soil fertility and groundwater levels. For issues of productivity, Keizer, (2005), suggest unproductive crop replacement with superior seedlings. While Mintarti, (2007) focus on increasing crop productivity of coconut through horizontal and vertical diversification. Samuel *et al* (2014) found the advantages of the application of agricultural systems that integrate fish farming in irrigation to increase crop productivity of coconut. Rodriguez *et al* (2007) add the aspect of personal development of coconut farmers through participation in a training program. Meanwhile the existence of institutional expected to increase bargaining position, access to information, financing, farm management and marketing (Sutthachaidee 2015, Lay and Pasang, 2012). Luntungan *et al.* (2005) adds the importance of mastering appropriate technology in an effort to increase

the value-added of agriculture. In order to encourage the role of products derived from coconut, Sutthachaidee, (2015) research recommends the implementation of the five criteria relating to the advantages of cultural peculiarity, community care, local product, uniqueness and specialized marketing system.

Associated with LED based on coconut commodity, Tambajong, (2010) said that the only effort to increase coconut added value is through the industry existence of derivative products. Theoretically increase in economic activities based on coconut commodity will increase the availability of jobs (Bartik 2003). Technically, according to Sutthachaidee, (2015) coconut derived products need to be designed by applied the five criterias:

- the representing design of local cultural heritage;
- the inclusiveness of aging societies;
- the use of local raw materials in production with low cost;
- the product should be unique and attract customers;
- the product must be shipped via parcel delivery.

The success of LED will be reflected in an increasing ability of local resources both commodity productivity and labor productivity (Bartik 2003). The improvement accumulation of both types of these productivity that will contribute to local economic capacity so as to create the welfare of farmers. As one of the coconut producing areas, the dominance of coconut in the local economy community in the district of West Sei Kepayang can be used as basis of LED for the improvement of social welfare. The objective of this study is to design the LED strategy based on coconut commodity in the district of West Sei Kepayang.

The outline of this paper is as follows. The second section discusses the research methodology that used in this study. The third section discusses the empirical results. Finally, the fourth section concluded the findings.

1. Research methodology

The method used in this study to design the LED strategy is the Analytical Hierarchy Process (AHP), which pioneered by Saaty (1983) that was very popular for the purpose of determining the strategy of business development. In AHP techniques there is Multi Criteria Decision Making (MCDM) methods which has two basic approaches, namely Multi Attribute Decision Making (MADM) and Multi Objective Decision Making (MODM) (Pohekar and Ramachandran 2004). According ti the objective for this study so using MODM follow Garcia, *et al.* (2014) and Samari *et al.* (2012). The decision diagram constructed as multilevel (hierarchical). Each branch of hierarchy is divided into other branches to decision making purpose. In the end, each branch will provide the results to determine the purpose of the decision. This process is used to select the most appropriate of LED strategy based on coconut commodity in the district of West Sei Kepayang (Figure 1).

Figure 1. The plan priority of local economic development based on coconut commodity

Information:

Criterias:
K1: Facilities and infrastructure
K2: Natural Resources
K3: Human Resources
K4: Technology

Sub-criterias:
SK1: Infrastructure
SK2: Market
SK3: Replanting
SK4: Distribution of Land
SK5: Training and Education
SK6: Entrepreneurship
SK7: Product Diversification
SK8: Innovation

Alternatives:
A1: Revenue Increased
A2: Employment
A3: Productivity Increased
A4: Empowerment
A5: Institutional Developmen

2. Empirical results

The result of priority synthesis of criteria and sub criteria coconut-based LED strategy is presented in Table 1 below:

Table 1. The results of Priority Synthesis of Criteria and Sub Criteria of LED Based on Coconut Commodity

Criteria	Weight	Rangking	Sub Criteria	Weight	Rangking
Facilities and infrastructure	0,405	1	1. Infrastructure	0,83	1
			2. Market	0,17	2
Natural Resources	0,377	2	1. Distribution of Land	0,750	1
			2. Replanting	0,250	2
Technology	0,180	3	1. Innovation	0,875	1
			2. Product Diversification	0,125	2
Human Resources	0,138	4	1. Training and Education	0,833	1
			2. Entrepreneurship	0,167	2

Sources: Own work (2016)

Based on the result of priority synthesis of the criteria so that the facilities and infrastructure is a top priority a with weight value of 0.405 than others. Based on the observations, the majority of population in the district of West Sei Kepayang involved in coconut based farming and make it as a primary source of revenue. Thus, the creation and development of business activities that utilize this commodity will have broad impact on the improvement of local community life. However, the condition of available facilities and infrastructure in the district less support the ongoing of economic activities. The poor conditions of infrastructure have weakened society economic activity. As a major infrastructure, paved roads in the district is only 1.5 km long, while the rest is still stony gravel road (BPS Asahan 2015). This fact indicating the lack of availability of good facilities and infrastructure in this district. In fact, the availability of good infrastructure is needed to support the improvement of both the quality and quantity production of goods and services and increasing the mobility between region. Facilities and transportation infrastructure play a key role in increasing agricultural output (Tong *et al.* 2013). Therefore, the top priority on the LED strategy based on coconut commodity is facilities and infrastructure.

Natural resources be the second priority with a weight value of 0.377. Agronomically the districts of West Sei Kepayang has a carrying capacity for the development of coconut (BPS Asahan 2015). Nevertheless, the coconut plants in the districts are less productive to meet the increased demand for coconut from year to year. Rupasingha, (2009) research says that the success of LED projects in agriculture can stimulate capital investment and distribution of land. It means that, to get investment capital inflow into its region as carrying accelerate the development of LED, it needs the sincerity of local stakeholders to improve the investment attractiveness.

Meanwhile, the third priority is technology with a weight value of 0.180. Based on the observations, coconut farmers in the district of West Sei Kepayang have the ability to process the coconuts only into wet copra and charcoal. The limitations capability of processing coconut due to limited technology so as to make the public and coconut farmers continue to live below the poverty line (Minten and Barrett 2008, Luntungan 2008). Coconut farmers do not have the ability to choose the appropriate technology (Saragih 2002). In other words, the existence of the appropriate technology is needed to support the success of LED (Ebenhardt and Vollrath 2016). The technology is mainly to produce the type of coconut derived products through the process of changing the chemical, biochemical and physical agricultural into higher economy value products either for direct consumption or for industrial raw materials. Human resources is the criteria of the fourth priority in with a weight value of 0.138. Low levels of education, also affects insight farmers to follow the development of the coconut commodity information. Lack of innovation, creativity and skills of coconut farmers and the community as well as limited land and funds resulted in farm products are produced only in the form of coconut and copra without quality standard, so that it becomes uncompetitive with market demand. Increasing farmers' knowledge and skills through training is essential (Tarigans 2005). Training needs to be done includes training mastery of technology and training of coconut product diversification to deliver new innovations. The availability of human resources should be supported with increased productivity as one of the important factors in LED based on coconut commodity because this activity is able to absorb a lot of labor (Tarigans 2005).

Furthermore, in the third hierarchy there are sub criteria supporting each criterion. Each criterion comprises of two sub criteria. On the criteria of facilities and infrastructure there are sub criteria infrastructure with value weights of 0.83. The result of synthesis priority of sub criteria on facilities and infrastructure criteria indicates that the sub criteria of infrastructure as a major priority. Facilities and infrastructure transportation play a key role in increasing agricultural output (Tong *et al.* 2013). Therefore, the presence of a good road infrastructure will support the LED strategy.

Besides road infrastructure, it is needed the existence of the market to support local economy activities with a weight of 0.17. Based on the observations, there is no market in this district to collect and distribute the processed coconut products. Product marketing chain of coconut farmers' crops are marketed directly to middlemen that there are some in every village. Majority of processed coconut products produced in the district should be marketed outside the districts. As an example of wet peel copra products are marketed directly to the coconut processing plant which is in other districts. The region's position of West Sei Kepayang districts located between two other coconut producers districts actually very suitable if there is a special market to collect and distribute the processed coconut products. However, for the development of this market needs in depth study to determine the characteristics and to see the opportunities absorption of varying coconut based products.

On the criteria of natural resources there is sub criteria of replanting and distribution of land. The result of priority synthesis of sub criteria on the criteria of natural resources shows that the distribution of land is a major priority with a weight of 0.750 compared with the sub-criteria to replanting with a weight of 0.250. Therefore, one important thing to do in order to support the productivity of coconut in the district is to replanting the old coconut that is economically unproductive by using quality seeds (Keizer 2005). The unproductive of coconut plants can be cut down and to be sold to coconut wood processing industry.

Further is technology criteria which consist of innovation and product diversification sub criteria. The result of priority synthesis of sub criteria on the technology criteria shows that the sub criteria of innovation is the prime priority with a weight of 0.875 in compared with diversified products with a weight of 0.125. In the development of technology needs the innovation. The existence of appropriate innovation will make an agency to be market leader (Lay and Pasang 2012). This is because the innovation will be able to do something that has not occurred such as to produce products with good quality and special specifications of market required. Meanwhile, the creation of product diversification will increase market coverage. The more diversified products can be created will generate more added value so that farmers' income will be increase. Thus, its necessary technology and processing facilities in order to encourage the use of coconut as a base of LED (Ebenhardt and Vollrath 2016). Coconut farmers aimed to developed an integrated coconut processing as a continuous pilot unit. Furthermore, in the mass development, quality of the products need to have standardization and production volumes that meet the economic scale for easier marketing.

Meanwhile, in the hierarchy of human resources criteria there are sub criteria of training and education and entrepreneurship. Sub criteria of training and education is a major priority with a weight of 0,833 in compared with entrepreneurship with a weight of 0.167. The existence of appropriate technologies are needed to support the success of LED (Ebenhardt and Vollrath 2016). Training needs to be done includes training mastery of technology and training of coconut product diversification to deliver new innovations in the creation of new products that encourage entrepreneurship to absorb a lot of labor (Tarigans 2005).

Finally, in the fourth hierarchy there are alternatives. Alternatives hierarchy are a form of important action that carried out in the LED. The priority of this alternative is used to determine the choice in taking the right decision in accordance with actors of local economic selected. The synthesis priority on alternative hierarchy are selected decisions in determining LED strategy based on coconut commodity in West Sei Kepayang districts. The synthesis of alternative priorities can be seen in Table 2 below:

Table 2. Results of priority alternative synthesis

No.	Alternative	Weight	Priority
1.	Productivity Increased	0,365	1
2.	Revenue Increased	0,330	2
3.	Employment	0,154	3
4.	Institutional Development	0,094	4
5.	Empowerment	0,057	5

Sources: Own work processed 2016.

From the synthesis result of LED alternative based on coconut commodity above note that the increased of productivity be a major priority with a weight value of 0.365. The second priority is occupied revenues increased with a weight value of 0.330, followed by employment as the third with a weight value of 0.154. Furthermore, in the fourth position is the institutional development weighting of 0,094. Meanwhile, as a last alternative is empowerment with a weight value of 0.057.

To see the effect of changes in the weights of criteria against alternative arrangement, used the sensitivity analysis. Sometimes, the change of new information received by respondents can make them changed the

assessment so that the synthesis of the priority of a hierarchy will also change. In the LED strategy based on coconut commodity can apllied the change of weight value in the assessment of criteria that will result a change in overall weight alternative priorities. The results of sensitivity analysis on priority of LED strategy based on coconut commodity is presented in Table 3 below:

Table 3. The results of sensitivity analysis based on the change of criteria priority

No	Criteria	Weight (%)	No	Alternative	Weight (%)
1.	Facilities and infrastructure	40,5	1.	Increased Productivity	36,5
2.	Natural resources	37,7	2.	Revenue Increased	33,0
3.	Human Resources	13,8	3.	Employment	15,4
4.	Technology	8,0	4.	Empowerment	9,4
			5.	Institutional Development	5,7

Source: Own Work processed 2016

Table 3 above shows that when the weight of the priority criteria for infrastructure experiencing changes at 40.5%, so the priority criteria also changes where further the technology before the changes is the third priority with a weight of 18%, fell down to fourth priority with a weight of 8%. Meanwhile, the criteria of human resources rose from fourth into third priority with a weight of 13.8%. The natural resources continue to occupy second priority before and after sensitivity analysis.

Meanwhile with the same sensitivity analysis the alternatives of productivity increased is the highest priority with a weight amounted to 36.5%. The revenue increased became second priority with a 33%. The employment occupies third priority with 15.4%. The fourth priority is empowerment with 9.4%. The fifth priority with 6.7% occupied institutional development. This synthesis results shows that the respondents' preferences in placing an productivity increased as a top priority over the LED strategy based on coconut commodity is not replaceable and the most important to address the economic problems faced by coconut farmers in the district of West Sei Kepayang.

For the alternative, a top priority on LED strategy based on coconut commodity is to increase productivity. This is consistent with the study results of Lay and Pasang, (2012). Increasing productivity can be done through both natural and human resources. On natural resources, productivity increased can be done through the distribution of land and replanting less productive plant by using quality seeds, fertilizer and recommended cultivation techniques. While the increased productivity of human resources can be made through training to farmers in processing coconut fruit into multiple high value products. Samuel *et al* (2014) study results found that based on the investment feasibility analysis, the application of coconut based farming systems that integrate fish farming on irrigated have positive impact in improving coconut plant productivity.

Furthermore, the second alternative priority of LED strategy based on coconut commodity is the revenue increased. Farmers' income can be increase through horizontal and vertical diversification as an added value income from the farming community of polyculture cropping systems by applying a stream of planting high value (Mintarti 2007, Lay and Pasang 2012). This research was supported by Rodriguez *et al.* (2007) by adding self development aspects of coconut farmers through participation in a training program in addition to the application of intercropping and livestock integration were found to have a positive impact on total revenue. In terms of horizontal diversification can be done by utilizing a part of coconuts which have received less attention. During this time, the coconut farmers rely solely on revenue from the sale of wet copra farming and coconut granules. Meanwhile, coconut fiber, water and coconut sap has not been used to generate additional income for coconut farmers. Coconuts has a high economic value when processed into various products such as coconut husk, coconut shell, coconut water and coconut meat (Lay and Pasang 2012).

The third priority of alternative of LED strategy based on coconut commodity is employment. Successful LED is the capability of creating many new jobs. The activity of business diversification of coconut derivative products will open up employment opportunities. Coconut commodity management will be moving both the upstream and the downstream sector. With existing activities, coconut has been able to absorb 67.39 percent of the population involved as workers (BPS Asahan 2014). Theoretically with the increase in economic activity based on this coconut commodity will further increase the availability of jobs. This synthesis results in accordance with Lay and Pasang (2012).

Institutional development is the fourth alternative priority of LED strategy based on coconut commodity. The existence of institutions is expected to increase bargaining power, increasing access to information, financing, farm management and improving marketing through cooperation (Sutthachaidee 2015). Based on the observation, there has been no formal institutional either cooperatives or farmer groups in the district of West Sei Kepayang. The

results are consistent with Lay and Pasang (2012). Therefore, it is necessary to set up farmer institution that originates from the initiative of farmers like cooperatives or farmer associations in which the government acts as fasilisitator and supported.

Empowerment is the fifth priority of alternative of LED strategies based on coconut commodity. Based on interviews with research note that in this district had not been established empowerment activities efforts to farmers in order to be able to produce a multiple products derived from coconut. According to Elizabeth, (2008), the farmers' empowerment through household agro industry business training of coconut processing into a multi product with the aim of increasing capacity in the development and management of the institution and the business is one of the efforts to increase the added value of coconut. According to Supandi and Nurmanaf, (2006), the farmers' empowerment can be done through the recovery phase which aims to improve farmers' motivation and self confidence. This stage needs a program extension and advisory services to educate, train and motivate farmers through farmer groups, to improve the productivity and efficiency of farming which includes cultivation, post-harvest processing and marketing. The next stage is the development of an independent economic institution of farmers to support the sustainable development of rural farming.

Conclusions

This study is the first to define and evaluate the importance of the criteria for LED strategy based on coconut commodity. Analytical Hierarchy Process (AHP) technique is used to determine and evaluate the criterias, sub criterias and alternatives. This article shows that AHP is an effective technique and obtained priority policy strategies and programs to be recommended to the local government in order to accelerate the development of coconut into the base of LED. Sequentially, the perpetrators of local economic activities has chosen the increase in productivity, an increase in income, employment, institutional development and empowerment as priority alternative to LED strategy of coconut commodity.

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Bank Competition and Performance: The Case of Slovakia and the Czech Republic

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Abstract:

We assess the relationship between competition and performance on a sample of banks in Slovakia and the Czech Republic over the 2005-2016 period. Results of the linear Granger causality test suggest that a higher degree of market power (measured by market share and Lerner index) is associated with the performance increase. We find strong causation running from market power to performance, whereas the opposite causality is very weak. Our nonlinear investigation shows that above a certain threshold, the higher market share of an individual bank is likely to exacerbate the individual-risk-taking behaviour, and could be detrimental to the performance of the banking sector.

Keywords: bank competition; Lerner index; performance, Slovakia, Czech Republic

JEL Classification: G21, C12, D40

Introduction

After the financial crisis the banking system, as a part of the financial system, has begun to be affected by significant regulatory changes focusing on the elimination of possible failures of other banks. These changes are the main factors that gradually reduce the cost of capital and significantly affect the performance and competitiveness of the banking sector in the international context (Siddik *et al.* 2016). Both mentioned aspects of the banking sector (competition, performance) must be examined together. The performance must be considered in the context of market structure, as the number of banks and the strength of their market position can affect the performance of a whole banking system (Belás and Polach 2011). While the debate on whether competition influences bank performance continues (Berger *et al.* 2009), the question if the performance influences the level of competition is not often discussed.

As the contribution of the paper can be considered in the application of a panel Granger causality approach which accounts for lags in variables and has a different conceptual orientation. As the second contribution can be considered in the application of the nonlinear model to analyse the link between competition and bank performance. Such a nonlinear investigation can be useful from a policy point of view, as it allows for identifying an optimal threshold beyond which competition becomes dangerous for the performance and later the stability of the whole banking sector. To fulfil the aim mentioned above the paper is divided into the next sections. Section 2 gives an overview of the theoretical and empirical literature. Section 3 describes the applied methodology and data set. The main findings and discussion are presented in section 4. The last section brings the main findings in the form of a conclusion.

1. Literature review

In the last years, the banking system, as a part of the financial system, has begun to be affected by significant regulatory changes focusing on the elimination of possible failures of other banks. For example, in Slovakia can be seen regulation of loan-to-value ratio for housing loans, gradual implementation of capital buffers, direct regulation of local systemically important banks by European Central Bank (ECB), and so on. As a result of the crisis and as well as the increased regulatory requirements, the number of banks decreased, which has strengthened the market power of the remaining, mostly large banks on the market. It can also be seen in the case of Slovakia where the number of banks dropped from 32 in 2011 to 27 in 2017, mainly due to the closure of smaller branches of foreign banks. It affected the level of competition in the market and raised questions about the relationship between competition and banking stability. Other essential factors on the banking market were for example market globalisation, innovation, and technological progress, but the macroeconomic development (Šoltés and Gavurová 2014, Miklaszewska and Kil 2016). Changes mentioned above are the main factors that gradually reduce the cost

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of capital and significantly affect the performance and competitiveness of the banking sector in the international context (Siddik *et al.* 2016).

Competition in the banking industry is essential for the efficient production of financial services, the quality of financial products and the degree of financial innovations (Claessens and Leaven 2004). Bank competition is also crucial for households and firms to access the financial resources, for proper functioning of the financial sector, for stability of the financial system, efficient management of financial intermediaries, improvement of monetary policy transmission through the interbank market rates, and for overall industrial and economic growth (Amidu and Wolfe 2013). Pruteanu-Podpiera *et al.* (2008) point to the fact that a bank competition is expected to provide welfare gains by reducing monopoly rents and cost inefficiencies, favouring the reduction of loan rates and then of investments. These expected gains are a significant issue for transition countries in which bank credit represents the largest source of external finance for companies. The literature also emphasises some potential negative effects of bank competition through excessive risk-taking of banks, which may hamper financial stability.

Another important aspect is the performance and ability of the bank to gain profit, as in the banking industry the profit is one of the most motivating factors of the business. According to Resti (1996), at the macroeconomic level, bank performance represents a socially optimal objective. It reduces the costs of financial intermediation in the transfer process of funds from savers to producers. Consequently, central banks are seriously interested in the accomplishment of operating practices and market equilibrium that grant the maximum productive efficiency, if this does not result in a monopoly, which would expropriate consumers from the advantages due to the reduction in average costs. Of course, given some crises, it may be optimal to postpone the search for performance, concentrating on the defence of the system stability and preventing dangerous "domino effects" that can arise when the less productive institutions are forced to leave the market in a traumatic way. Nevertheless, the false dilemma between performance and stability exists only in the short term: when things are put in the broder perspective, performance appears as the only endogenous force, which can ensure solidity of a banking system.

Both mentioned aspects of the banking sector (competition, performance) must be examined together. The performance must be considered in the context of market structure, as the number of banks and the strength of their market position can affect the performance of a whole banking system (Belás and Polach 2011). While the debate on whether competition influences bank performance continues (Berger *et al.* 2009), the question if the performance influences the level of competition is not often discussed. The importance of healthy and stable banking sector for the well-working economy makes this subject actual for both researchers and policy-making institutions. A proper analysis of the degree of causality from competition to bank performance can be useful in order to deploy the right measures to enhance the stability of the whole banking sector. The question of how measuring competition and bank performance, and how helping policy-making to promote stability and economic growth, is a prime (Cuestas *et al.* 2017).

There are some number of studies, which have attempted to answer the question of whether highly concentrated banking markets have an impact on bank performance. Investigation of this relationship is driven by the aim of creating an efficient banking market, which minimises the probability of default. However, the results are far from conclusive since they depend on the period and countries analysed. Therefore, in the literature, there can be found different paradigms describing the relationship between these variables. We can see two main group of results, which led to the formulation of two different competition-performance paradigms. One is the "quiet life" hypothesis theoretically presented by Hicks (1935), and the second one is the approach presented by Mason (1939) and Demsetz (1973). Under both approaches the level of competition in the market is usually measured indirectly via the level of banking sector concentration using the market share of individual banks as an indicator of relative concentration, concentration indices (Concentration ratio, Herfindahl-Hirschman index) as indicators of absolute concentration, or by applying non-structural indicator in form of Lerner index. Market concentration (in a particular market) refers, according to Boďa (2014), to a degree to which a small number of firms (in our case banks) provide a significant portion of total production (in banking sector mostly total assets, loans or deposits). Markets, which tent to monopoly, are addressed as (highly) concentrated.

On the other hand, the concentration of the market, which is close to perfect competition, is evaluated as low. We can, therefore, say, if the concentration measure indicates low concertation, the situation on the market can be considered competitive. On the opposite side, if the concentration measure shows high concentration, then the market is considered as a monopoly or oligopoly. The Lerner index is also an inverse proxy for competition. It aims to measure the pricing power of firms and corresponds to the markup of price over cost. As stated by Leroy and Lucotte (2017), the main advantage of the Lerner index is that it is the only time-varying non-structural measure of competition that can be computed at a disaggregated level, *i.e.* at the firm level.

First paradigm, "quiet life" hypothesis, suggests that a higher level of market power (higher concentration of power in the hands of the largest banks in the market) reduces the bank's efforts to improve their profitability and allow them a quiet life (especially in a case of larger banks). This quiet life leads to decreasing motivation of managers to focus on the effective functioning of banks, which in turn leads to a decrease in their performance. On the other hand, a stronger competitive environment (lower market power) prevents managers to "live quietly", forcing them to continually look for opportunities to strengthen the position in the market, which will be reflected in the growth of their performance.

When structural indicators are used to measure the competition, then we can talk about two basic paradigms to define the relationship between competition in the market and banks´ performance. The first, "Structure-Conduct-Performance (SCP)" paradigm, and the second one, "Efficient structure (ES)" paradigm. To test the presence of the SCP paradigm, the banking sector concentration is measured by indicators of absolute concentration. The SCP paradigm was firstly presented in the work of Mason (1939). This paradigm is based on the idea that the performance depends on the conduct of the enterprises and buyers, while the conduct of the enterprises and buyers depends on the structural characteristics of the market (market structure). Mason (1939), in his study, identified not only flows from the basic conditions to the structural characteristics, conduct and performance but also analysed feedbacks between the parts of the model. The SCP paradigm explains the positive relationship between performance and concentration. According to Rumler and Waschiczek (2016), who analysed 1042 Austrian commercial banks during the 1995-2009 period, higher concentration reduces competition by fostering collusive behaviour among firms conducts research, whether more concentrated market improves market performance as a whole. In a highly concentrated market, enterprises have higher market power, which allows them to set prices above marginal costs and achieve higher profitability. The second, "efficient structure (ES)" paradigm argues that performance of enterprise grows with its size and market power. As in the case of ES paradigm, the banking sector concentration is measured by indicators of relative concentration (market share of individual banks) or by Lerner index, we can say, that growth of market power leads to the growth of ability to achieve higher profits. Demsetz (1973) assumes that banks that are more efficient increase their market power by pushing less efficient competitors out from the market. Also, this paradigm explains the positive relationship between performance and concentration. It is a result of the fact that firms that are more profitable achieve higher market power, which brings the growth of profitability with increasing concentration.

From the basic industrial organisation theory, it is assumed that competition in markets tend to reduce the prices paid by consumers, and increase efficiency, as only the most efficient firms would survive in a perfectly competitive market. However, in the case of the banking sector, this prevailing assumption might be misguided, since fierce competition among banks can result in increased banking sector instability, leading to a financial crisis with fatal consequences. In this scenario, pro-competitive policies targeted to enhance banking sector efficiency might have substantial adverse effects on a whole economy. The answer depends on whether high competition enhances stability or otherwise, high competition reduces banking stability (Cuestas *et al.* 2017).

Casu and Girardone (2006) applied Granger causality test to analyse the relationship between competition and efficiency, using bank-level balanced data for the commercial banks from five European Union (EU) countries (France, Germany, Italy, Spain, and the United Kingdom), during the period from 2000 to 2005. They found out that the relationship between competition and efficiency is not reciprocal. Increasing competition has forced banks to become more efficient, but increasing efficiency has not resulted in more competitive EU banking systems.

Pruteanu-Podpiera *et al.* (2008), examined the Czech banking market in a period of years 1994-2005 and tried to analyse the effects of competition to efficiency. The competition was measured indirectly by the Lerner index on the loan market, using data on loan prices. Efficiency was computed as cost efficiency using nonparametric approach, Data Envelopment Analysis (DEA). The results of their analysis reject the "quiet life" hypothesis and indicate a negative relationship between competition and cost efficiency. In other words, the positive relationship between the Lerner index and cost efficiency was found out. It indicates that the "efficient structure" paradigm presented by Demsetz (1973) was confirmed in conditions of the EU banking sector. He considered that the best-managed firms had the lowest costs and consequently the most significant market power, which led to a higher level of concentration.

Ferreira (2014) contributed to the literature with the test of the panel Granger causality relationship running not only from bank efficiency to bank market concentration but also the reverse causality from concentration to efficiency. Bank efficiency was measured by the DEA, and the Herfindahl-Hirschman Index was used for the bank marked concentration. He applied a panel of 27 EU countries over a relatively long period, from 1996 to 2008. The findings confirmed the complexity of the relationship between concentration and performance and were generally in line with the SCP paradigm.

Neither the empirical literature does provide a clear answer to question about the link between competition and bank performance, nor do theoretical papers arrive at a consensus. Therefore, in the literature, we can see two main groups of results, which led to the formulation of two different opposite competition-performance paradigms. One is the "quiet life" hypothesis, and the second one is the approach based on structural competition indicators in form of "Efficient structure" and "Structure-Conduct-Performance" paradigm. It highlights the important need of addressing the question of what is the effect of the competition on the risk-taking of banking institutions with the aim to gain higher profits. Therefore, we focus on the analysis of the relationship between competition and performance, and on the testing of the presence of competition-performance paradigms in the condition of Slovakia and the Czech Republic. In previous studies, the authors from European countries try to analyse the link between competition and performance using the correlation analysis, the traditional linear regression analysis considered only contemporaneous relationships, or Granger causality approach. In the conditions of the Czech Republic and Slovakia, there can be found some studies dealing with this relationship and using mainly traditional linear regression analysis confirming the existence of "Efficient structure" paradigm (Pruteanu-Podpiera *et al.* 2008, Kočišová 2014) or "Structure-Conduct-Performance" paradigm (Palečková 2016). However, we can also see that in Slovakia and the Czech Republic, no studies are dealing with nonlinear effects of competition on bank performance. Therefore, we try to analyse the relationship between competition and performance by Granger causality approach, but also in addition, we also focus on the potential nonlinear relationship between these variables, which can be considered as a novelty in conditions of analysed countries, which was missed, in previous research. Hence, understanding whether the moderate concentration levels in these countries affect the risk-taking behaviour of banks, and consequently a whole banking sector performance, it has crucial importance for the implementation of regulation and competition policies.

2. Data and methodology

As the contribution of the paper can be considered in the application of a panel Granger causality approach which accounts for lags in variables and has a different conceptual orientation. The aim is to examine the relative complexity of the relationship between competition and performance that causation runs not only from competition to performance but also from performance to competition. We are testing whether knowledge of one variable (*e.g.* competition) helps to predict another variable (*e.g.* performance). Alternatively, it can be said that we are testing the precedence of one variable before another, which is the precondition of causation. As the second contribution can be considered in the application of the nonlinear model to analyse the link between competition and bank performance. We follow the recent theoretical predictions from Martinez-Miera and Repullo (2010) and allow for the possibility of a U-shaped relationship between competition and bank performance. Such a nonlinear investigation can be useful from a policy point of view, as it allows for identifying an optimal threshold beyond which competition (or inversely the lack of competition) becomes dangerous for the performance and later the stability of whole banking sector.

In Slovak and Czech empirical literature most of the authors (SBA 2006, Horváth 2009, Střelecká 2010, Pancurová and Lyócsa 2013, Kočišová 2014, Boďa 2014, Palečková 2016) used standard tools to measure the level of competition (Concentration ratio, Herfindahl-Hirschman index or market share). It, therefore, seems relevant to provide new empirical evidence by measuring competition with the Lerner index, which allows measuring the degree of monopoly power of each bank in the dataset. By calculating the Lerner index and by applying the panel Granger causality approach and nonlinear approach we fill the gap in the existing Slovak and Czech empirical literature.

We consider all domestic commercial banks located in Slovakia and in the Czech Republic for which we have unconsolidated balance-sheet data over the period 2005-2016, giving an unbalanced panel data of 28 banks. Table 1 shows the list of banks, country and the period available. Our sample contains 14 banks located in Slovakia (SR), and 14 banks located in the Czech Republic (CR). The author created her database and takes all data from annual reports of analysed banks. All results were calculated with the help of the software MS Excel and the program R.

Table 1. List of commercial banks located in Slovakia and the Czech Republic

Bank name	Country code	Period	Bank name	Country code	Period
Československá obchodná banka, a.s.	SR	2008-2016	Air Bank a.s.	CR	2012-2016
ČSOB stavebná sporiteľňa, a.s.	SR	2005-2016	Česká spořitelna, a.s.	CR	2005-2016
Komerční banka Bratislava, a.s.	SR	2005-2009	Československá obchodní banka, a. s.	CR	2005-2016

Bank name	Country code	Period	Bank name	Country code	Period
OTP Banka Slovensko, a.s.	SR	2005-2016	Equa bank a.s.	CR	2005-2016
Poštová banka, a.s.	SR	2005-2016	ERB bank, a.s.	CR	2007-2013
Prima banka Slovensko, a.s. (Dexia)	SR	2005-2016	Expobank CZ a.s.	CR	2005-2016
Privatbanka, a.s.	SR	2005-2016	Fio banka, a.s.	CR	2010-2016
Prvá stavebná sporiteľňa, a.s.	SR	2005-2016	J&T Banka, a.s.	CR	2005-2016
Sberbank Slovensko, a.s. (Volksbank/Ľudová banka)	SR	2005-2016	Komerční banka, a.s.	CR	2005-2016
Slovenská sporiteľňa, a.s.	SR	2005-2016	MONETA Money Bank, a. s.	CR	2005-2016
Tatra banka, a.s.	SR	2005-2016	PPF banka a.s.	CR	2005-2016
UniCredit Bank Slovakia, a. s.	SR	2005-2012	Raiffeisenbank a.s.	CR	2005-2016
Všeobecná úverová banka, a.s.	SR	2005-2016	Sberbank CZ, a.s.	CR	2005-2016
Wustentrot stavebná sporiteľňa, a.s.	SR	2005-2016	UniCredit Bank Czech Republic and Slovakia, a.s. (UniCredit Bank, a.s.)	CR	2005-2016

Source: Prepared by the author.

Since we try to test the relationship between competition and bank performance in Slovakia and in the Czech Republic, we first need to choose a bank-level competition measure. The bank competition of individual banks can be measured indirectly via the concentration indicators. These indicators could be divided into two main groups: indicators of absolute concentration and indicators of relative concentration. The primary indicator of relative concentration is the market share describing the market power of an individual bank. Market share can be defined as a percentage value of selling or purchasing of specific goods or services, controlled by business, on the relevant market in a particular calendar year. In the banking market, the market share could be analysed from the different point of views (*e.g.* assets, loans, deposits). The market share from total assets is the percentage of an individual commercial bank asset within a defined geographic market for a specific period.

The market shares ($MS_{i,t}$) of individual banks (I = 1,2,…, N) operating in the banking market in the specified year (t = 1,2,…, T) could be defined as follows:

$$MS_{i,t} = \frac{q_{i,t}}{Q_t} = \frac{q_{i,t}}{\sum_{i=1}^{N} q_{i,t}} \tag{1}$$

where: Q_t is the sum of assets of all N individual banks within the market in specified year t; $q_{i,t}$ is the value of assets of bank i in year t.

The market share is the primary indicator for calculation of the absolute concentration indicators, describing the level of competition in the whole banking market. In the literature, the most often used indicators of absolute concentration are the Concentration ratio and the Herfindahl-Hirschman index (Bikker and Haaf 2002, Kosmidou *et al.* 2005, Casu and Girardone 2006, Claeys and Vander Vennet 2008, Horváth 2009, Střelecká 2010, Řepková 2012, Pancurová and Lyócsa 2013, Boďa 2014, Lapteacru 2014, Rumler and Waschiczek 2016). The Concentration Ratio ($CR_{m,t}$) can be calculated as the sum of market shares ($MS_{i,t}$) of m largest banks ($m \epsilon <1;n>$) in year t, arranged from highest to lowest value. Some subjects included in the calculation of $CR_{m,t}$ is per-set by the user, but in the banking sector, the $CR_{m,t}$ is most frequently quantified for three, respectively five largest banks on the market. Then we can talk about the CR3 index or the CR5 index. The second indicator of absolute concentration is the Herfindahl-Hirschman Index (HHI), which includes in the calculation market shares of all banks in the market. According to the US Department of Justice (NBS 2013) value of the HHI below 0.1 shows a very low concentration, in the range from 0.1 to 0.18 shows a moderate concentration, value of index above 0.18 shows a very high concentration of the banking system, whereas the index value equal to 1 shows a full concentration. Regulators rely on the concentration indicators, namely the Herfindahl-Hirschman index because it has been predictive in concentrated industries. On the other hand, this measure shows only the potential for competitive/collusive behaviour and is thus augmented with additional market/behavioural information.

Figure 1, we represent the share of assets held by the five largest banks (CR5 index) and the Herfindahl-Hirschman Index (HHI) in Slovakia (SR) and in the Czech Republic (CR), as the leading indicators describing concentration on the whole banking market. As we can see, Slovakia and the Czech Republic could be considered as an area with a moderately concentrated banking sector (according to a value of HHI), with a small number of large, mostly foreign, banks. The level of concentration in case of Slovakia is higher compared to the Czech banking

market. In Slovakia, in 2016, the five largest banks had around 72% of total banking sector assets, and this ratio was higher than 65% in the Czech Republic. The development of concentration can be considered as a long-term stable development, which is the result of restructuring and privatisation, which have begun since 1997 in both countries.

Figure 1. The concentration (HHI, CR5 index) of banking sector assets
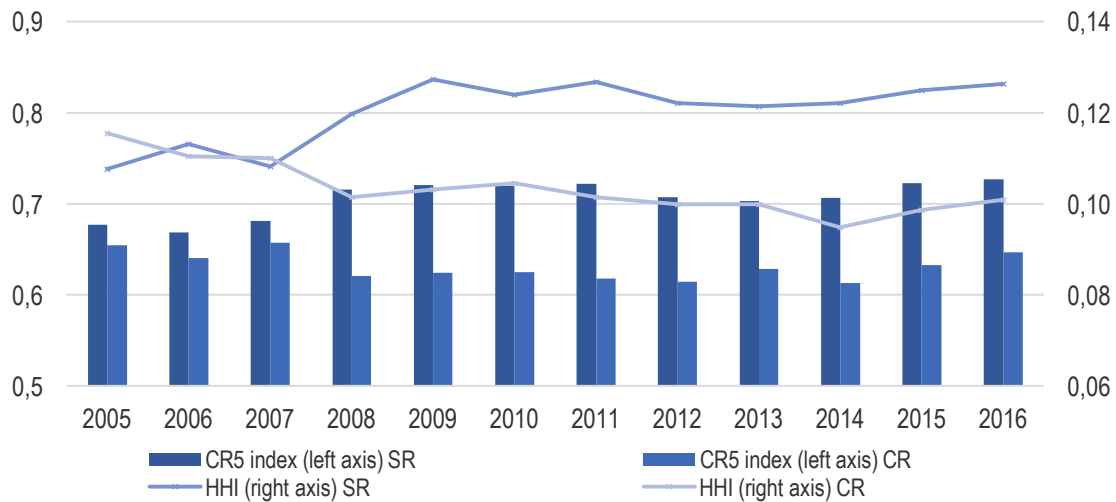
Source: Prepared by the author based on ECB (2016)

Another way to measure bank competition is the estimation of the Lerner Index (LI) as a proxy for market power presented by Lerner (1934). Formally, the index is defined as the difference between price (*P*) and marginal costs (*MC*) divided by price for bank *i* in year *t*:

$$Lerner_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}} \tag{2}$$

In our case, the *P* is given as a price of assets and is equal to the ratio of total revenue (the sum of interest income, non-interest income and operating income) to total assets. The marginal cost (*MC*) can be obtained by employing a conventional approach in the literature that consists of estimating translog cost function. In line with most banking studies (Berger *et al.* 2009, Řepková 2012, Leroy and Lucotte 2017), we consider production technology with three inputs and one aggregate output proxy. Due to the low number of observations, the translog cost function is not estimated separately for each year, but we estimated it on the whole sample of commercial banks (*r*, where *r*=1,…,*N*x*T*) during the whole analysed period using pooled ordinary least squares. Then the following translog cost function can be formulated:

$$\ln TC_r = \beta_0 + \beta_1 \ln TA_r + \frac{\beta_2}{2}(\ln TA_r)^2 + \sum_{k=1}^{3} \gamma_k \ln W_{k,r}$$
$$+ \sum_{k=1}^{3} \phi_k \ln TA_r \ln W_{k,r} + \sum_{k=1}^{3}\sum_{j=1}^{3} \rho_{k,j} \ln W_{k,r} \ln W_{j,r} + \varepsilon_r \tag{3}$$

where: TC_r corresponds to the total costs of bank *r* and is equal to the sum of interest expenses, personal expenses, and other operating expenses. TA_r is measured as the total assets of bank *r* and represents a proxy for the bank output. $W_{1,r}$, $W_{2,r}$ and $W_{3,r}$ are prices of three inputs of bank *r*, where price of first input $W_{1,r}$ is the ratio of interest expenses to total assets, price of second input $W_{2,r}$ is the ratio of personnel expenses to total assets, and price of third input $W_{3,r}$ is the ratio of other operating expenses to total assets.

The descriptive statistics for all data used to calculate Lerner index are reported in Table 2 and Table 3 reports regression results of the assessment of translog cost function. The coefficients β_1, β_2, ϕ_1, ϕ_2, and ϕ_3 estimated from the translog cost function can be used to estimate the marginal costs for each bank *i* in year *t*:

$$MC_{i,t} = \frac{TC_{i,t}}{TA_{i,t}}\left[\beta_1 + \beta_2 \ln TA_{i,t} + \sum_{k=1}^{3} \phi_k \ln W_{k,i,t}\right] \tag{4}$$

where: $TC_{i,t}$ corresponds to the total costs of bank *i* in year *t*, $TA_{i,t}$ is measured as the total assets of bank *i* in year *t*, and $W_{1,i,t}$, $W_{2,i,t}$ and $W_{3,i,t}$ are prices of three inputs of bank *i* in year *t*.

Table 2. Descriptive statistics of variables used to calculate the Lerner index

	TC*	TA*	W1*	W2*	W3*	P*
Minimum	1,524	26,318	0.00072	0.00036	-0.00968	0.02574
Maximum	1,243,347	38,984,210	0.07564	0.03848	0.04638	0.23578
Average	205,701	6,598,913	0.01423	0.01002	0.01345	0.09027
St. dev.	260,886	8,971,227	0.00812	0.00460	0.00613	0.03068

*Note: * TC - total costs, TA - total assets, W_1 - ratio of interest expenses to TA, W_2 - ratio of personnel expenses to TA, W_3 - ratio of other operating expenses to TA, P - price of assets. TC and TA are in thousands of EUR.*
Source: Prepared by the author.

Table 3. Assessment of translog cost function

	Coefficient	Standard error	t Stat	p-value
Intercept	1.796139	0.212181	8.465116	1.32E-15
lnTA	1.007073	0.017209	58.51939	6.44E-162
(lnTA*lnTA)/2	0.000647	0.001223	0.529311	0.596996
lnW1	0.561844	0.031776	17.68134	7.004E-48
lnW2	0.457634	0.055335	8.270144	4.995E-15
lnW3	0.296286	0.063644	4.655308	4.943E-06
lnW1*lnW1	0.083419	0.002098	39.75354	5.897E-119
2*lnW1*lnW2	-0.025986	0.002321	-11.19591	2.14E-24
2*lnW1*lnW3	-0.043887	0.003928	-11.17099	2.603E-24
lnW2*lnW2	0.067565	0.003389	19.93390	3.709E-56
2*lnW2*lnW3	-0.029361	0.003826	-7.669602	2.673E-13
lnW3*lnW3	0.087150	0.004561	19.10628	3.955E-53
lnTA*lnW1	-0.005669	0.001501	-3.776291	0.000193
lnTA*lnW2	-0.002972	0.003679	-0.807892	0.419819
lnTA*lnW3	0.01242	0.004059	3.059253	0.00242
R-squared	0.999782			
Adj. R-squared	0.999771			
Standard error	0.021462			
No. of observations	303			

Source: Prepared by the author.

Once marginal costs are estimated, and prices of output are calculated, we can estimate the Lerner index for each bank *i* in year *t* and obtain an indirect measure of bank competition. Based on theory, the Lerner index can take values from zero to one, where the Lerner index equal to zero indicates perfect competition and Lerner index equal to one indicates monopoly. When the price of output is equal to marginal cost, the Lerner index is zero, which indicates that the bank has no pricing power. A Lerner index closer to one indicates the higher markup of price over marginal cost and hence higher market power for the bank. However, in the real market situation, its value can be negative, indicating the difficult trend for the specific bank in a specific year. According to Pruteanu-Podpiera (2008), the negative value of the Lerner index can come from the fact that in average the marginal cost was higher than the price of assets due to the high interbank rates triggered by the financial turmoil. However, the indicator should not be negative for a long time (either for a bank or a country). Similarly, as the Concentration ratio and the Herfindahl-Hirschman index, the Lerner index is an inverse measure of competition, *i.e.* a higher Lerner index means lower competition and thus higher bank´s market power on the market. According to Bolt and Humphrey (2015), academics have solid theoretical reasons favoured the Lerner index, which seeks to measure, realised competition. Using a procedure based on efficient frontier analysis, the inefficiencies of competition can be derived separately for three bank service lines while taking into account cost differences among banks.

Based on the massive debate in the literature concerning the reliability of the above measures of competition, we adopt a conservative approach and choose both a structural and non-structural measure of bank-level competition. The structural measure we consider is the market share, and the non-structural measure is the Lerner index.

The performance of commercial banks can be measured by the standard financial ratios like Return On Assets (ROA) and Return On Equity (ROE), which could be calculated using the following formulas:

$$ROA = \frac{Net\ profit}{Total\ assets} \tag{5}$$

$$ROE = \frac{Net\ profit}{Total\ equity} \tag{6}$$

Return On Equity and Return On Assets are profitability indicators intended to measure shareholders´ performance in using their capital and assets. A higher share of profit indicates that the bank tends to have reached a higher profit per unit of assets or equity and has been more profitable in doing its business.

In order to test the Granger causality relationship between variables, we will follow the concept of the Granger causality developed by Granger (1981). According to Lopez and Weber (2017), the panel Granger causality model is computed by running bivariate regressions; there can take the following form:

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \beta_{i,k} \cdot y_{i,t-k} + \sum_{k=1}^{K} \delta_{i,k} \cdot x_{i,t-k} + \varepsilon_{i,t} \tag{7}$$

where: $i = 1,2,..., N$ denotes the cross-sectional dimension; $t = 1,2,...,T$ denotes the period dimension of the panel; $k = 1,2,..., K$ are lags; ε is error term; $y_{i,t}$ represents stationary performance measure (ROA or ROE) for individual i in period t; and $x_{i,t-k}$ the stationary competition measure (the Lerner index or market share) for individual i in period $t-k$.

Coefficients are allowed to differ across individuals (note the i subscripts attached to coefficients) but are assumed time-invariant. The lag order K is assumed to be identical for all individuals, and the panel must be balanced.

As in Granger (1981), the procedure to determine the existence of causality is to test for significant effects of past values of x on the present value of y. The null hypothesis is therefore defined as:

H_0: $\delta_{i,1} = ... = \delta_{i,K} = 0$, $\forall\ i = 1,2,..., N$ \hfill (8)

Which corresponds to the absence of causality for all individuals in the panel.

The test assumes there can be causality for some individuals but not necessarily for all. The alternative hypothesis states that there is a causality relationship from x to y for at least one cross-unit of the panel, which can be written as:

H_1: $\quad \delta_{i,1} = ... = \delta_{i,K} = 0$, $\forall i = 1, ... N_1$

$\delta_{i,1} \neq 0$ or ... or $\delta_{i,K} \neq 0$, $\forall i = N_1 + 1, ..., N$ \hfill (9)

where: $N_1 \in [0, N-1]$ is unknown. If $N_1 = 0$, there is causality for all individuals in the panel. N_1 is strictly smaller than N. Otherwise, there is no causality for all individuals, and H_1 reduces to H_0 (Lopez and Weber 2017).

According to Próchniak and Witkowski (2016), before proceeding with the Granger causality panel investigation, we test the stationarity of the series, using panel unit root tests: Fisher Chi-square test for panel data. The Fisher test allows individual unit root processes so that autoregressive coefficients may vary across cross-sections. The test is characterised by combining individual unit root tests to derive a panel-specific result. The null hypothesis assumes individual unit root processes. If the p-value is higher than 0.05, the null hypothesis cannot be rejected. If the p-value is lower than 0.05 the null hypothesis can be rejected, indicating that data are stationary and there is no unit root.

As we believe that it takes time for the effect of market power on performance, and vice versa to become apparent, we adopt yearly lags. The optimal number of lags is estimated using the Schwarz information criterion (SC) and the Hannan-Quinn (HQ) information criterion. Schwarz (1978) under a Bayesian perspective adopted a special class of a priori distribution of parameters and defined a criterion for selection of models, based on the maximum value of a penalised logarithm of the likelihood of the observations. An important advantage of SC is that for a wide range of statistical problems it is ordered consistent (*i.e.* when the sample size grows to infinity, the probability of choosing the right model converges to the unit) leading to more parsimonious model. Hannan and Quinn (1979) defined the HQ information criterion for the determination of the order of an autoregressive model. HQ criterion is defined as the sum of the maximum value of the log likelihood plus a penalty.

In the next step, we use a vector autoregressive model (VAR) to disentangle the relationship between competition and performance assuming linear (10) but also nonlinear (11) relationship. If the model (10) or (11) specifies the statistically significant positive relationship between market power and performance measures, the

"efficient structure" paradigm is confirmed. The specification of VAR models is defined in the following part of the paper according to the results of the optimal number of lags estimation and Granger causality test.

3. Results and discussion

Before turning to the econometric analysis, we present the main cross-sectional and time series features of the Lerner index and the market share variables and analyse whether they are linked to our bank performance proxies. Our results of the Lerner index for each year for both countries are displayed in Table 4. We must not forget that the higher value of the Lerner index means higher market power, *i.e.* lower competition.

In the Czech Republic, we can observe that the market power of commercial banks seems to have decreased between 2005 and 2012, where the average Lerner index had gone from 0.5997 in 2005 to 0.3721 in 2012, and the average market share from 6.38% in 2005 to 4.93% in 2012. Since 2012 the average Lerner index started to increase until it reached a value of 0.6846 in 2016, and the average market share increased to 5.86% until the end of the analysed period. In case of Slovakia, we observe that the market power of commercial banks seems to have increased during the thoroughly analysed period, where the average Lerner index rose from 0.5088 in 2005 to 0.6305 in 2015, and the average market share rose from 4.88% in 2005 to 6.75% in 2016. The similar tendency of development can also be seen in the case of the CR5 index and the HHI for whole banking sector presented in Figure 1.

Table 4. Evolution of the Lerner index and the market share

	Lerner index (average)		Market share (average)	
	SR	CR	SR	CR
2005	0.5088	0.5997	0.0488	0.0638
2006	0.5357	0.5837	0.0540	0.0625
2007	0.5145	0.5826	0.0553	0.0647
2008	0.5098	0.5110	0.0609	0.0607
2009	0.5348	0.4901	0.0625	0.0562
2010	0.5949	0.5074	0.0674	0.0529
2011	0.5846	0.3917	0.0672	0.0525
2012	0.5587	0.3721	0.0669	0.0493
2013	0.5846	0.4710	0.0676	0.0517
2014	0.6088	0.5730	0.0677	0.0550
2015	0.6387	0.6050	0.0675	0.0581
2016	0.6305	0.6846	0.0675	0.0586
2008-2016	0.5652	0.5277	0.0626	0.0568

Source: Prepared by the author.

As a part of our analysis, we have also calculated the correlation between market share and the Lerner index of individual banks. Furthermore, to reduce the influence of outliers, all variables used in correlation analysis and regression analysis are adjusted for the 1st and 99th percentile level (see Berger *et al.* 2009).

Figure 2. Correlation between the Lerner index and the market share
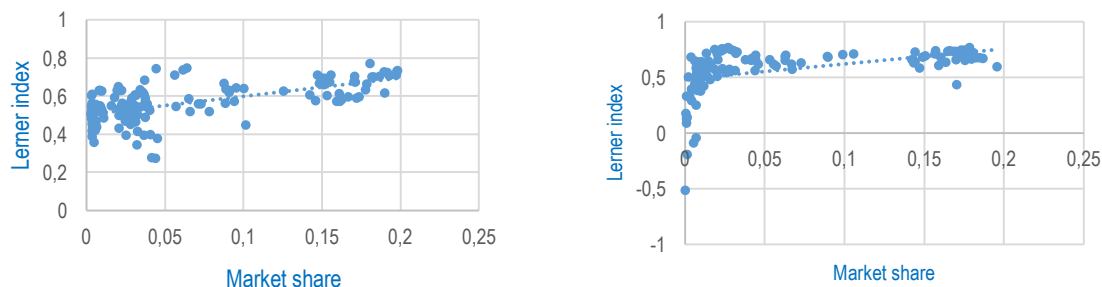
SR: Correlation coefficient = 0.6242

CR: Correlation coefficient = 0.4589

Source: Prepared by the author based on ECB (2016)

The low correlation between our two proxies for market power in both countries is confirmed by Figure 2. It is in line with the finding of Bikker and Haaf (2002), Lapteacru (2014), or Leroy and Lucotte (2017), who found out that these measures, are mostly uncorrelated with each other. It encourages our choice of considering two alternatives measures of bank market power.

Finally, in Figure 3, we plot the Lerner index and the market share against the performance indicators (ROA, ROE). In each case, we consider both linear and nonlinear fitted values. R-squared are obtained by regressing each measure of performance on the market share or the Lerner index, and by considering a linear or quadratic function. As can be seen, there exists a relatively tight relationship between Lerner index and performance measures, while the link is less clear when we consider the market share. The positive relationship is between market power and performance measures, where this preliminary result is in line with the "efficient structure" paradigm. More importantly, scatter plots reported in Figure 3, indicate a potential nonlinear link between competition and performance more evident in the case of the Lerner index. Therefore, the next section provides an in-depth assessment of this issue.

Figure 3. Scatter plots between the Lerner index, the market share, and alternative measures of performance
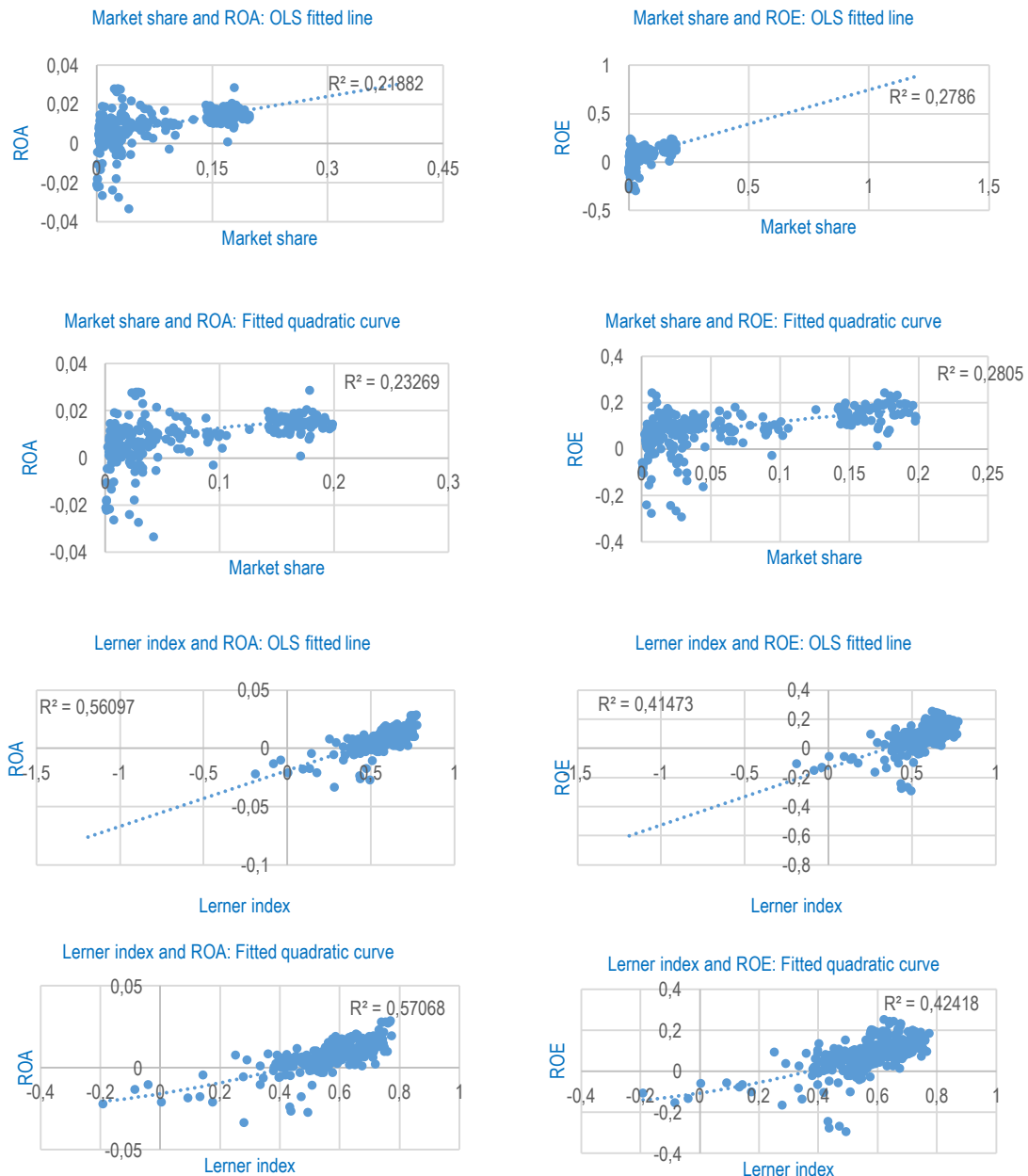
Source: Prepared by the author based on ECB (2016)

Focusing on the link between market power and performance, the theoretical and empirical literature does not provide a clear-cut conclusion about a direct relationship between variables. As can be seen in the literature review there exist many paradigms about this relationship. While the "quiet life" paradigm suggests a negative relationship between market power and performance, the SCP paradigm and "efficient structure" paradigm favour

a positive relationship between these two variables. We analyse the link between market power and performance, in the Slovak and in the Czech banking market, where our empirical analysis proceeds in two steps. First, we consider a linear framework and assess whether our competition measures are positively or negatively related to bank performance or vice versa. As we use data on bank level, the analysis is done in the panel Granger causality framework following the theoretical results from Casu and Girardone (2006), Pruteanu-Podpiera *et al.* (2008), and Ferreira (2014). As we believe that it takes time for the effect of market power on performance to become apparent, and vice versa, we adopt yearly lags. The optimal number of lags is estimated using the Schwarz information criterion (SC) and the Hannan-Quinn (HQ) information criterion. As the optimal number of lags are appointed one-year lag (see Table 5).

Table 5. Lag order selection criteria

	0	1	2	3	4
SC	-11.66532	-20.70625**	-19.80105	-19.43772	-18.72582
HQ	-11.74937	-21.21055**	-20.72560	-20.78252	-20.49087

Note: **significant at 5% level. SC represents Schwarz information criterion and HQ represents Hannan-Quinn information criterion.
Source: Prepared by the author.

Before proceeding with the panel Granger causality test, we test the stationarity of the series, using panel unit root tests: The Fisher Chi-square test for panel data. The first condition is that the variables must be non-stationary at the level (there is unit root), but when we count into first differences, they become stationary (there is no unit root). The null hypothesis assumes that all series are non-stationary. The results of stationarity analysis display in the next table (Table 6) allows us to reject the null hypothesis at the 1st differences.

Table 6. Lag order selection criteria

Variable	Test	Level		1st difference	
		Statistic	Probability	Statistic	Probability
MS [a]	Fisher Chi-square test	58.8421	0.0665	77.9289	0.0012
LI [a]	Fisher Chi-square test	37.5502	0.7429	105.772	0.0000
ROA [a]	Fisher Chi-square test	60.8047	0.0472	118.821	0.0000
ROE [a]	Fisher Chi-square test	56.4881	0.0981	127.863	0.0000

Note: [a] MS - market share, LI - Lerner index, ROA - return on assets, ROE - return on equity.
Source: Prepared by the author.

In our panel Granger causality test we use panel ordinary least squares (OLS) estimation. The results are displayed in Table 7, both for the causality running from market power to bank performance and for causality running from performance to market power. We test the null hypothesis that there is no Granger causality running between variables. In order to test the null hypothesis, F statistics is appointed. According to the results in Table 7, we cannot reject the null hypothesis if the probability is higher than 0.05 and instead we accept the null hypothesis. Therefore, we can say that there is no Granger causality running from return on assets to a market share, from return on equity to a market share, and from return on equity to a Lerner index of individual banks.

On the other hand, if the probability is lower than 0.05, we can reject the null hypothesis, and we can accept the alternative hypothesis. Based on the results then we can say, that there exists the Granger causality running from a market share of individual banks to return on assets and to return on equity, and also from Lerner index to return on assets and to return on equity, at the at 1% significance level. Therefore, we can say, that market power (indirectly competition) causes changes in profitability. We can also see the reverse causality running from return to assets to the Lerner index, but this causality can be considered as weak causality at a 10% significance level. Based on the results we can see that there exist only one-way causality running from market power to performance.

Table 7. Granger causality test – F statistics

Null hypothesis	F statistics	Probability	Result
MS does not Granger Cause ROA [a]	9.75052	0.0020	Reject H0***
ROA does not Granger Cause MS [a]	0.29898	0.5850	H0 is not rejected
MS does not Granger Cause ROE [a]	21.17380	0.0000	Reject H0***
ROE does not Granger Cause MS [a]	0.01023	0.9195	H0 is not rejected
LI does not Granger Cause ROA [a]	19.81160	0.0000	Reject H0***
ROA does not Granger Cause LI [a]	3.63709	0.0577	Reject H0*
LI does not Granger Cause ROE [a]	25.17550	0.0000	Reject H0***
ROE does not Granger Cause LI [a]	0.01217	0.9123	H0 is not rejected

Note: ***significant at 1% level, * significant at 10% level. [a] MS - market share, LI - Lerner index, ROA - return on assets, ROE - return on equity.

Source: Prepared by the author.

In our research, we apply the Granger causality in VAR model and we use one-year lag to identify the direction of impact of market power on performance. We use the following regression specification for our main analysis:

$$perf_{i,t} = \alpha + \gamma_1 \cdot comp_{i,t-1} + \beta_1 \cdot perf_{i,t-1} + \varepsilon_{i,t} \qquad (10)$$

where: i are banks and t denotes the period indicator; $perf_{i,t}$ represents alternatively one of our measure of performance (ROA or ROE), $comp_{i,\,t-1}$ represents alternatively one of our measure of competition (the Lerner index or market share), α is intercept, $\varepsilon_{i,t}$ is error term.

Table 8. A linear relationship between competition and performance

	ROA	ROE	ROA	ROE
Intercept	0.002866***	0.033047***	-0.00854***	-0.05768**
MS(-1)[a]	0.034416***	0.410467***		
LI(-1)[a]			0.025667***	0.214459***
ROA(-1)[a]	0.421684***		0.278924***	
ROE(-1)[a]		0.322313***		0.259823***
R-squared	0.406558	0.429181	0.420231	0.419633
Adj. R-squared	0.401352	0.424152	0.415167	0.414497
Durbin-Watson stat	2.475382	2.253376	2.294502	2.227588
No. of observations	231	230	232	229

Note: ***significant at 1% level; **significant at 5% level. [a]MS - market share, LI - Lerner index, ROA - return on assets, ROE - return on equity.

Source: Prepared by the author.

Based on the statistical characteristics of the model we can conclude that the results are statistically significant and the autocorrelation was not detected. The results in Table 8 show that the market power measured by market share of individual banks and by the Lerner index positively influence the performance measured by return on assets and by return on equity. In the case of Slovak and Czech commercial banks, such a result could also be explained by the fact that banks with highest market power in the process of pricing (banks with a higher Lerner index or a higher market share) are banks with foreign capital (subsidiary of foreign banks), which are generally characterised by a better risk and performance management than smaller banks.

These results are in line with "efficient structure" paradigm, which suggests that there exists a positive relationship between performance and market power. It is in line with findings Goldber and Rai (1996), Grigorian and Manole (2006), Almeida and Divino (2015) and Soana (2016). According to the Grigorian and Manole (2006) banks with a larger share of a given country´s market is likely to be more efficient than those with a smaller share. This might be the case if banks were to take advantage of economies of scale (or at least a wider array of borrowers) or play the role of a market maker in the loanable funds market. Also, Goldber and Rai (1996) confirmed "efficient structure" paradigm on European banking market. They stated that efficient firms increase in size and market share because of their ability to generate higher profits, which usually leads to higher banking sector concentration. The positive relationship between profits and concentration is explained by lower costs achieved through either superior management or production processes. Almeida and Divino (2015) and Soana (2016) found that more concentrated environments might reflect higher market power which leads to higher spreads. In other words, banks exercise their monopolistic power obtaining abnormal profits that, otherwise, would not exist in a more competitive environment.

Our results are also in line with Casu and Girardone (2006) who applied the Granger causality test to analyse the relationships between competition and efficiency and found out one-way relationship running from competition to efficiency. We have concluded that the increasing market power in the form of market share growth will drive performance growth in the next period. Conversely, a decrease in concentration will bring a decrease in the banks' performance in the next period. As can be seen, the market power is followed by a higher profit. The market power allows banks to manipulate prices, thus leading over time to higher profit. We can say, that the market share is one of the key variables, which influenced the performance of commercial banks. We can assume that banks with higher market share have well-differentiated products because of advertising, location, or other advantages can use market power in pricing their products and services. Therefore, the positive profit – market share relationship occurs because market share affects output prices and this, in turn, affects the profitability of commercial banks.

Second, following the theoretical results from Martinez-Miera and Repullo (2010), we examine whether exists a nonlinear causality between competition and performance measures. Such a nonlinear investigation can be useful from a policy point of view, as it allows identifying an optimal threshold beyond which bank competition (or inversely the lack of competition) becomes dangerous for the performance and later the stability of whole banking sector. Therefore, we extend our baseline estimation of VAR equation (10) by including the squared term of the Lerner index or the market share:

$$perf_{i,t} = \alpha + \gamma_1 \cdot comp_{i,t-1} + \gamma_2 \cdot comp_{i,t-1}^2 + \beta_1 \cdot perf_{i,t-1} + \varepsilon_{i,t} \qquad (11)$$

where: i are banks and t denotes the period indicator; $perf_{i,t}$ represents alternatively one of our measure of performance (ROA or ROE), $comp_{i,t-1}$ represents alternatively one of our measure of competition (Lerner index or market share), α is intercept, $\varepsilon_{i,t}$ is error term.

Results obtained are reported in Table 9. For each specification, we report the turning point (*i.e.* optimal threshold). As we can see in the table, results show the inverse U-shaped relationship between market share and performance measures (concave curve), but the quadratic parameter could be considered as statistically significant only at 10% level. Turning points vary between 0.1414 and 0.1425 form market share, suggesting that beyond this threshold, growing market power tends to decrease the performance of the banking sector.

Table 9. The nonlinear relationship between competition and performance

	ROA	ROE	ROA	ROE
Intercept	0.001724	0.022116	-0.00823***	-0.05293**
MS(-1)[a]	0.102169*	1.040037**		
MS(-1)*MS(-1)[a]	-0.358562*	-3.678700*		
LI(-1)[a]			0.009712**	0.102527**
LI(-1)*LI(-1)[a]			0.026700***	0.174172***
ROA(-1)[a]	0.414187***		0.225988***	
ROE(-1)[a]		0.324061***		0.244217***
Turning point	0.1425	0.1414	-0.1819	-0.2943
R-squared	0.415524	0.437762	0.431304	0.44145
Adj. R-squared	0.407800	0.430299	0.424135	0.434003
No. of observations	231	230	242	229

Note: ***significant at 1% level; **significant at 5% level; *significant at 10% level. a MS - market share, LI - Lerner index, ROA - return on assets, ROE - return on equity.
Source: Prepared by the author.

On the other hand, we can see the U-shaped relationship between the Lerner index and performance measures (convex curve), where the quadratic parameter is statistically significant. In the case of the Lerner index, the turning points vary between -0.2943 and -0.1819, suggesting that up to this threshold, growing market power tends to decrease the performance of the banking sector.

Consequently, even if our results seem to support the "efficient structure" paradigm, our nonlinear also suggests that a low degree of bank competition measured indirectly via the market share is likely to exacerbate bank risk-taking, and then be detrimental to the performance of whole banking sector in Slovakia and the Czech Republic. If we now compare the situation of each commercial bank in Slovakia and the Czech Republic in 2016 with the optimal threshold for the market share, we can see that 16% of banks exhibit the market share higher than the optimal threshold. In the case of the Lerner index, there are any banks below the optimal threshold for the Lerner index in 2016. As in last year, there can be seen the trend of strengthening the position of largest banks on the market (from the point of view of the CR5 index in Figure 1), therefore, for policymakers, it is essential to look

for the market share of the largest bank on the market as its strong position can have a negative impact on the performance of the whole banking sector.

Conclusion

Just a gradual process of globalisation significantly affects the structure of the financial and banking system, their performance and stability (Siničaková *et al*. 2017). Therefore, it is critical to focus on the examination of banks and banking systems performance, under the purpose of investigation of their structure (the level of concentration). It is essential to follow these issues as not only isolated phenomena but also focus on the investigation of their relations. This paper contributes to the existing literature by analysing the relationship between market power and performance in the condition of Slovakia and the Czech Republic. Different methods are used to measure market power and performance. The annual data on the bank level (28 domestic commercial banks) are used during the period from 2005 to 2016.

The analysis of market power showed that through the thoroughly analysed period, the top five banks owned an absolute majority of the assets of the Slovak and the Czech banking market, and their position became stronger at the end of the analysed period. As the contribution of the paper can be considered the application of a panel Granger causality approach to examine the relative complexity of the relationship between market power and bank performance. The results showed a one-way positive relationship running from market power to performance indicators. It means that the more concentrated banking market enhances the performance of banks with the highest shares on the market. This finding is in line with "efficient structure" paradigm which was also confirmed in the study of Goldber and Rai (1996), Grigorian and Manole (2006), Almeida and Divino (2015) and Soana (2016).

Our empirical investigation was later extended by considering a nonlinear framework and examining whether a nonlinear causality exists between competition and performance. Results obtained show statistically significant inverse U-shaped relationship between the market share and performance measures (at 10% significance level), and U-shaped relationship between the Lerner index and performance measures (at 1% significance level). Thus, this suggests that about the specific threshold, the lack of competition is likely to exacerbate the individual-risk taking behaviour of banks, and could be detrimental to the performance of the banking sector in Slovakia and the Czech Republic.

Regarding policy implications, the policymakers should aim at monitoring and regulate the banking industry, they should place greater emphasis on mergers and acquisitions, to avoid a significant increase of the banking sector concentration, and then mitigate potential adverse effects of high market power on financial stability (Leroy and Lucotte 2017). They also must regulate and monitor small banks on the market, because "too much" competition may result in greater instability in the whole banking sector. The regulators should have in mind the strong linkage between market power and risk-taking, which should have an impact on the whole banking sector, not only from the performance point of view.

Acknowledgments

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Logistics Performance Review: European Union and ASEAN Community

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Abstract:

This paper explores the logistics performance within and between ASEAN Community (AC) and the European Union (EU). The study makes comparison and inspection based on World Bank's Logistics Performance Indicators (LPI) of each economy and each collaboration. The finding shows big gap of logistics performance between economy in the collaboration. Where the EU is more advanced, and the gap is smaller, the AC is struggled with the improvement. The unbalanced level of performance within and between economies can be a big obstacle for future development as the global supply chain is unavoidable. The paper then discusses and suggests on the issues.

Keywords: logistics performance indicators; ASEAN Community (AC); European Union (EU)

JEL Classification: F42; F53; L98; O52; O53; O57

Introduction

This paper explores the logistics performance of selected economies in order to review the synchronized level of logistics system of the economic collaborations. Of interest is the newly developed ASEAN Community (AC) of the Association of South-East Asia Nations (ASEAN) and the European Union (EU). Where AC aims at strengthening the economies by integrating their resources and entering the world market as a single entity, the AC model is similar to the EU which has successfully developed its own mark and today has become a key player in global supply chain (European Commission 2014, Nugent 2017). Such collaboration allows that labour can be relocated freely, raw material can be sourced without any barrier, goods can be moved regardless of country border, *etc*. The supply chain will be redesigned to get into its optimal conditions. This open opportunity will result in higher competitiveness of the participating economies (OECD 2016, Hewitt 1994, Lambert and Cooper 2000).

This paper focuses on logistics performance of AC and EU because an active collaboration (investing or exchanging resources) requires that logistics systems may be levelled. Otherwise, it will result in delayed, unbalanced costs, or even insufficient quality of the deliveries (Houlihan 1985, Nagurney 2010). Therefore, the

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paper focuses on logistics performance of the EU and AC and to compare within and between the collaborations. The result shall be suggestive if a specific measure must be conducted.

1. The European Union and ASEAN community in brief

The following sections explore key economic characteristics and collaboration of the EU and the AC.

The European Union (EU) aims at creating a single standardized market, allowing free flow of goods, service, money and people. The sharing resource includes energy, knowledge and capital market. This creates stability, mobility and growth with a single currency and governing institutions. The European Union comprises of 28 European economies, covering an area of 4.4 million sq.km with a population over 510 million. The EU in 2016 generated a nominal GDP of USD16.5 trillion, contributing 22.2% of global GDP. However, there are big gaps between economies. Where Luxemburg are by far the wealthiest of EU, topped with GDP per capita (PPP) at USD 93,173, Belgium and Romania are as low as USD20,000 band (see Figure 1). The average GDP per capita of the EU is at USD 36,408 (Balcerowicz *et al.* 2013).

ASEAN Community (AC) is a cooperative initiative of South-East Asian countries. The aims are to integrate the economies into a single market and a single production base, allowing free flow of goods, services, investment, capital and skilled labour. Similar to EU, this collaboration would strengthen ASEAN economies to compete to the world (ASEAN and ASEAN Secretariat 2008). ASEAN community comprises of 10 economies, covering an area of 4.4 million sq.km with a population of 629 million. ASEAN GDP is at 2,432 USD billion, contributing 3.3% to world. Here, there are also big gaps between economies. Singapore GDP per capita is as high as USD87, 100. Brunei GDP per capita is also high at USD79, 700. Cambodia is as low as USD3, 700 (Figure 1). The average GDP per capita of the AC is at USD25, 200 (ASEAN and ASEAN Secretariat 2015, ASEAN and ASEAN Secretariat 2016).

Figure 1. GDP per capita of EU and AC
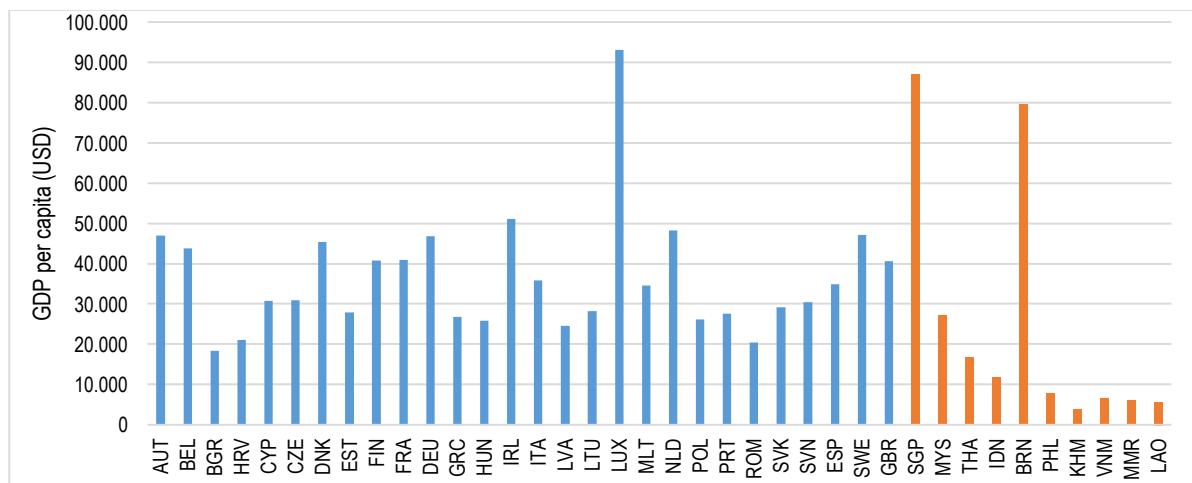
Source: tradingeconomics.com

According to IMF report, ASEAN is rank 3rd in world's fastest growing economies. It has grown 66% since 2006 to 2015. Whereas EU has grown at the rate of 10% in the same period (International Monetary Fund 2016).

2. Logistics performance

Logistics is a key to economy competitiveness. Especially in today global supply chain, better logistics system allow and facilitate efficient flow of resources, goods and services. This applies to either a single economy or an economic community (Porter 1990, Monash *et al.* 1996).

Where single market and single production base are now applied in the AC and the EU, logistics system is then of interest. Each economy tries to improve their logistics performance both supporting systems, *e.g.,* customs, infrastructure, and operations, *e.g.,* logistics effectiveness and efficiency. Together with the advancement of modern management concepts and technologies, the terms "Industry 4.0" and "Logistics 4.0" are emerging. Cyber-physical systems and automation, digitalization and miniaturization are future trends. However, to become smart logistics, they must pass their minimum requirement. Here, the logistics performance must be at least good or levelled with their chain (Akinlar and Fraunhofer 2014, Lasi *et al.* 2014, Lee *et al.* 2015, Rüßmann 2015)

Logistics performance indicators (LPI)

Logistics is important where globalization becomes localization and global supply chain becomes common. So-called "competitiveness", the country with better logistics performance tends to attract investment and trade and get more benefit in today borderless value chain. World Bank has issued a report on logistics performance of 160 economies, "Connecting to Compete - Trade Logistics in the Global Economy - The Logistics Performance Index and Its Indicators". Here, "Logistics Performance Indicators (LPI)" is used in this paper to inspect the logistics performance of EU and AC (Arvis *et al.* 2016). LPI constructs of 6 logistics areas, scored and based on global survey to reflect the logistics friendliness of each country. LPI is a result of qualitative assessment, aggregated and based on:

- customs: the efficiency of customs and border management clearance,
- infrastructure: the quality of trade and transport infrastructure,
- international shipments: the ease of arranging competitively priced shipments,
- logistics quality and competence: the competence and quality of logistics services,
- tracking and tracing: the ability to track and trace consignments,
- timeliness: the frequency with which shipments reach consignees within scheduled or expected delivery times.

3. Results and discussion

Figure 2 summarises LPI score of the EU and AC. It can be seen that the EU has overall higher LPI scores than the AC. This is understandable where EU's economic is more advanced. The average LPI of EU is at 3.61. Top 3 LPI score of EU belongs to Germany, Luxemburg and Sweden at 4.23, 4.22 and 4.20, respectively.

They are, in fact, world's top 3 performers. The 4th and 5th of EU, *i.e.*, Austria and Belgium, are also considerably world class, at 4,11 and 4.10. On the other hand, last 3 EU are Bulgaria, Romania and Cyprus at 2.81, 2.99 and 3.00, respectively. The standard deviation of LPI is at 0.43.

Comparing to those of AC, the average LPI is at 2.98. The best is Singapore at 4.14. Singapore is in fact world's 5th. Then to AC's 2nd and 3rd are Malaysia and Thailand at 3.43 and 3.26, respectively. Here, a big gap is present. Last 3 of AC are Cambodia, Myanmar and Laos at 2.80, 2,46 and 2.07, respectively. Laos is at world's 152th. The standard deviation of LPI of AC is at 0.56.

Figure 2. LPI score of EU and AC
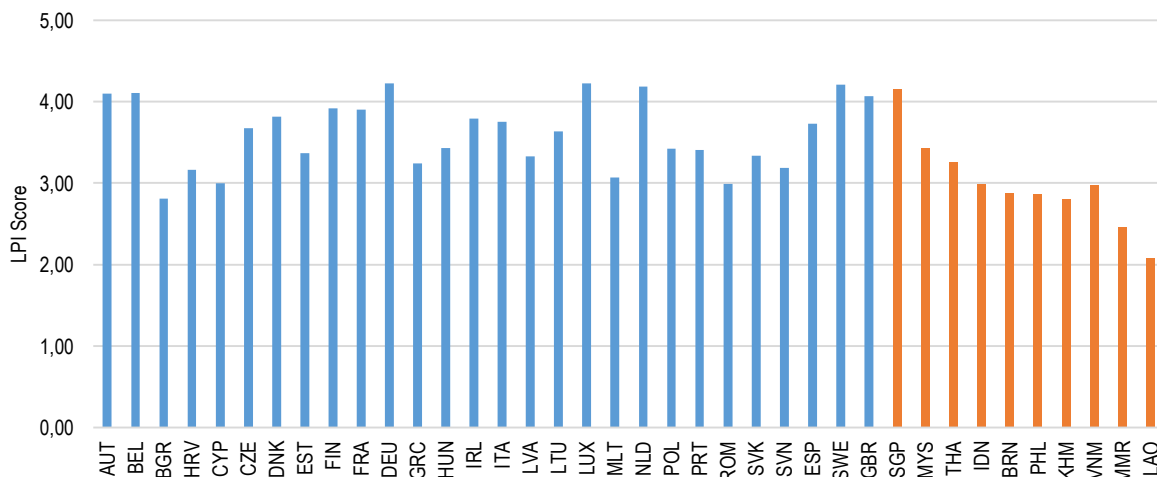
Source: Arvis *et al.* 2016

In general, it is indicative that both EU and AC logistics system are quite unbalanced. The gap is big, especially the AC. This will be crucial in cases if the regional supply chain is required to be connected. The overall supply chain of the regions and their logistics performance can only be as strong as the weakest link.

In case of the further review, Singapore and Brunei economic are extremely strong for the case of the AC. It is too strong and creates a big gap of economics to the AC as a whole. Therefore, in this paper, Singapore and Brunei are then considered economic outliers of the AC. Also, Luxemburg is also considered an outlier to those EU.

Figure 3 investigates the performance trends of the EU and AC. Here, data dated back to 2012 and 2014 are used. Here, it can be seen that the performance of EU has improved. It jumps from 3.45 in 2012 to 3.55 in 2014

and to 3.59 in 2016. On the other hand, the AC are struggled with its improvement. Their logistics performance did improve from 2.88 in 2012 to 2.96 in 2014 but declined to 2.85 in 2016.

Figure 3. LPI: EU and AC – w/o 3 outliers – 2012, 2014 and 2016
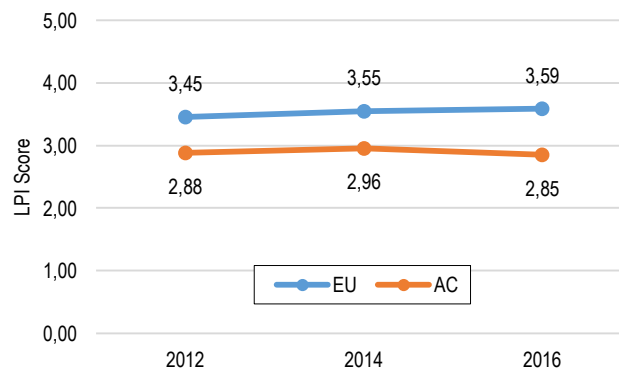
Source: Arvis *et al.* 2016

Figure 4. LPI – 6 indicators: EU and AC – w/o 3 outliers
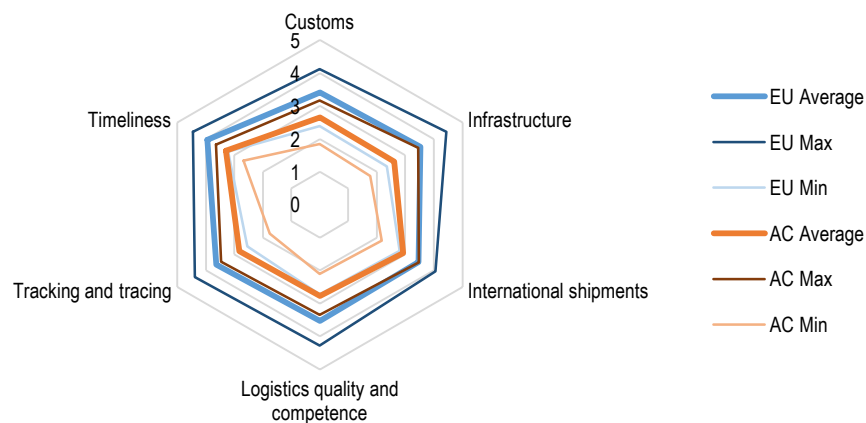
Source: Arvis *et al.* 2016

Figure 4 inspects in 6 logistics indicators of the EU and AC. Here, it can be seen that EU is advanced in logistics. The top score is from "Timeliness" at the average of 3.95. The rest of the LPI indicators also lies high at the average of 3.42 - 3.64. The EU's logistics are "world class". Many economies are world's best or even world's top 5. Germany, Netherland, Finland and UK are world's top 5 in terms of "Customs", scoring at 3.98 - 4.12. Germany, Netherland, Sweden and UK, also Luxemburg", are world's top 5 in terms of "Infrastructure". They score 4.21 - 4.44. Austria and Belgium also among top 10 of the world in many areas. However, some economies struggle with their capability. Bulgaria, Greece, Malta and Slovenia have "Customs" and "Infrastructure" scores at less than 3. Croatia and Romania also have "Infrastructure" of less than 3. Cyprus has "International shipments" at score of 2.80. In terms of "Logistics quality and competence", Cyprus, Greece and Malta score at less than 3. In terms of "Tracking and tracing", Bulgaria and Cyprus also score at less than 3.

On the other hand, the AC are struggle with not only to synchronize together but within their own development. "Timeliness" are found to be the most advance area at average score of 3.29. However, it scores much less than most of the EU. Malaysia, Thailand, Indonesia and Vietnam have developed its capacity to reach a score of 3.5. However, Laos and Myanmar are as low as 2.68 and 2.85, respectively. "Customs"-wise, Indonesia, Philippines, Cambodia, Vietnam and Myanmar score 2.43 - 2.78. Laos scores at, world's 155th, 1.85. The average of the AC on "Customs" is at 2.65. "Infrastructure"-wise, the AC scores at the average of 2.61. Malaysia scores at 3.45 as the AC's best. However, Myanmar, Cambodia and Laos score as low as 1.75 - 2.36. "International shipments" is adequate for the AC. It scores at the average of 2.93. Laos and Myanmar are among the bottom at 2.18 - 2.23. In terms of "Logistics quality and competence" and "Tracking and tracing", the AC are quite weak. It scores at an average score of 2.77 and 2.82, respectively. Where Malaysia, Thailand and Indonesia top at over 3, Laos and Myanmar are among the bottom.

4. Cross mapping LPI with Gross Domestic Product per capita

It is obvious that EU has higher logistics performance than AC. However, it is also obvious that economics of EU is better than AC. The following section tries to handicap the logistics performance with GDP per capita in order to inspect the performance norms of these countries.

Figure 5. LPI vs GDP per capita: EU and AC – w/o 3 outliers
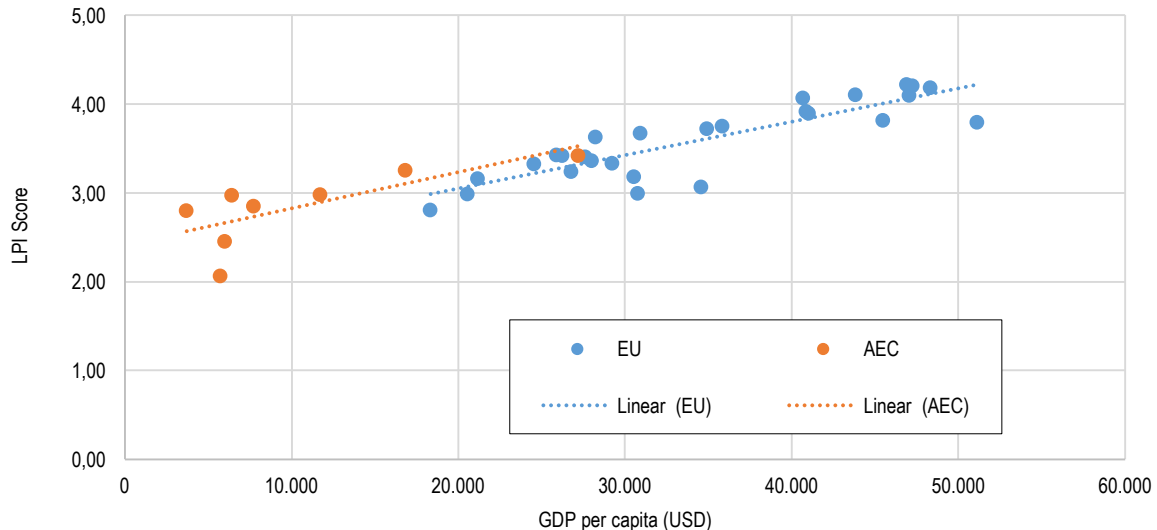
Here, the trend lines (see Figure 5) show positive relationship between logistics performance and GDP per capita. This indicates that any country tends to have better logistics if the economy grows.

Focusing on the gradient of the linear trend lines, the relationship of logistics performance and GDP per capita are quite similar both EU and AC. From figure, it was clear that the EU are more progressed. However, the performance of AC can be better as the trend line of AC lies in higher vertical interception. This means that AC shows promising ratio of performance and GDP per capita. If the economies are leveraged, the AC will presumably perform better than the EU.

Conclusion

Focusing on overall logistics performance of the AC and the EU, the EU outperforms the AC, however, only with the advantage of current economics strengths. Average LPI score of the EU is at 3.61 with standard deviation of 0.43. The AC's average LPI score is at 2.98 with standard deviation 0.56. These deviations indicate the unbalanced logistics performance among countries in both collaborations. If logistics should facilitate economics activities, this big gap will affect on effectiveness and efficiency of the collaboration. The case is so crucial if the regional supply chain is targeted. It is also a big obstacle for future development, especially "Logistics 4.0" or such for the AC. If the countries or the community wish to enter the global supply chain, they shall focus on improvement to reach the required level of advancement. Otherwise, they will be left far behind.

The more advanced EU, on the other hand, cannot ignore these issues. They must also pay attention while trading with these underperformed economies. This is unavoidable today. Therefore, they must understand the nature of their partners' logistics system in order to get full competitive advantages. The collaboration within and across economies are needed.

Acknowledgement

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Study of Power Asymmetry in Industry Markets: A Russian Case

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Abstract:

The authors claim that the level of competition is the crucial factor in economic growth of an industry market. The study aims to develop a method for assessing power asymmetry in various industry markets. The proposed method is based on the analysis of the structure of industry and related markets, as well as on the assessment of the state support for the sector. The empirical base is the data obtained from 42 Russian industry markets. The results demonstrate a significant differentiation of the power asymmetry level in Russia's industry markets and make it possible to improve the assessment of inequality in industry markets. The research results are of an applied nature and can serve as the basis for designing a strategy for industrial enterprises development. The findings of the study can also be useful to public authorities when framing competition policy and assessing the effect of the power asymmetry level on economic growth of the sector.

Keywords: industry market; power asymmetry; limited competition; manufacturing sector; institutional environment.

JEL Classification: L11; L13

Introduction

The restructuring of sectors and complexes of the Russian economy, which is conditioned by changes in the trajectory of industrial policy, macroeconomic shocks and institutional reforms, substantiates the need for continuous evaluation of the state and development of particular industry markets. The global decline in economic growth rates also creates the necessity for seeking new reserves for the long-term development of individual enterprises and markets in which they operate. A number of research studies (Buccirossi *et al.* 2013, Kurnysheva 2016, Rozanova, Komarnitskaya 2016) demonstrate that market inequality produces specific institutional interaction among participants and consequently affect their performance.

In Russia, most of sectors are markets with limited competition. However, the creation of a reliable system of public administration and market mechanisms remains a significant challenge that is far from being resolved (Kurnysheva 2016, 5). At the same time, the development of competition can serve as a prerequisite for overcoming stagnation processes and stimulating economic growth. In the market mechanism, competition is of central importance: it encourages activity of firms; causes an increase in the quality of products and a fall in prices and costs, and accelerates introduction of the leading-edge technologies.

The paper aims to develop and conduct empirical testing of the method for assessing the level of power asymmetry in the industry markets in Russia. To achieve the stated purpose, the following tasks should be accomplished:

- to clarify the subject field of the study;
- to work out the method for calculating the level of power asymmetry;
- to test the method using the case of 42 industry markets in Russia;
- to analyze the results.

1. Background

According to a broad interpretation, power is the subject's ability to influence the object. Emma Goldman came up with the idea to conceptualize this term as far back as the beginning of the 20th century (Red Emma Speaks 1972).

Within the framework of the theory of industrial organization, power is viewed not as a characteristic of a system, but as a deviation from system rules, the most important of which is perfect competition. When referring to such a market, the number of its participants is supposed to be quite large. Such a situation is only possible if there is no particular firm dominating in the market. If an enterprise can influence the level of prices with a view to generate profit, and then it is considered to have "market power" (Newbery 1995). In industry markets with limited competition, every firm tries to maximize its profit through raising prices or through individual strategic moves.

In the theory of industrial organization, the emphasis is shifted towards studying the demand. The concept of organizational field is much broader than the concept of sector, since it denotes the space of mutual positioning of participants according to their status hierarchy.

Analysis of organizational fields also includes institutional system introduced by the state (Radaev 2011). Institutional economics is closely related to industrial organization, since the latter reveals the specificity of counterparties' behavior depending on various market parameters (Orekhova 2015, 25). According to Etzioni (Etzioni 1988, 223), the formation of monopolies and oligopolies is caused by not only the dynamics of production and transaction costs, but also by the use of political resources by economic entities. Relationships of power between the economic subject and the state determine relationships of power at other levels of the institutional structure (Oleynik 2003, 38).

The modern understanding of industry market suggests that inequality is inherent in it, because, in practice, there are no perfectly competitive markets. During the rule of the perfect competition model, competition policy was focused on antitrust regulation tools and suppression of any manifestations of firms' non-competitive behavior (Piraino 2007). Later, the state's priority shifted towards regulating unfair competition, as well as encouraging the development of competition in the markets (Etro 2006). Such a concept is known as "Smart Regulation" (Gunningham 2004).

Proactive industrial policy that was of a selective industry nature and stimulated the transfer of technology was the determinant of the fast economic growth of the East Asian newly industrialized countries (Wade 2003). This approach was formulated by J.Y. Lin (2012), the founder of New Structural Economics (Lin and Rosenblatt 2013). Based on the experience of the Asian countries, he argues that the state is able not only to create favorable basic conditions for the functioning of business, but also to directly stimulate certain manufacturing industries.

However, the absence of a single interpretation of the term "market inequality" hinders competition management. The variety of approaches to comprehending the phenomenon of power causes a wide range of definitions to emerge. The most widespread of them are "market power", "bargaining power" and "dominant position".

It is equally difficult to assess the level of competition due to the absence of a direct measure and the underdevelopment of the national system for monitoring competition. In economic theory and practice, various statistical coefficients and indices are applied to assess the consequences of competition: the coefficient of production concentration, the Herfindahl–Hirschman index, the entropy coefficient, the Gini coefficient, the Rosenbluth index, the Lerner index, the Lind index, Tobin'sq, the Bain index, and indices of vertical integration. Due to the imperfection of statistical methods for assessing competition, some countries commenced using questionnaires designed for heads of enterprises (Earle and Estrin 1998, Carlin *et al.* 2000). Recent works in this sphere attempt to apply original and mathematically more accurate methods (see, for example, (Vorobyov 2016, Shastitko 2017, Zaikin 2017, Svetunkov 2017).

At the same time, there are virtually no publications on integrated assessment of power asymmetry. In our opinion, power asymmetry refers to a state of an industry market where some economic agents are mighty enough to influence the decisions of other market agents including the state.

2. Materials and methods

Synthesis of existing approaches to assessing market inequality and the clarified term "power asymmetry" allows us to identify its three main elements: Structural – market inequality among firms of the same industry market; Interactional – market inequality among firms in related industry markets; Institutional – the degree to which the needs and the trajectory of market development correspond to the institutional environment (needs and the path of the state development).

Based on the structure of power asymmetry, we developed a method for calculating its level (Figure 1).

Figure 1. Algorithm of the method for determining power asymmetry of an industry market
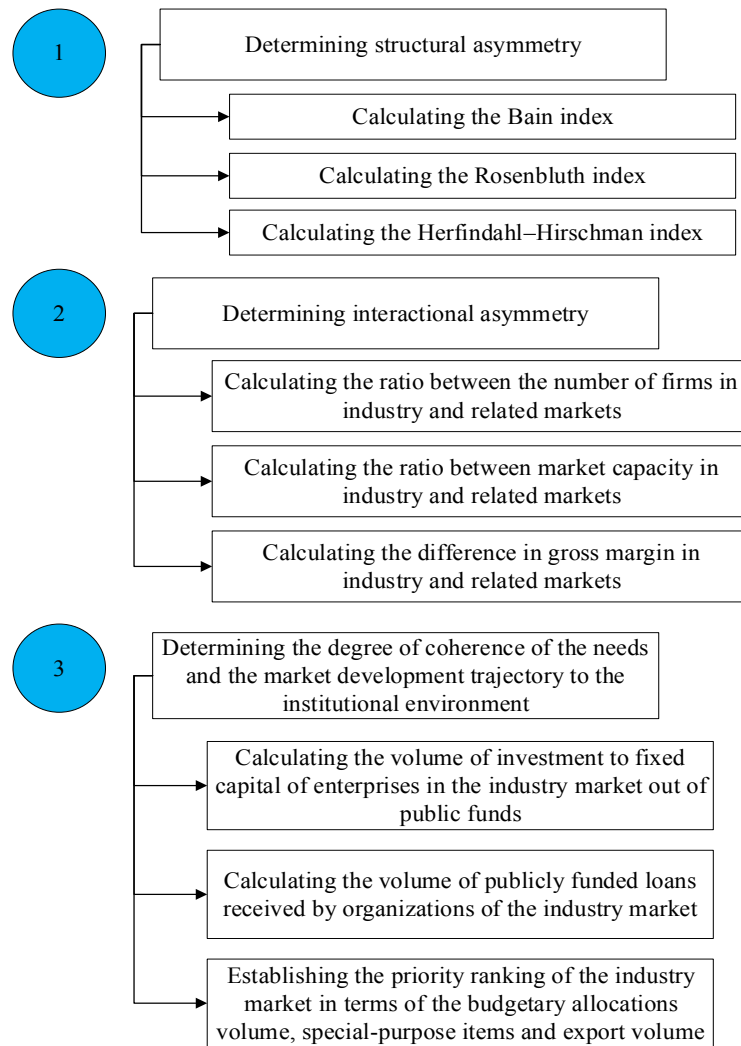
The first step of the algorithm is to measure the level of structural asymmetry. It takes account of direct (the Bain index) and indirect (the Hall-Tideman and Herfindahl-Hirschman indices) indicators of market inequality, which guarantees a comprehensive assessment. To compare the results, the indices are converted using a scale ranging from 1-5 (Table 1).

Table 1. Scale of converting structural asymmetry indicators into points

Coefficient	Indicator feature	Scale explanation	Notation	Assessment scale					
				0	1	2	3	4	5
Bain index	Efficiency of enterprises' investment in the market	The index is compared with the baseline	r'	<0.1	0.1 – 0.25	0.25 – 0.4	0.4 – 0.8	0.8 – 2	>2
Hall-Tideman index	Comparing the ranks of enterprises in the market	The index scaling depends on the number of firms in the industry	HT'	<0,1 %	0.1 – 1	1 – 5	5 – 10	10 – 40	>40
Herfindahl-Hirschman index	The sum of the squares of the firms' market shares within the industry	The scaling of the coefficient depends on the concentration level in the market	HHI'	<100	100 – 400	400 – 800	800 – 1200	1200 – 1500	>1500

The formula for calculating the resulting coefficient of structural asymmetry is the following:

$$SA = \frac{r`\times 0.5 + HT`\times 0.3 + HHI`\times 0.2}{5} \qquad (1)$$

where: r' is the Bain index, points; HT' is the Rosenbluth index, points; HHI' is the Herfindahl–Hirschman index, points.

The structural asymmetry coefficient determines the level of market power in an industry market (Table 2).

Table 2. Interpretation of the values of the structural asymmetry level

Value	Structural asymmetry level	Interpretation
SA ≥ 90%	Extremely high	The level indicates that in the market there is a firm holding considerable market power
90% > SA ≥ 65%	High	Market inequality level is quite high, the largest proportion of the market is divided between several major firms
65% > SA ≥ 45%	Medium	Market inequality level corresponds to monopolistic competition, in the market there are many firms with a relatively low level of market power
SA < 45%	Low	Market inequality is minimal, none of the firms have sufficient market power to impact market processes

The second step of the algorithm is to determine interactional asymmetry, *i.e.* the level of market power in related markets. One of the fundamental tasks when computing this indicator is to identify the most important related markets. The object of the study is traditional industrial markets; therefore, we proceed from the assumption that the number of key related markets is small and can vary between 1 and 3. The coefficient of interactional asymmetry takes into account the direct (comparative net profit margin in industry and related markets) and indirect (the ratio between the number of firms in industry and related markets, and the ratio between these markets' capacities) indicators of inequality. The scale of converting interactional asymmetry indicators into points is presented in Table 3.

Table 3. Scale of converting interactional asymmetry indicators into points

Coefficient	Explanation	Notation	Assessment scale					
			0	1	2	3	4	5
Comparative pent	Scaling depends on the degree, to which profit margin in the industry market exceeds that in the related market	$\mathrm{Re}\,nt'$	< -15%	-15 – 0	0 – 5	5 – 10	10 – 25	≥ 25%
The number of firms	Scaling depends on how many extra firms are present in the related market as compared to the industry market	SE_i'	≥ 10	4 – 10	1 – 4	1/4 – 1	1/20 – 1/4	< 1/20
Market capacity	Scaling depends on how much revenue in the industry market exceeds that in the related market	Vol_i	< 0,005	0,005 – 0,05	0,05 – 0,5	0,5 – 2	2 – 5	≥ 5

Once the scalar indices are calculated, we compute the coefficient of interactional asymmetry using the formula:

$$IA = \left(\sum_{i=1}^{n} \frac{\mathrm{Re}\,nt`_i\times 0.4 + SE`_i\times 0.3 + Vol`_i\times 0.3}{5}\right)\times s_i \qquad (2)$$

where: $\mathrm{Re}\,nt'$ is the index based on comparative profit margin of the industry and i-th related markets, points; SE_i' is the index based on the ratio between the number of firms in the industry market and that in i-th related market, points; Vol_i is the index based on the ratio between the capacities of the industry market

and i-th related market, points; s_i is the share of i-th related market, where $\sum_{i=1}^{n} s_i = 1$; n is the number of related markets.

The interactional asymmetry coefficient characterizes the level of market power of enterprises in the industry market in relation to enterprises in related markets (Table 4).

Table 4. Interpretation of the values of the interactional asymmetry level

Value	Interactional asymmetry level	Interpretation
IA ≥ 75%	Extremely high	Firms in the industry market, as the key suppliers of related markets, virtually completely control them
75% > IA ≥ 60%	High	Firms in the industry market are able to significantly influence the processes in related markets
60% > IA ≥ 40%	Medium	Firms in the industry market have no significant impact on related markets but can affect some processes
IA < 40%	Low	Firms in the industry market depend on the processes in related markets

The third step of the algorithm is to assess the degree to which the needs and the path of the market development correspond to the institutional environment, the so-called institutional asymmetry.

According to World Economic Forum, the most serious obstacles to the development of competition in the Russian economy are limited access to finance, unnecessary bureaucracy, high inflation and overall weakness of the tax system. Most of these factors are common to the whole nation and provide no answer the question why in Russia some industries develop better than others. Our study is designed to evaluate the impact of intra-industry factors of the institutional environment on the development of the industry market. Among the aforementioned factors, the government support for the industry can significantly change competition landscape of markets.

This logic underlies the choice of indicators for assessing the level of institutional asymmetry. The more stimulating factors there are in the industry market and the more prioritized the industry is, the more actively enterprises of this market can advance their interests and the bigger influence is exerted on the formation of the institutional environment. Direct assessment indicators of the institutional asymmetry level are the volume of investment in fixed capital of the enterprises within the industry out of public funds, as well as the volume of publicly funded loans received by the enterprises operating in the industry market. To compare the data, the indicators' values were normalized. In addition, based on the analysis of the state programs and general economic and industry strategies, we used an expert way to determine the importance of the industry market for the purposes of current industrial policy. All indicators are systematized into a single scale of measure (Table 5).

Table 5. Scale of converting the bargaining power indicators with the institutional environment

Coefficient	Explanation	Notation	Assessment scale				
			1	2	3	4	5
Investment in fixed capital	Scaling depends on the share of investment volumes in fixed capital in relation to all industries	I'	< 0.001%	0.001% – 0.1%	0.1% - 0.5%	0.5% - 1.5%	≥ 1.5%
Publicly funded loans	Scaling depends on the share of publicly funded loans in relation to all industries	Kr'	< 0.00001%	0.00001% - 0.1%	0.1% - 1%	1% - 5%	≥ 5%
Priority	Depends on the presence of the state programs and export volumes (Assessed by using an expert way)	PI'	1	2	3	4	5

The coefficient of institutional asymmetry is calculated on the basis of scalar indices by formula:

$$IE = \frac{I` + Kr`}{10} \times 0.4 + \frac{PI`}{5} \times 0.6, \tag{3}$$

where: I' is the index based on the volume of investment in fixed capital, points; Kr' is the index based on the volume of issued publicly funded loans, points; PI' is the industry priority indicator, points.

The level of institutional asymmetry shows the degree to which enterprises in the industry market are able to influence the decisions of the state (Table 6).

Table 6. Interpreting the value of an indicator IE

Value	Institutional asymmetry level	Interpretation
IE ≥ 80%	Extremely high	Firms in the industry market control the institutional environment and are actively supported by the state
80% > IE ≥ 65%	High	Firms in the industry market exert a considerable impact on the institutional environment formation and are actively supported by the state
65% > IE ≥ 40%	Medium	Firms in the industry market have a noticeable impact on the formation of the institutional environment, but it is not enough to promote their interests. Firms in the industry receive incentive payments
IE < 40%	Low	Firms in the industry market have virtually no impact on the institutional environment

Such a three-step algorithm of assessing the level of power asymmetry examines all possible types of competition inequality. Moreover, it is founded on the calculations with the use of publicly available statistical data; consequently, it is universal and can be used to analyze any industry market. These features of the method allow performing dynamic and intermarket comparisons.

3. Results

The empirical base of the study was 42 industry markets of the extractive and manufacturing industry of the Russian Federation. To compute the indicators of structural and interactional asymmetry, we analyzed the data for enterprises retrieved from SPARK-Interfax Database. Institutional asymmetry was evaluated on the basis of the informational analysis of Russian statistics, as well as budget, fiscal and customs legislation and government programs.

Figure 2 shows the markets with the highest and the lowest levels of structural asymmetry. The first series of values are indicators of structural asymmetry, the second and the third ones are indicators of interactional and institutional asymmetry respectively.

Figure 2. Markets with the highest and the lowest levels of structural asymmetry
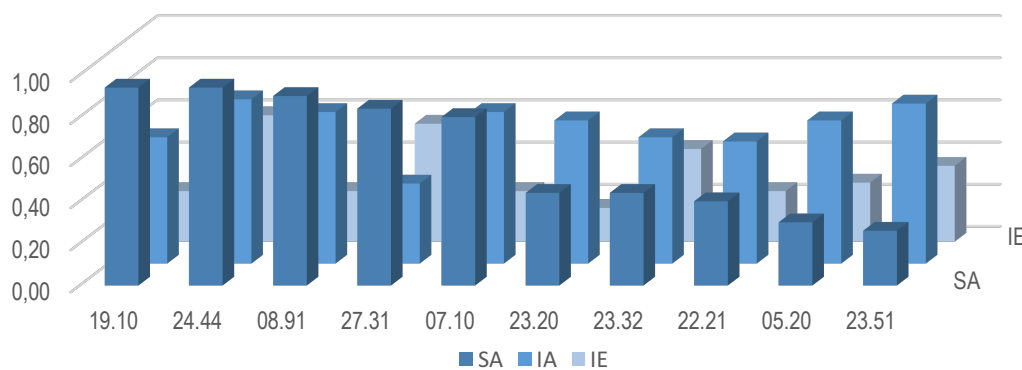
Supplement. OKVED codes (All-Russia Classification of Economic Activities): 19.10 – coke production; 24.44 – copper production; 08.91 – extraction of mineral resources for the chemical industry and production of mineral fertilizers; 27.31 – production of fiber optic cables; 07.10 – extraction and beneficiation of iron ore; 23.20 – production of refractory products; 23.32 – production of brick, roof tiles and other baked clay-made construction products; 22.21 – production of plastic sheets, strips, pipes and profiles; 05.20 – extraction and beneficiation of brown coal (lignite); 23.51 – cement production.

As shown in Figure 2, the markets for coke, copper and mineral resources exhibit extremely high level of structural asymmetry, which characterizes them as oligopolistic markets. Their structure is very uneven, as evidenced by high values of the Hall-Tideman and Herfindahl-Hirschman indices. The markets for the machine industry products, peat production and glue production are characterized by high values of the Bain index, but these markets' structure displays the signs of monopolistic competition. The markets for lead, synthetic rubber, chemical fibers, natural gas and glass fiber, on the contrary, while demonstrating an extremely uneven distribution

of market shares, have a high level of the Bain index. Figure 3 presents the markets with the highest and the lowest levels of interactional asymmetry (the first series of values).

Figure 3. Markets with the highest and the lowest levels of interactional asymmetry
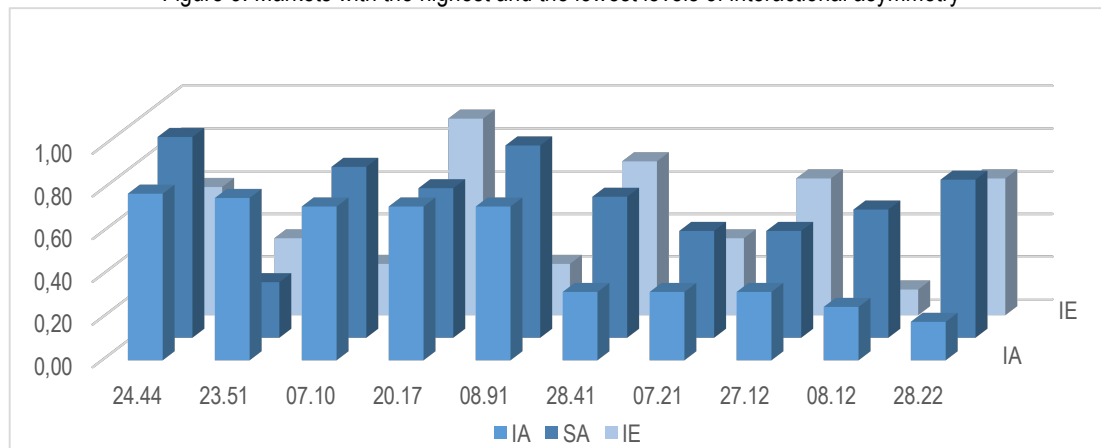
Supplement. OKVED codes (All-Russia Classification of Economic Activities): 24.44 – copper production; 23.51 – cement production; 07.10 – extraction and beneficiation of iron ore; 20.17 – production of synthetic rubber in primary forms; 08.91 – extraction of mineral resources for the chemical industry and production of mineral fertilizers; 28.41 – metalworking machinery manufacture; 07.21 – mining of uranium and thorium ores; 27.12 – manufacture of electrical distribution equipment and control systems; 08.12 – exploitation of gravel and sand quarries, extraction of clay and kaolin; 28.22 – manufacture of hoisting equipment.

High level of interactional asymmetry in the markets for copper, cement, iron ore, synthetic rubber and mineral resources indicates that enterprises in these markets exercise market power in relation to suppliers (Table 7).

Table 7. Matching industry and related markets

Industry market	Related market
Copper production	Production of wire, chain and spring products
	Production of central heating radiators and boilers
Cement production	Construction of residential and non-residential buildings
Extraction and beneficiation of iron ore	Production of cast iron, steel and ferrous alloys
	Production of steel pipes, hollow profiles and fittings
Production of synthetic rubber in primary forms	Production of rubber products
Extraction of mineral resources for the chemical industry and production of mineral fertilizers	Production of other basic inorganic chemicals
	Production of other basic organic chemicals
	Production of fertilizers and nitrogen compounds
Production of petroleum products	Retail trade in motor fuel in specialized stores
	Production of plastic products
	Production of rubber products
Extraction and beneficiation of brown coal (lignite)	Generating, transmitting and distributing electrical energy
Extraction of crude oil and associated petroleum gas	Coke production
	Production of petroleum products
	Pipeline transport activity
Quarrying ornamental and building stone, limestone, gypsum, chalk and shale	Construction of residential and non-residential buildings
Production of refractory products	Construction of residential and non-residential buildings

Figure 4 presents a visual assessment of the level of institutional asymmetry. For the purpose of comparing, the second and the third series display the values of structural and interactional asymmetry indicators of the same markets respectively.

The markets for synthetic rubber, power systems and plastics exert the most profound impact on the state. The markets for natural gas, crude oil and steel pipes display a high level of bargaining power, primarily due to the availability of government programs on export support. The detailed calculations of the power asymmetry indicators and the rank evaluation of the industry markets are given in Appendix.

Figure 4. Markets with the highest and the lowest degree of correlation between the needs and development path and the institutional environment
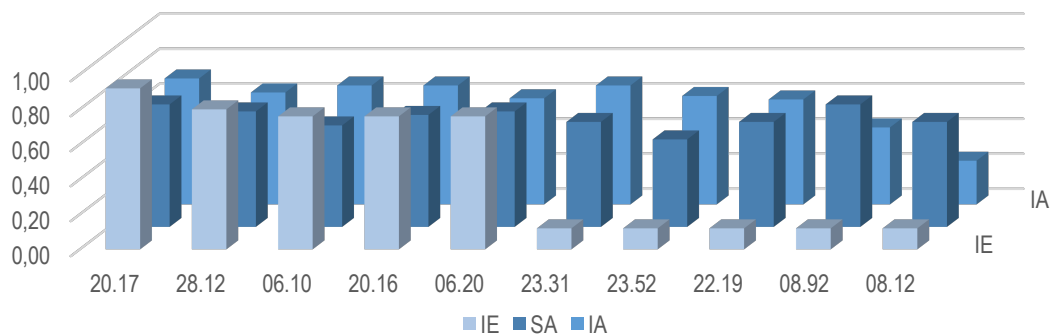
Supplement. OKVED codes (All-Russia Classification of Economic Activities): 20.17 – production of synthetic rubber in primary forms; 28.12 – manufacture of hydraulic and pneumatic power systems; 06.10 – extraction of crude oil and associated petroleum gas; 20.16 – production of plastics and synthetic resins in primary forms; 06.20 – extraction of natural gas and gas condensate; 23.31 – production of ceramic tiles; 23.52 – production of lime and gypsum; 22.19 – production of other rubber products; 08.92 – extraction and agglomeration of peat; 08.12 – exploitation of gravel and sand quarries, extraction of clay and kaolin.

4. Discussion

The results of the empirical study demonstrate a significant differentiation of the level of power asymmetry in Russia's industry markets. The calculations performed show that 36% of the markets under consideration are characterized by a high level of power asymmetry; in 26% of them, its level is medium, and 38% of the industry markets exhibit a weak level of power asymmetry.

In our sample of 42 industries, the copper market displays the highest value of power asymmetry due to structural and interactional asymmetries. The synthetic rubber market also has a high level of power asymmetry, but it has the highest level of institutional asymmetry. The markets for hydraulic and pneumatic power systems, plastics, steel pipes, crude oil and natural gas also have a high level of power asymmetry due to institutional factors, although the level of competition inequality here is rather low. The market for mineral resources, on the contrary, does not possess a high level of bargaining power with the state, but due to the significant concentration and the presence of market power in related markets, it ranked seventh in terms of the level of power asymmetry. The market for chemical fibers has an uneven market structure and is actively supported by the state, but, not having sufficient market power in related markets, ranked only eighth. As for the oil products market, its high level of power asymmetry is attributed exclusively to the presence of market power in related markets, given that its level of interactional asymmetry is 71%. At the same time, the markets that rank near the bottom of our list have low levels of all the three components of power asymmetry. Such markets usually include production of building materials, dyes and chemical products.

Conclusion

It is widely recognized that competition provides the major impetus for economic growth. In recent years, Russia has demonstrated a slowdown in economic growth, which indicates weak competition in the industry markets and ineffective support for competition from the state. The study of power asymmetry in 42 industry markets of the Russian manufacturing sector allowed us to gain several important scientific insights and specify the types of power asymmetry. The proposed method accounts for objective indicators and each of them is based on public data sources.

In our opinion, the importance of the current research lies in the study of all the vast array of industry markets of the Russian manufacturing sector with the use of the tools for analyzing the theory of industrial organization and the neo-institutional economic theory. The research results make it possible to improve the assessment of inequality in industry markets of the manufacturing sector and give a clearer picture of regularities that persist when the level of competition influences market growth. This fact, in turn, can help with formulating more effective proposals concerning competition policy.

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APPENDIX

Final values of power asymmetry indicators

Industry market (according to OKVED codes (All-Russia Classification of Economic Activities)	SA	IA	IE	Rait (SA)	Rait (IA)	Rait (IE)
Copper production	0.94	0.78	0.60	2	1	15
Production of synthetic rubber in primary forms	0.70	0.72	0.92	9	4	1
Manufacture of hydraulic and pneumatic power systems	0.66	0.64	0.80	14	14	2
Production of plastics and synthetic resins in primary forms	0.64	0.68	0.76	16	12	4
Extraction of natural gas and gas condensate	0.66	0.61	0.76	12	20	5
Extraction of crude oil and associated petroleum gas	0.58	0.68	0.76	25	9	3
Extraction of mineral resources for the chemical industry and production of mineral fertilizers	0.90	0.72	0.24	3	5	31
Chemical fibers production	0.70	0.55	0.64	11	29	12
Producing steel pipes, hollow profiles and fittings	0.60	0.60	0.72	24	24	6
Oil products production	0.60	0.71	0.60	19	6	16
Coke production	0.94	0.60	0.24	1	22	32
Extraction and beneficiation of coal and anthracite	0.56	0.68	0.64	26	13	10
Production of fiber optic cables	0.84	0.38	0.56	4	37	18
Extraction and beneficiation of iron ores	0.80	0.72	0.24	5	3	30
Production of lead, zinc and tin	0.74	0.54	0.48	6	30	22
Metalworking machinery manufacture	0.66	0.32	0.72	15	38	7
Manufacture of tools and devices for measuring, testing and navigation	0.46	0.62	0.68	35	17	8
Clue production	0.70	0.61	0.36	10	19	27
Production of cast iron, steel and ferrous alloys	0.50	0.62	0.60	31	18	17
Production of glass fiber	0.66	0.62	0.36	13	15	26
Production of other wires and cables for electronic and electrical equipment	0.56	0.44	0.64	27	35	11
Production of rubber tires and chambers	0.60	0.54	0.48	20	31	23
Manufacture of hoisting equipment	0.74	0.18	0.64	7	42	14
Production of industrial gases	0.50	0.58	0.52	29	26	19
Aluminum production	0.50	0.61	0.48	32	21	21
Manufacture of electric motors, generators and transformers	0.46	0.42	0.68	36	36	9
Production of dyes and pigments	0.44	0.52	0.52	37	33	20
Production of brick, roof tiles and other baked clay-made construction products	0.44	0.60	0.44	39	25	24
Manufacture of electrical distribution equipment and control systems	0.50	0.32	0.64	33	40	13
Quarrying ornamental and building stone, limestone, gypsum, chalk and shale	0.60	0.68	0.12	17	7	37
Production of ceramic tiles	0.60	0.68	0.12	23	8	38
Production of other rubber products	0.60	0.60	0.12	21	23	40
Extraction and agglomeration of peat	0.70	0.44	0.12	8	34	41
Production of plastic products used in construction	0.60	0.52	0.16	22	32	36
Manufacture of bearings, gear trains, mechanical transmission components and drives	0.50	0.56	0.24	34	28	34
Cement production	0.26	0.76	0.36	42	2	25
Production of refractory products	0.44	0.68	0.16	38	10	35
Production of lime and gypsum	0.50	0.62	0.12	30	16	39
Extraction and beneficiation of brown coal (lignite)	0.30	0.68	0.28	41	11	29
Production of plastic sheets, strips, pipes and profiles	0.40	0.58	0.24	40	27	33
Mining of uranium and thorium ores	0.50	0.32	0.36	28	39	28
Exploitation of gravel and sand quarries, extraction of clay and kaolin	0.60	0.25	0.12	18	41	42

The Effect of Market Orientation Activities on Performance of Microfinance Institutions: Empirical Evidence from Yemen

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Abstract:

This paper provides the empirical evidence of the effect of market orientation activities of intelligence generation, intelligence dissemination and responsiveness on the performance of Microfinance Institutions (MFIs) in Yemen. A survey questionnaire distributed to 166 branch managers of MFIs across Yemen utilizing a self-administered method from which 125 sets of questionnaires were successfully collected and used for the analysis. The measurement model and structural model analyses were obtained using the partial least square structural equation Modeling, SmartPLS 3.0. The results proved that market orientation activities are central to the performance of MFIs, although only two out of three components of market orientation activities are found significant. They only showed the significant effect of the intelligence dissemination and responsiveness on MFIs performance, whereas, the effect of intelligence generation on MFIs performance could not be confirmed. The findings of the study are valuable for policy makers, MFIs managers, practitioners and academicians who have the interests in the development of the microfinance sector.

Keywords: market orientation activities; microfinance performance; Yemen

JEL Classification: M3

Introduction

Nowadays, the environment is turbulent and changeable where adaptability and competitiveness are critical for the survival and success of an organization (Fang, Chang, Ou and Chou 2014). The situation, coupled with globalization and the rapid technology development compel the organizations to be more effective in decision making to provide superior customer value and respond quickly (Shahsiah and Sepahvand 2016). In order to achieve that, Chao and Spillan (2010) suggest that marketing goals should be a priority with a continuous understanding of the market orientation strategy. The organizations, in order to remain competitive, have to improve a market sensing capability, which is generally referred to as the "market orientation". According to Fang *et al*. (2014), the focus of the organizations should not be limited to initiate, maintain and accumulate resources but they also need to review continuously the functionality of their assets and market knowledge in order to gain sustainable competitive advantage.

Market-oriented organizations of market sensing capability explore the market broadly and usually have a long-term focus (Chao and Spillan 2010). They carry out small-scale market experiments and learn from the conclusions which enable them to face the future challenges of turbulent events that may emerge later. The knowledge obtained from market experiments shall provide the organizations with the opportunity to adjust their products and services based on the new knowledge and insights (Slater and Olson 2002). Importantly, market orientation is observed as part of the business behaviors when it enables managers to learn about customers' needs and then they act in an entrepreneurial way to generate better or superior customer value. Moreover, the capabilities inherent in a market orientation enable organizations to identify the customer needs as well as the

opportunities in the un-served markets and in markets they are currently serving (Barney 1991, Slater and Olson 2002, Teece, Pisano and Shuen 1997).

The fact that market orientation (MO) has become one of the cornerstones of marketing cannot be denied. It can be seen as the culture or activities of the firm that effectively create the behaviors needed for superior performance.

There is a bulk of research works conducted on the link between market orientation and organization performance (e.g., Langerak 2003, Sandvik and Sandvik 2003, Kai and Xiaofan 2010, Wang, Chen and Chen 2012, Boso, Story and Cadogan 2013, Protcko and Dornberger 2014, Al-Ansaari, Bederr, and Chen 2015, Shahsiah, and Sepahvand 2016, Buli and Buli 2017, Homaid, Zain, Al-Matari, Minai and Ahmad 2017). However, examining the link between MO and organization performance at the disaggregated level is missing (Chao and Spillan 2010).

It is also claimed that studies should focus on the impact of each distinctive dimension of MO as a separate construct rather than studying MO as a whole to obtain better and deeper understanding (Shin 2012). Moreover, within the context of the MFIs performance, it can be said that there is a scarcity of studies about the effect of market orientation on organizational performance. For example, Ghani and Mahmood (2011) have carried out a study investigating the link between MO and MFIs performance in Pakistan, however, concluded that MO is not significantly related to MFIs performance. Whilst arguing that MO is a context specific, they mentioned that its effect cannot be equally ensured in all settings.

A more recent study conducted by Homaid *et al.* (2017) found a significant relationship between market orientation as a composite variable and Islamic MFIs in Yemen. The results were based on 71 questionnaires collected from the branch managers of Islamic MFIs operating in Yemeni microfinance sector. They claimed that there is a scarcity of studies on the association between market orientation and organization performance in the least developed countries such as Yemen. Furthermore, examining the effect of market orientation dimensions on organization performance is still insufficient and on MFIs performance is even less documented. Most of the research work related to the MFIs is applied based, thus make the research work where this article is written is relevant. There is still a gap remains to be filled up which involves examining the effect of market orientation MFIs performance.

Based on the aforementioned arguments and discussions, there are more insights to be revealed, in exploring the relationship between MO and the performance of the MFIs. It is important to note that MFIs are different from other business organizations, especially in terms of its focus, as the MFIs focus on the dual objectives of financial returns and social impact (Roy and Goswami 2013).

1. Literature review

1.1. Marketing concept and market orientation concept

The concept of marketing can be defined as a readiness to identify the potential customer's needs and demands as well as adjusting any of the marketing mix elements to meet the customer satisfaction (Houston 1986). Sin, Tse, Yau, Chow and Lee (2003) stated that the marketing concept is basically comprised of three components:
- customer philosophy (identifying the needs of the target clients and satisfying them);
- goals attainment (achieving the objectives of an organization through satisfying the clients);
- integrated marketing organization (integration of all functional areas of the organization to attain the goals through satisfying the needs of customers).

According to Osarenkhoe (2008), market-oriented organizations focus more on the customer relationship management via defining a certain special organizational culture that puts the customer at the core of the organization's strategy and operations. Thus, marketing concept should be seen as the business philosophy, which guides the business marketing and selling efforts, is widely accepted and employed in every part of an organization's operations.

The concept of market orientation originated from the application of marketing concept, which is regarded as critical for the organization survival and success (Mahmoud, Kastner and Akyea 2011). Ruekert (1992) defines the level of market orientation in a business unit as the degree to which the business unit (i) generates and utilizes information obtained from customers; (ii) designs a strategy that satisfies customer needs and demands; and (iii) ultimately implements a responsive strategy to customer needs and demands. Deshpandé, Farley and Webster (1993) view MO as the body of beliefs that puts the customer's interests first, however, the views of other stakeholders such as owners, managers, and employees should not be ignored totally, as it relates and, builds a long term profitable business. For example, Day (1990), defined MO as something that relates to the outstanding skills used by a business to understand customers' needs and attain their satisfaction.

The two definitions proposed by Kohli and Jaworski (1990) and Narver and Slater (1990) are the most predominant ones in the MO literature. Kohli and Jaworski (1990) defined MO as "the organization-wide generation of market intelligence pertaining to current and future needs of customers, dissemination of intelligence within an organization and responsiveness to it". Following this definition, the MO can be measured by three constructs namely intelligence generation, intelligence dissemination, and respond to market intelligence. Meanwhile, another definition suggested by Narver and Slater (1990) is slightly different. They defined MO as "the organizational culture that most effectively and efficiently creates the necessary behaviors for the creation of superior value for buyers and thus superior performance for business". Based on the above definition, MO needs to be classified into three constructs: (i) customer orientation, (ii) competitor orientation and (iii) inter-functional coordination.

The scale provided by Jaworski, and Kohli (1993) is called MARKOR and the one provided by Narver and Slater (1990) is called MAKTOR. They have become a turning point of focus from describing and conceptualizing the marketing concept from a business philosophy to a theory testing focus where empirical evidence can be gathered and analyzed (Goldman and Grinstein 2010). The majority of studies carried out regarding the MO have used either a MARKOR scale of Jaworski and Kohli (1993) or a MAKTOR scale of Narver and Slater (1990).

For the current study, the Kohli and Jaworski (1990) concept of MO and MARKOR scale is used due to at least three primary reasons. First, this concept explains the MO construct briefly with clear and explicit activities which emphasizes the entire organization's processes. Second, it is argued that generating information, disseminating it and responding to the customers, competitors and market condition is faster and cheaper than trying to establish or change organization culture (Ogunnaike, Akinbode and Onochie 2014). As such, the behavioural perspective enables the organization to gain a greater immediate return with less effort which could be the base for organizational culture or cultural change. Third, MARKOR scale seems to outperform the MAKTOR scale in terms of variance explained and more generalized (Cano, Carrillat and Jaramillo 2004, Matsuno, Mentzner and Rentz 2005, Ellis 2006, Shoham, Ruvio, Vigoda-Gadot and Schwabsky 2006, Vieira 2010, Rojas-Méndez and Rod 2013).

1.2. Market orientation and MFIs performance

According to Resources-Based View theory, MO is acknowledged to be a sustainable source of competitive advantage and outstanding performance within the firm (Kumar, Jones, Venkatesan and Leone 2011, Liao, Chang, Wu and Katrichis 2011). Market-oriented organizations have the required resources to predict the customers' needs and demands, react quickly to satisfy them and adapt to environmental changes, which resulted in better organizational performance (Mahmoud and Yusif 2012). Since the linkage between MO and organization performance is a well-studied topic in the current literature, the focus of the study is on the MO dimensions rather than on MO as a composite construct. It examines the effect of the three dimensions of MO, namely intelligence generation, intelligence dissemination and responsiveness. Figure 1 below presents the theoretical framework.

Figure 1. Theoretical framework of the study
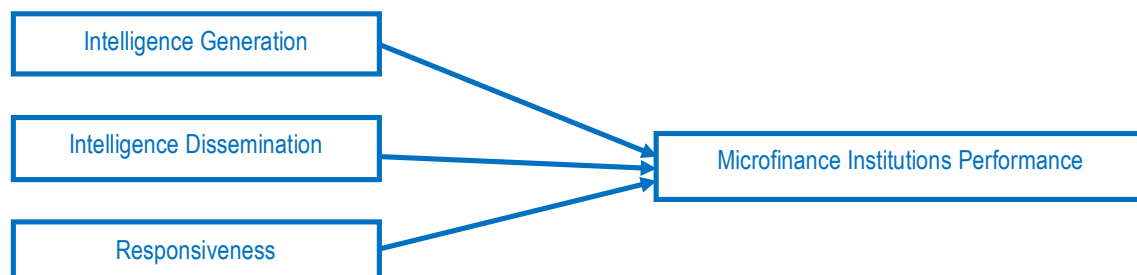
1.2.1 Intelligence generation

Intelligence generation towards the market is the starting point of the MO (Hajipour, Rahimi, and Hooshmand 2012). It involves collecting information about current and potential customers and other influential factors such as competition, regulation, technology and business environment which enables the organization to anticipate customers' needs and preferences (Boso, Story, and Cadogan 2013). For the MFIs, understanding the current and future demands of the customers, building customers' loyalty and attracting new customers is critical for the MFIs financial and social performance (Savescu 2011).

According to Julian, Wangbenmad, Mohamad and Ahmed (2013), generating information can be carried by formal and informal channels such as customer survey and build a good relationship with suppliers and government

officials. All the departments of the organization together with the marketing department should be involved in generating information about the customers and competitors (AL-Dmour, Basheer and Amin 2012). The permanent tracing of competitors, understanding the way they affect the customers and investigating the business environment are successful actions of market intelligence (Hajipour *et al*. 2012).

Literature review on MO shows that intelligence generation is significantly related to organizational performance (Untachai 2008, Hamadu, Obaji and Oghojafor 2011, Julian *et al*. 2013). However, other studies did not support the significant effect of intelligence generation on organizational performance such as Chao and Spillan (2010) and AL-Dmour *et al*. (2012) or mixed results based on the measurements of performance (Keelson 2014). To conclude, the conflicting findings concerning this relationship in business organizations lead to the urgent need for examining such relationship in microfinance. Based on the previous discussions and results, the following hypothesis can be postulated as follows:

H 1: Intelligence Generation is significantly associated with Microfinance Institutions Performance in Yemen.

1.2.2 Intelligence dissemination

The second dimension of MO is intelligence dissemination, which is very important because it provides common foundations to focus on different segments' activities in the organization (Hajipour *et al*. 2012). It involves spreading and communicating information throughout the different departments of the organization (Julian *et al*. 2013). Market, customer and competitor information can be disseminated via formal and informal communication mechanisms (Chao and Spillan 2010). Moreover, it is crucial to disseminate that intelligence to the different departments and individuals in the organization periodically and in a timely manner (AL-Dmour *et al* 2012).

Empirically, intelligence dissemination was found to be significantly associated with organizational performance (Hamadu *et al*. 2011, AL-Dmour *et al*. 2012, Julian *et al*. 2013). However, other studies such as Untachai (2008) and Chao and Spillan (2010) found an insignificant connection between the two in business organizations. The inconsistent results regarding this relationship in business organizations indicate the need to test this relationship in the microfinance sector. This study suggests that disseminating information creates synergies and deep understanding within the MFIs which enable them to respond effectively and accomplish the desired financial and social objectives. Thus, the hypothesis related to the link between Intelligence Dissemination and MFIs performance is as follows:

H2: Intelligence Dissemination is significantly associated with Microfinance Institutions Performance in Yemen.

1.2.3 Responsiveness

The third dimension of MO is responsiveness towards market intelligence, which includes proper actions by an organization to the market conditions by developing products and even designing and producing new products (Ogunnaike *et al*. 2014). According to Hamadu *et al*. (2011), responsiveness consists of two activities: (i) response design, which requires developing the organizational plan and (ii) response implementation, which requires implementing the plan. It is a set of behaviors and actions made by the organizations as a reaction to generate and disseminate intelligence in which the whole organization responds to the existing and future needs of the customers (AL-Dmour *et al*. 2012). For the market-oriented MFIs, it is also crucial to respond to market intelligence by meeting the clients' needs and preferences and even making in their policies, rules and regulations (Agyapong 2014).

Empirically, the studies of Untachai (2008), Chao and Spillan, (2010), Hamadu *et al*. (2011), AL-Dmour *et al*. (2012) and Julian *et al*. (2013) reported the significant effect of responsiveness on organization performance. This indicates that responsiveness is a significant variable in fostering performance in business organization, however, this relationship in microfinance has been ignored. Thus, this study attempts to test this relationship for validating and generalizing the previous results. Therefore, the hypothesis regarding responsiveness and MFIs performance is postulated as follows:

H 3: Responsiveness is significantly associated with Microfinance Institutions Performance in Yemen.

2. Methodology

2.1 Data and measurements

In order to test the theoretical framework of the study, a survey questionnaire approach was utilized. A total of 166 questionnaires was distributed to the branch managers of Yemeni Microfinance Institutions (MFIs). After collecting data, 125 questionnaires were returned and employed for the analysis. For measuring the MFIs performance, the Balanced Scorecard approach, developed by Kaplan and Norton (1993) was employed. This measurement was

suggested to be employed in measuring the performance of MFIs by many authors such as Nanayakkara and Iselin (2012) and Roy and Goswami (2013).

It comprises of the four main components utilized in for profit businesses, namely, financial, customer, internal process, learning and growth social perspective in addition to social component as the MFIs are unique due to their focus on business and social objective. The MARKOR scale of Jaworski and Kohli (1993) used to measure Market Orientation (MO) activities, intelligence generation, intelligence dissemination and responsiveness. The respondents were asked to rate the questions on the 5-Likert scale.

2.2 Analysis and findings

In order to evaluate the theoretical framework of the study, this study utilized the two-stage approach the outer, (measurement) and the inner (structure) model evaluation. This approached has been taken based on the recommendations of many scholars such as Valerie (2012), Henseler, Ringle and Sinkovics (2009) and Hair, Hult, Ringle and Sarstedt (2014).

In the first stage, the evaluation of the outer model or the measurement model was employed to ensure construct validity and reliability. This involves undertaking three tests namely, content validity, convergent validity and discriminant validity.

In the second stage, the inner model or structure model was utilized to assess the model quality. This can be done by conducting the following tests: R-square values, predictive relevance of the model and the significance level of path coefficient. SmartPLS 3.0 software using the bootstrapping algorithm was utilized to test for the hypothesized relationships.

2.2.1 Outer model analysis

As suggested by Hair, Ringle and Sarstedt (2011) and Valerie (2012), the construct, convergent, and discriminant validity are assessed for the measurement of goodness in the study. For the measurement of construct validity, all items are loaded significantly with 0.70 or higher. Similarly, for establishing the convergent validity, the values of both Composite Reliability (CR) and Cronbach's alpha are taken when they exceed the values of 0.70. While the average variance extracted (AVE) values are considered if they exceed the generally recognized value of 0.50.

Figure 2 and Table 1, below present the observed values that indicate that form the construct validity and the convergent validity.

Figure 2. Items loadings and R^2 value
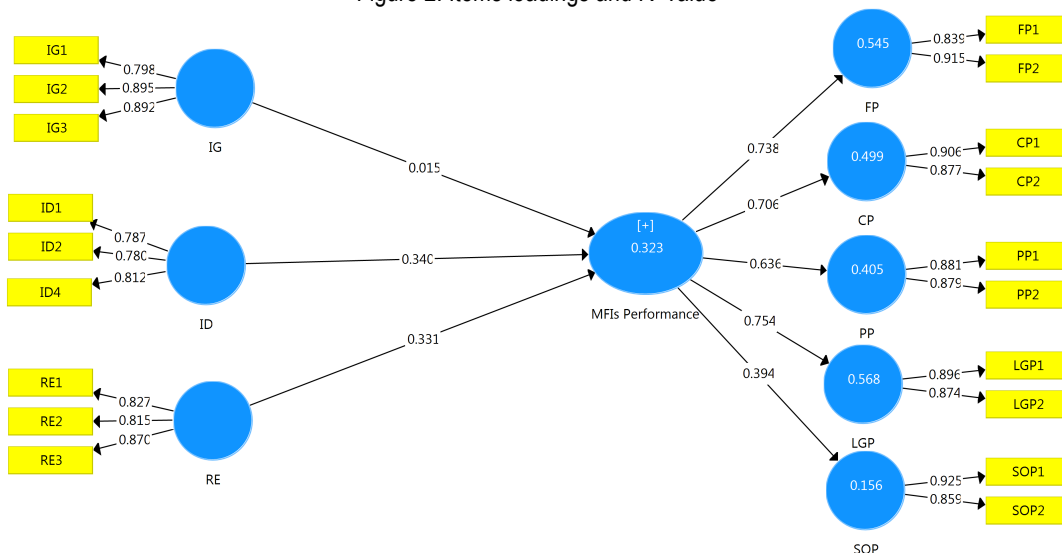
Table 1. The content and convergent validity test

Construct	Items	Loadings	Cronbach's Alpha	CRa	AVEb
Customer Perspective	CP1	0.906	0.743	0.886	0.795
	CP2	0.877			
Financial Perspective	FP1	0.839	0.709	0.870	0.771
	FP2	0.915			
Intelligence Dissemination	ID1	0.787	0.705	0.836	0.629
	ID2	0.780			
	ID4	0.812			

Construct	Items	Loadings	Cronbach's Alpha	CRa	AVEb
Intelligence generation	IG1	0.798	0.830	0.897	0.744
	IG2	0.895			
	IG3	0.892			
Learning and Growth	LGP1	0.896	0.724	0.878	0.783
	LGP2	0.874			
Internal process Perspective	PP1	0.881	0.709	0.873	0.775
	PP2	0.879			
Responsiveness	RE1	0.827	0.790	0.876	0.701
	RE2	0.815			
	RE3	0.870			
Social Perspective	SOP1	0.925	0.750	0.887	0.797
	SOP2	0.859			

According to Hair *et al*. (2011), in performing and testing the discriminant validity, the square root of the average variance extracted (AVE) should be compared with correlations of each latent construct as the requirement to confirm the discriminant validity of the study model.

As shown in Table 2, the discriminant validity of the outer model is established as none of the intercorrelations of the instruments exceed the square root of the AVE. Thus, it can be concluded that the measurement model of the current study is confirmed.

Table 2. Correlation and discriminant validity

Dimension	CP	FP	ID	IG	LGP	PP	RE	SOP
Customer Perspective (CP)	**0.892**							
Financial Perspective (FP)	0.463	**0.878**						
Intelligence Dissemination (ID)	0.312	0.355	**0.793**					
Intelligence generation (IG)	0.246	0.230	0.446	**0.863**				
Learning and Growth Perspective (LGP)	0.376	0.339	0.449	0.297	**0.885**			
Internal process Perspective (PP)	0.200	0.330	0.276	0.080	0.448	**0.880**		
Responsiveness (RE)	0.330	0.469	0.396	0.490	0.403	0.093	**0.837**	
Social perspective (SOP)	0.173	0.184	0.092	0.228	0.185	0.108	0.195	**0.893**

2.2.2 Inner Model Analysis

Chin (2010), Hair *et al*. (2011) and Valerie (2012) emphasized that for the structural model quality assessment, three main criteria should be tested, which are the R² values, the predictive relevance of the model and the level and significance of the path coefficients. The R² score is the most important reference and is suggested by Valerie (2012) as one of the most critical criteria for the quality of the structural model assessment. Chin (2010) pinpoints thatit shows the variance in the endogenous latent variables, the percentage of dependent variable being explained by the independent variables.

The results of the tests are illustrated in Table 3 below. The R² value of MFIs performance is 0.323, indicating that 32.3% of the variance in the MFIs performance is explained by the three activities of market orientation (Intelligence generation, Intelligence Dissemination and responsiveness). The value surpasses the criterion R² evaluation recommended by Cohen (1988) of R² >0.26 as substantial. It shows that the market orientation variables under observation substantial explaining the performance of the MFIs under study. For the prediction quality, the cross-validated redundancy value is observed to be greater than zero. The study model, thus has an adequate prediction quality as the value of the cross-validated redundancy was greater than the threshold, as suggested by Fornell and Cha (1994). Table 3 below shows the R² and Cross Validated Redundancy value of the study.

Table 3. Predictive quality indicators

Variable	Variable Type	R square	Cross-Validated Redundancy	Cross-Validated Communality
MFIs performance	Endogenous	0.323	0.093	0.202

After the establishment of the goodness of the measurement model, the hypothesized relationships among the variables of the study were tested by running the PLS Bootstrapping algorithm. Figure 3 and Table 4 show the path coefficient values between MO activities and the MFIs Performance. One of the 'unexpected' result is the inability to support the significant relationship between Intelligence generation (one of the MO activities) and

Microfinance Institutions (MFIs) Performance (β = 0.015, t =0.177, p >0.1). The expected results are realized for the other two MO activities, the significant relationship between Intelligence Dissemination and MFIs performance (β = 0.340, t =0.3.581, p <0.001) and the relationship between responsiveness and MFIs performance (β = 0.331, t =4.465, p <0.001).

Table 4. Hypothesis testing results

No.	Hypothesis Path	Path Coefficient	Standard Error	T Value	P Value	Decision
H_1	IG->MFIs performance	0.015	0.082	0.177	0.859	Not Supported
H_2	ID->MFIs performance	0.340	0.095	3.581	0.000	Supported
H_3	RE -> MFIs performance	0.331	0.074	4.465	0.000	Supported

Figure 3. The significance of Factor Loadings and Path Coefficient
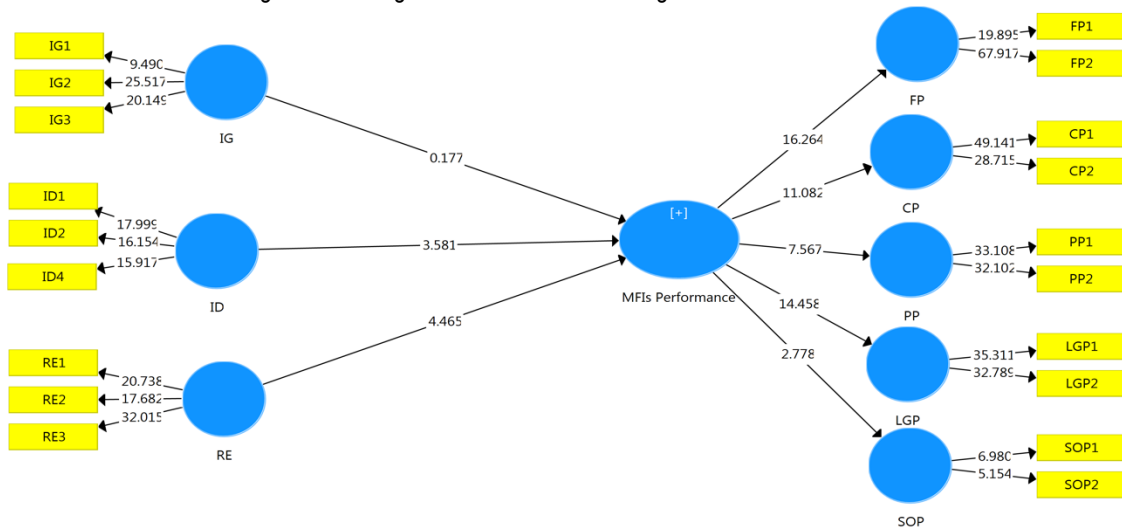
3. Discussion and conclusion

The current study achieved the objective by examining the effect of Market Orientation (MO) activities and Microfinance Institutions (MFIs) performance in the context of Yemen. The results showed that two activities of MO which are intelligence dissemination and responsiveness were found to be significant predictors of MFIs performance while intelligence generation was otherwise.

Specifically, intelligence generation, as one of the MO activities, is the only activity that was not found to be significantly associated with the MFIs performance. This is an unexpected result because the researcher hypothesized a significant connection between the two constructs following the findings of the previous studies carried out by Untachai (2008), Hamadu *et al*. (2011) and Julian *et al*. (2013). However, the result is similar to the results of studies by Chao and Spillan (2010) and Al-Dmour *et al*. (2012) who found insignificant relation between intelligence generation and organization performance. It is claimed that the effect of intelligence generation cannot be realized directly on the MFIs performance, which might have an indirect effect through other components of the MO. This fact is supported by the conclusion offered by Carbonell and Rodríguez Escudero (2010) who claimed that intelligence generation has an indirect influence on organizational performance through intelligence dissemination and responsiveness.

However, intelligence dissemination was found to be a significant predictor of MFIs performance. This result indicates that intelligence dissemination, individually, has a very strong effect on the MFIs performance. This result is consistent with the findings of studies carried out by Hamadu *et al*. (2011), Al-Dmour *et al*. (2012) and Julian *et al*. (2013). This implies that the MFIs should pay more attention to disseminating information within the different levels so that their performance can be improved. As disseminating information creates synergies among the departments of an institution and provide a clear picture about the market trends so they can make prompt action which results in achieving competitive advantage and then better performance. Disseminating information within the context of microfinance industry is easily accessible by all staffs that recognize the needs of customers so that they can respond promptly.

Similarly, intelligence dissemination, responsiveness is also found to be a very significant variable affecting the MFIs performance. This result is an agreement with what the researcher tries to prove based on the claim made by scholars such as Untachai (2008), Chao and Spillan (2010), Hamadu *et al*. (2011), Al-Dmour *et al*. (2012) and Julian *et al*. (2013) who reported the significant impact of responsiveness on the organizational performance. This

implies that the performance of MFIs can be enhanced by the quick response to the changes in the business environment such as to regulations, technology and price strategies. Keelson (2014) mentioned that responding quickly to any competitive actions which are supposed to threaten target market is an important for superior performance, and for this finding, it shall be the case for the MFIs performance.

The current study contributes significantly to the body of knowledge by examining the MO activities on MFIs performance in the context of a least developed country, Yemen. It provides deeper understanding and insights about the effects of each activity in an environment where empirical studies regarding MO activities are scarce. It can also raise the awareness of the significant effect of MO activities in fostering the MFIs performance among the managers of MFIs. They should pay more attention to all the three of the MO activities and its practices within MFIs regardless the insignificant result found in the study. This is because of that intelligence generation is an important activity and the effects of other two activities of MO depend mainly on intelligence generation.

The results of the study are based on the data collected from branch managers of MFIs so that they can be generalized to similar sectors. The future research can employ a longitudinal approach as this study employed as a cross-sectional research design which involved collecting data at one point of time. It can be conducted in other contexts such as in other sectors or countries which may provide more understanding about the relationship between MO activities and organizational performance. The future study can employ mediators or moderators on the link between MO activities and organization performance which may explain the relationship better. It can also examine the relationship among these activities in which intelligence dissemination and responsiveness can be used as mediators and intelligence generation can be a predictor.

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A Dynamic Model of Non-Performing Loans of the Largest Micro-Lender in Indonesia

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Abstract:

This study is aimed at empirically exploring the short- and long-term relationships between lending interest rate, total deposits, total loans, and non-performing loans of the largest micro-lender in Indonesia. It also attempts to investigate both bivariate and multivariate causalities among these variables. For this purposes, an Autoregressive Distributed Lag (ARDL) and a Vector Error Correction Model (VECM) approaches are adopted using the quarterly data over the 2003-2015 period. The non-performing loans were positively affected by their total loans and total deposits, but they were negatively impacted by the lending interest rate. As for the dynamic causalities, the total loans and lending interest rate bidirectionally Granger caused the non-performing loans, but the non-performing loans were unidirectionally Granger caused by the total deposits. These findings imply that to enhance the capital structure of the small- and medium- enterprises in the country through the distribution of small-scale loans by the largest micro-financing banks in Indonesia, the bank should design a proper credit policy with a lower lending interest in order to have lower level of non-performing loans.

Keywords: interest rates; deposits; non-performing loans; micro-finance; ARDL; VECM

JEL Classification: C32; E51; G21; G28

Introduction

In the last decade, there have been a growing interest among researchers in investigating the issue of non-performing loans as one of crucial determinants of banking stability (Rinaldi and Sanchis-Arellano 2006, Berge and Boye 2007, Boss *et al.* 2009) and subsequently the sustainability and steady economic growth (Reinhart and Rogoff 2010, Nkusu 2011). Considering a recently increased trend in household loan, both in relative to household income and absolute terms, the issue of non-performing loan has attracted more attention due to its essential financial and macroeconomic ramifications.

As a reflection of the quality of asset, credit risk, and efficiency of banking industry in channelling funds to productive sectors, non-performing loans have been studied from political, economic, social, technological, legal, and environmental (PESTLE) perspectives (Rajan and Dhal 2003). Of these perspectives, economic factor has been proven to be the most critical factor in determining the portfolios of banks and their non-performing loans (Berge and Boye 2007, Louzis *et al.* 2012). Additional, apart from exploring the determinants of non-performing loans from the macroeconomic perspective, previous empirical studies have also investigated the non-performing loans from the perspective of bank-specific characteristics.

From the macroeconomic standpoint, Rinaldi and Sanchis-Arellano (2006) empirically studied household non-performing loans in the European countries and found that unemployment, disposable income, and monetary variables have significant impacts on non-performing loans. In Finland, Berge and Boye (2007) documented evidence that non-performing loans were highly responsive to the unemployment and real interest rates during the

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period 1993–2005. Meanwhile, Berger and DeYoung (1997) and Podpiera and Weill (2008) explored the effects of bank-specific characteristics on their non-performing loans. Berger and DeYoung (1997) found that the non-performing loans of the US commercial banks were affected by the banks' inefficiency and capital inadequacy over the period 1985-1994. In a similar vein, Podpiera and Weill (2008) also documented that cost inefficiency has negatively impacted future non-performing loans in the Czech banking industry over the period 1994-2005.

Unlike studies on the non-performing loans among banking industry in the developed economies, similar study on the emerging of economies of Asia, especially for the case of Indonesia, has been limited. Comparing to the immense growing of the banking and financial industry in Indonesia, the studies that comprehensively investigated the issue of non-performing loans and their determinants have been scare. Previous studies by Firmansyah (2015), Setiawan and Putri (2013), and Havidz and Setiawan (2015) only investigated the determinants of non-performing loans of the Islamic People Credit Bank (*Bank Perkreditan Rakyat Syariah - BPRS*) and Islamic banks over a shorter period of study and using the simple OLS-multiple regression and bivariate causality. Thus, these studies failed to provide a clearer picture and robust findings on the non-performing loans and subsequently could not provide comprehensive policy ramifications for managing the non-performing loans and ensuring banking stability in the country. This study is motivated to enrich the non-performing loans literature in the Indonesian context by filling up those existing gaps in two ways.

First, the study examines the determinants of non-performing loans of the largest micro-lender in Indonesia, the Indonesian People Bank (*Bank Rakyat Indonesia - BRI*) that has been inexistence in the literature. In Indonesia, BRI is a long established bank since December 18, 1968 mandated by the Law No. 21 Year 1968 has spreading its offices to remote areas of the villages across 34 provinces nationwide. BRI consistently focuses on providing loans to Small- and Medium- Enterprises (SMEs) segment using more than 10,000 integrated online work units throughout Indonesia to make the bank as the largest micro-banking institution not only in Indonesia, but also in the world (BRI Annual Financial Report 2014). The amount of granted loans by the BRI to the SMEs has increased from IDR236.9 billion in 2011 to IDR455.7 billion in 2014. Of its total loans, 70.25% was allocated to the SMEs. This made up 13.88% of the BRI's market share to the national banking industry with 1.69% non-performing loans. Thus, studying the total loans and non-performing loans of the BRI in Indonesia would enrich the literature on this topic from the perspective of the largest micro-lender in the world.

Second, the study utilizes combination of the latest Autoregressive Distributed Lag (ARDL) approach to cointegration and standardized Vector Error Correction model (VECM) thus enables us to empirically investigate both bivariate and multivariate dynamic causalities and both short- and long-run relationships between the non-performing loans and their determinants. These approaches are believed to provide more comprehensive findings of dynamic interaction between the non-performing loans and their determinants that subsequently could be used as crucial reference for policy ramifications.

Against the above backdrop, this study is aimed at empirically exploring the short- and long-term relationships between the lending interest rate, total loans, total deposits, and non-performing loans of the largest micro-lender in Indonesia. It also attempts to investigate both bivariate and multivariate causalities among these variables. The findings of the study are intuitively expected to shed some lights for the banking institutions and policy-makers in designing credit policy on how to manage the non-performing loans by focusing on their determinants.

The rest of the paper is structured as follows. Section 2 briefly presents the review of selected relevant previous studies on the non-performing loans. Section 3 describes the empirical framework, whereas Section 4 discusses the findings and their implications. Finally, Section 5 concludes the paper.

1. Selected literature review

Akin to other developing countries, banking sector acts as the backbone of national economy of Indonesia (Setiawan and Do 2013). Bank is a financial institution that collects funds from the community in the form of deposits and redeployment in the form of loans for the purpose of improving the lives of many people. One of the banking institutions that channel loans to the public is *Bank Rakyat Indonesia* (hereinafter called as BRI). As a long established bank since December 18, 1968 based on the Law No. 21 Year 1968, BRI has spread its banking units to remote corners of the villages through more than 10,000 integrated online work units across the country, making it as the largest micro-lender not only in Indonesia, but it also in the world (BRI Annual Financial Report 2017).

Currently, BRI has 10,396 working units and 3 offshore branches, which are all connected in real time online. With the support of experience and competent personnel and innovative products and services, BRI has been able to record the achievement for 10 consecutive years as the bank with the largest profit. With a concentration in micro-financing, BRI can take high yields and became the most profitable bank in Indonesia over the period 2009-

2013 (Pakpahan 2014). To date, BRI has recorded returns of more than 100% of capital acquired since 2009 (BRI Annual Financial Report 2017).

An increased trend of loans extended by BRI during the last decade is influenced by internal and external factors of the bank. Bank internal factors include its ability to raise funds from the public and the soundness of banks, lending interest rates (Suarni *et al.* 2014, Benes and Kumhoff 2015; and Khan and Sattar 2014), third party funds, the business prospects of the debtor, the condition of the banking itself, such as capital or capital adequacy ratio, loan to deposit ratio (Warjiyo 2017) and the amount of non-performing loans (Ghost 2015, and Haneff *et al.* 2012). Meanwhile, the external factors affecting loans extended by the bank to public include macroeconomic conditions such as inflation rate (Sun'an and Kaluge 2007) and interest rate, government regulations, and political situation (Ofori-Abebrese *et al.* 2016).

According to the Banking Act No. 10 (1998), the amount of loans' distribution depends on the amount of third party funds that can be collected by banks. However, in practice not all funds collected from the community are channelled entirely to the community due to difficulties faced by the borrowers to repay their loans to the bank that subsequently cause the non-performing loans to increase. This indicates that non-performing loan is one of the crucial determinants of the banks' loan and vice versa.

In general, non-performing loans have been studied from macroeconomic aspect (Berge and Boye 2007, and Louzis *et al.* 2012) and bank-specific characteristic aspect (Berger and DeYoung 1997, Podpiera and Weill 2008). From the macroeconomic standpoint, Rinaldi and Sanchis-Arellano (2006) empirically studied household non-performing loans in the European countries and found that unemployment, disposable income, and monetary variables have significant impacts on non-performing loans. In Finland, Berge and Boye (2007) documented evidence that non-performing loans were highly responsive to the unemployment and real interest rates during the period 1993–2005. Ghosh (2015) investigated the non-performing loans of commercial banks and savings institutions in 50 districts of the U.S and found that real income has a negative impact on the non-performing loans, while inflation, unemployment rate, and the U.S public debt have a positive impact on the non-performing loans.

Dash and Kabra (2010) and Rajan and Dhal (2003) investigated macroeconomic determinants of non-performing loans in India over the period 1998-2009 and documented that the real income and interest rates affected the non-performing loans of commercial banks. On Hong Kong, Shu (2002) found that the non-performing loans were negatively impacted by inflation rate and real income, but directly affected by interest rates for the period 1995–2002. Karim *et al.* (2010) investigated the relationship between non-performing loans and bank efficiency in Malaysia and Singapore and found that cost inefficiency positively affected the non-performing loans. On Indonesia, Firmansyah (2015) investigated the determinants of non-performing loans of *Bank Perkreditan Rakyat Syariah* (Islamic People Credit Bank) over the period 2010-2012 (36 observations) using the Ordinary Least Square (OLS)-multiple regression. The study found no significant effects of banks' size and efficiency on the non-performing loan, but documented negative influences of gross domestic product and inflation on the non-performing loan, and positive effect of banks' liquidity on the non-performing loan. Setiawan and Putri (2013) and Havidz and Setiawan (2015) investigated the effect of bank efficiency on the non-performing financing of Islamic banks in Indonesia using the OLS multiple regression and bivariate causality over periods 2007-2012 and 2008-2014, respectively. They found that the non-performing financing is negatively associated with banks' efficiency.

On the other hand, Berger and DeYoung (1997) and Podpiera and Weill (2008) explored the effects of bank-specific characteristics on their non-performing loans. Berger and DeYoung (1997) found that the non-performing loans of the US commercial banks were affected by the banks' inefficiency and capital inadequacy over the period 1985 to 1994. In a similar vein, Podpiera and Weill (2008) also documented that cost inefficiency has negatively impacted future non-performing loans in the Czech banking industry over the period 1994 to 2005. Benard (2011) studied of the effect of interest rates on loan repayments and found that interest rates have a direct effect on the ability of consumers to repay loans. As it is the price for money, low interest rates provide incentives for public to borrow more because they find it relatively easy to pay off their debts. When interest rates are high, people are reluctant to borrow because loan payments become costly and even they find it difficult to meet existing loan payments, especially if interest rates increase faster than the increase in their income. This indicates that higher interest rates cause the non-performing loans to increase.

Furthermore, in their study, Sun'an and Kaluge (2007) found that total credit, third party funds (deposits), and lending rate have effects on the non-performing loans in the Indonesian banking sector. Third party funds and loan interest rate have positive effect on the credit distribution, indicating that higher amount of the third party funds caused the banks to increase their credit distribution that subsequently lead to higher potentiality of non-performing loans due to higher level of interest rate. A higher level of interest rates provides an incentive for the banks to distribute more loans, but difficulty for the borrowers to meet their loan repayment.

Study on the determinants of non-performing loans was also conducted by Ghost (2015) with a sample of all commercial banks and savings institutions in 50 districts of the US and Columbia over the period 1984-2013 using the dynamic Generalized Method of Moments (GMM). The study documented that, with the exception of profitability, other variables of large capitalization, liquidity risk, poor credit quality, greater cost inefficiency, and bigger size of the banking industry positively and significantly affected the non-performing loans. An increase in the non-performing loans in Pakistan is also caused by lacking of appropriate mechanism for risk management (Haneff *et al.* 2012).

Referring to the above reviewed studies, we notice that studies on the non-performing loans have focused more on the banking industry in the advanced economies than the developing countries, including Indonesia. None of the study has investigated the non-performing loans of the largest micro-lender in Indonesia and the world, namely the People Bank of Indonesia (*Bank Rakyat Indonesia – BRI*) using standardized empirical models, while it has provided major of its loans to the SMEs across the corners of 83.184 villages in the country. Thus, this motivates this study to empirically explore the dynamic of non-performing loans of the largest micro-lender in Indonesia using a combination of the latest approach to cointegration, the Autoregressive Lag Distributed (ARDL) and the Vector Error Correction Model (VECM).

2. Empirical framework

2.1. Data

Four bank-characteristic variables comprise total loans (TL), total deposits (TD), lending interest rate (LIR), and non-performing loans (NPL) are analyzed in this study. Both short- and long-run relationships between the NPL and TL, TD, and LIR are investigated. In addition, the bivariate and multivariate dynamic causalities among variables are also explored. For these purposes, this study uses a quarterly data over the period 2003-2015 sourced from the reports of *Bank Rakyat Indonesia* (BRI) and the Central Bank of Indonesia (Bank Indonesia). The data for TL, TD, and NPL are sourced from the report of BRI, while the LIR is sourced from the report of Bank Indonesia.

In this study, the TL is measured by the total of loans distributed by the BRI to the public in the Indonesian Rupiah (IDR), TD is measured by total third party funds deposited in the BRI in the IDR, LIR is the lending rate charged by BRI to the borrowers in percentage, and NPL is measured by the ratio of bad loans to the TL granted to the public. With the exception of the LIR and NPL, all other variables are estimated in natural logarithmic form.

2.2. Empirical models

To empirically investigate the interactions between total loans, total deposits, lending interest rate, non-performing loans, the following empirical model is estimated:

$$NPL_t = \alpha_0 + \beta_1 TL + \beta_2 TD + \beta_3 LIR + \varepsilon_t \tag{1}$$

where: TL is the total loans, TD is the total deposits, LIR is the lending interest rate, NPL is the non-performing loans, and ε is the error terms.

In estimating the empirical proposed model, the following steps are taken. First, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are conducted to ascertain the stationary of data. Second, the cointegration test is performed to explore a long-run equilibrium between the investigated variables using the latest ARDL approach to cointegration. There are various advantages of using ARDL as it can estimate variables of different levels of integration (Pesaran and Pesaran 1997, Bahmani-Oskooee and Ng 2002, Kasim and Majid 2008, Yusof and Majid 2008, Karim and Majid 2009 and Rahman *et al.* 2009) and it avoids problems of non-stationary data (Laurenceson and Chai 2003, Yusof and Majid 2007, Majid 2007, Majid 2008, Majid and Yusof 2009, Majid and Kassim 2010 and Yusof *et al.* 2011) by incorporating an adequate number of lags in the process of data generation of estimated model (Laurenceson and Chai 2003, Yusof *et al.* 2009, Karim and Majid 2010, Majid and Hasin 2014, Majid and Kassim 2015, and Majid 2016). Thus, the ARLD produces consistent and unbiased estimated coefficients for a short study period of cointegration analysis. Since period of the study covers a quarterly data for 13-year from 2000 to 2015, thus this model is very suitable for this study.

In this step, Equation 1 is then estimated in the form of the ARDL approach as follows:

$$\Delta NPL_t = \alpha_{01} + \sum_{i=1}^{n} \alpha_{11} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{12} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{13} \Delta(TD_{t-i}) + \sum_{i=1}^{n} \alpha_{14} \Delta(LIR_{t-i}) +$$
$$\beta_{11} NPL_{t-1} + \beta_{12} TL_{t-1} + \beta_{13} TD_{t-1} + \beta_{14} LIR_{t-1} + \varepsilon_{1t} \tag{2}$$

$$\Delta TL_t = \alpha_{02} + \sum_{i=1}^{n} \alpha_{21} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{22} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{23} \Delta(TD_{t-i}) + \sum_{i=1}^{n} \alpha_{24} \Delta(LIR_{t-i}) +$$
$$\beta_{21} TL_{t-1} + \beta_{22} NPL_{t-1} + \beta_{23} TD_{t-1} + \beta_{24} LIR_{t-1} + \varepsilon_{2t} \tag{3}$$

$$\Delta TD_t = \alpha_{03} + \sum_{i=1}^{n} \alpha_{31} \Delta(TD_{t-i}) + \sum_{i=1}^{n} \alpha_{32} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{33} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{34} \Delta(LIR_{t-i}) +$$
$$\beta_{31} TD_{t-1} + \beta_{32} TD_{t-1} + \beta_{33} TL_{t-1} + \beta_{34} LIR_{t-1} + \varepsilon_{3t} \tag{4}$$

$$\Delta LIR_t = \alpha_{04} + \sum_{i=1}^{n} \alpha_{41} \Delta(LIR_{t-i}) + \sum_{i=1}^{n} \alpha_{42} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{43} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{44} \Delta(TD_{t-i}) +$$
$$\beta_{41} LIR_{t-1} + \beta_{42} NPL_{t-1} + \beta_{43} TL_{t-1} + \beta_{44} TD_{t-1} + \varepsilon_{4t} \tag{5}$$

where: TL is the total loans, TD is the total deposits, LIR is the lending interest rate, NPL is the non-performing loans, α_1 to α_4 are the short-term coefficients, β_1 to β_4 are the long-term coefficients, *t* is the year, *i* is the order lag, and ε is the error term. The null hypothesis of H_0: $\beta_{i1} = \beta_{i2} = \beta_{i3} = \beta_{i4} = 0$ (non-cointegrated) is tested against its alternative hypothesis of H_1: $\beta_{i1} \neq \beta_{i2} \neq \beta_{i3} \neq \beta_{i4} \neq 0$ (cointegrated).

Third, after testing cointegration in the earlier step, the bivariate Granger causality is estimated using the following equations for the purpose of detecting the direction of bivariate causality between variables:

$$\Delta NPL_t = \varphi + \delta_1 \Delta NPL_{t-1} + \cdots + \delta_p \Delta NPL_{t-p} + \lambda_1 \Delta TL_{t-1} + \cdots + \lambda_q \Delta TL_{t-q} + \varepsilon_{1t} \tag{6}$$

$$\Delta NPL_t = \varphi + \delta_1 \Delta NPL_{t-1} + \cdots + \delta_p \Delta NPL_{t-p} + \lambda_1 \Delta TD_{t-1} + \cdots + \lambda_q \Delta TD_{t-q} + \varepsilon_{2t} \tag{7}$$

$$\Delta NPL_t = \varphi + \delta_1 \Delta NPL_{t-1} + \cdots + \delta_p \Delta NPL_{t-p} + \lambda_1 \Delta LIR_{t-1} + \cdots + \lambda_q \Delta LIR_{t-q} + \varepsilon_{3t} \tag{8}$$

To test for the bivariate causality, the null hypothesis of H_0: $\lambda_1 = ... = \lambda_p = 0$ is tested against the alternative hypothesis of H_1: $\lambda_1 \neq .... \neq \lambda_p \neq 0$. The rejection of null hypothesis indicates that the independent variables Granger causes the dependent variable. Four forms of directions of causality could be identified from this testing, that is a unidirectional causality from the variable *y* to *x* and vice versa, a bidirectional Granger causality between the variables x and y, and non-causality between the variables *x* and *y*.

Finally, to examine the short- and long-run relationships among variables and their multivariate dynamic causalities using the Wald test, the following equations are estimated:

$$\Delta NPL_t = \alpha_{01} + \sum_{i=1}^{n} \alpha_{11} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{12} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{13} \Delta(TD_{t-i}) + \sum_{i=1}^{n} \alpha_{14} \Delta(LIR_{t-i}) +$$
$$\alpha_{15} ECT_{t-1} + \varepsilon_{1t} \tag{9}$$

$$\Delta TL_t = \alpha_{02} + \sum_{i=1}^{n} \alpha_{21} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{22} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{23} \Delta(TD_{t-i}) + \sum_{i=1}^{n} \alpha_{24} \Delta(LIR_{t-i}) +$$
$$\alpha_{21} ECT_{t-1} + \varepsilon_{2t} \tag{10}$$

$$\Delta TD_t = \alpha_{03} + \sum_{i=1}^{n} \alpha_{31} \Delta(TD_{t-i}) + \sum_{i=1}^{n} \alpha_{32} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{33} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{34} \Delta(LIR_{t-i}) +$$
$$\alpha_{31} ECT_{t-1} + \varepsilon_{3t} \tag{11}$$

$$\Delta LIR_t = \alpha_{04} + \sum_{i=1}^{n} \alpha_{41} \Delta(LIR_{t-i}) + \sum_{i=1}^{n} \alpha_{42} \Delta(NPL_{t-i}) + \sum_{i=1}^{n} \alpha_{43} \Delta(TL_{t-i}) + \sum_{i=1}^{n} \alpha_{44} \Delta(TD_{t-i}) +$$
$$\alpha_{41} ECT_{t-1} + \varepsilon_{4t} \tag{12}$$

where: ECT is error correction term showing the speed of adjustment of short-run disequilibrium is moving towards a long-run equilibrium.

3. Results and discussion

3.1. Brief overview of the Bank Rakyat Indonesia

Bank Rakyat Indonesia (BRI) is one of the first and the largest state-owned banks in Indonesia. Initially, BRI was established on December 16, 1895 in Purwokerto, Central Java. The bank provides loans mainly to the Small-, and Medium-Enterprises (SMEs). Due to its success to provide micro-loans amounting to IDR 6,419.8 billion, the bank received award from the former Indonesian President, Susilo Bambang Yudhoyono on September 27, 2010. Today, BRI has a working unit totalling 4,447 offices, consisting of 1 BRI Head Office in Jakarta, 12 Regional Offices, 12 Inspection Offices, 170 Domestic Branches, 145 Sub-Branch Offices, 1 Special Branch Office, 1 New York Agency, 1 Cayman Island Agency, 1 Hong Kong Representative Office, 40 Cash Offices, 6 Car Bank Offices, 193 P. POINT, 3,705 BRI unit, and 357 Village Service Post.

BRI offers three main products, namely:
- Fund Collection consisting of: Deposit; Current Account; Savings (*i.e.*, BritAma, Simpedes TKI, Hajj Savings, BritAma Dollar and BritAma Junior;
- Loan consists of Micro-credit, retail loan (*i.e.*, Credit Collateral Cash, Express Credit, Investment Loan, Working Capital Loan, Export Credit, Import Credit, Construction Credit, BRIGuna Credit, Franchise Credit, Petrol station Credit, Warehouse Credit, Gas Station Supply credit, Coal Credit, Partner Credit, Alfamart Franchise Credit, Warehouse Ownership Credit, and Pharmacy Franchise Credit), Secondary

Loans (*i.e.*, Agribusiness Credit and General Business Credit), Program Loans, Development of Vegetable Energy and Plantation Revitalization credit, Food and Energy credit), and Business Credit,

▪ Business Services (*i.e.*, Guarantee, Clearing, Remittance, and Domestic Documented Credit Letters), Financial Services (Bill Payment, Deposit Receipts, Online Transactions, and Real-Time Gross Settlement), Tuition Online Payment for college students, E-Banking Services (*i.e.*, ATM, SMS Banking, Phone Banking, and e-Banking), Treasury (*i.e.*, Foreign Exchange, Money Market, Fixed Income and Derivatives), International Services (*i.e.*, BRIfast Remittance and Correspondent Bank Service).

Table 1 reports descriptive statistics of the investigated variables. In the first quarter of 2003, the bank recorded the lowest growth of total loans (TL) and total deposits (TD) by 17.50% and 18.06% respectively. Meanwhile, the highest growth of TL and TD is recorded in the last quarter of 2015 by 20.15% and 20.32% respectively. Over the study period, the bank recorded growth rate of TL and TD by 18.92% and 19.17%, respectively. In term of loan interest rate (LIR), the lowest rate of 15.29% recorded in the last quarter of 2013, while the highest rate of 25.03% is documented in the first quarter of 2003. On average, the LIR of the bank was 19.34%. Finally, the lowest ratio of non-performing loans (NPLs) is recorded in the last quarter of 2013 by 1.55%, while the highest ratio of NPLs of 3.75% is documented in the first quarter of 2003. On the average, the bank recorded NPLs of 3.75% during the period 2003-2015.

Table 1. Descriptive statistics

Variable	TL	LIR	TD	NPL
Mean	18.924	19.335	19.171	3.748
Median	19.054	19.780	19.206	3.580
Maximum	20.151	25.030	20.321	6.910
Minimum	17.496	15.290	18.056	1.550
Standard Deviation	0.813	2.860	0.732	1.577
Skewness	-0.151	0.348	-0.040	0.361
Probability	0.140	0.184	0.129	0.173

3.2. Findings from Stationary Test

Table 2 reports the results of stationarity of variables using the Phillips-Peron (PP) test. All variables were found to be non-stationarity at the level, I(0) as indicated by the higher PP values that their MacKinnon t-critical value. Since the variables were non-stationary at the level, it is necessary to conduct further stationary testing at the first difference level. All variables were found to become stationary at the first difference at the 1% significance level. In short, it can be concluded that all variables were stationary at the first difference or integrated in order I(I). This finding fulfils the necessary condition for the study to conduct cointegration test in the next step.

Table 2. Results of Test of Stationarity

Variable	Level, I(0)		Remark	1st Difference, I(1)		Remark
	PP	t-value		PP	t-value	
TL	-1.720	-3.565	Non-stationary	-8.141***	-3.539	Stationary
LIR	-2.164	-2.597	Non-stationary	-9.187***	-3.568	Stationary
TD	-0.025	-2.597	Non-stationary	-22.186***	-3.568	Stationary
NPL	-1.787	-2.597	Non-stationary	-11.568***	-3.521	Stationary

Note: *** indicates significant at the 1% level.

3.3. Findings from Cointegration Test

Having ensured that the variables are found to be stationary using the Phillips-Peron (PP), the cointegration test is now conducted using the ARDL approach. This test is aimed to identify the existence of long-term relationship between the variables. Table reports the finding from the cointegration test.

Table 3. Findings from the ARDL Cointegration Test

Dependent/Independent	Lag-length	F-statistics	Remark
NPL/TD, TL, LIR	1,0,0,2	37,864***	Cointegrated
TD/TL,LIR,NPL	1,0,0,0	2,100	Non-cointegrated
TL/TD,LIR,NPL	2,0,0,1	15,274***	Cointegrated
LIR/TD,TL,NPL	2,2,0,1	7,067***	Cointegrated

Note: *** indicates significant at the 1% level. The bounds' critical value was based on the study by Narayan (2005) for the Case II (restricted intercept and no trend, with 3 number of parameter (k). Values ranging from 4.94 to 6.02; 3.47 to 4.33; and 2.84 to 3.62 indicate significance at the 1%, 5%, and 10% levels, respectively.

As observed from Table 3, with the exception of ARDL Model (1,0,0,0), where the dependent variable of loans interest rate (LIR) is regressed on the dependent variables of total loans (TL), total deposits (TD), and non-performing loans, all other ARDL models are found to be cointegrated at the 1% level of significance. This indicates that the TD, TL, and LIR are found to have long-term equilibrium with the NPL. A change in the NPL could be predicted using other variables in the model as the variables move together in the long-run.

3.4. Long-Run Relationship based on the ARDL Model

In this section, the findings of long-run relationship between the variables are reported in Table 4 based on the ARDL model. As observed from the table, the study found that the non-performing loans were positively affected by the total loans and total deposits at the 1% level of significance, but it was negatively affected by the lending interest rate. These findings indicate that the higher the loans distributed to the SMEs, the higher the probability of the loans to be unpaid. This could be due to the flexibility of loan's requirements set by the banks.

The support of government to promote the SMEs in the country required the BRI as the state-owned banks to provide as much as possible the loans to them. Thus, granting the loans to the SMEs that were financially weak and poorly managed led to higher level of non-performing loans. This finding further implies that prudent credit assessment is extremely needed as it reduces the number of loans granted to the SMEs to become bad loans. Additionally, the government should not only support the SMEs, but it also provides the banks the SMEs' loan-incentive scheme such as tax-incentive.

Table 4. Long-run relationship between NPL, TD, TL, and LIR - ARDL (1,0,0,2)

Variable	Lag-Length	t-statistics	Probability
Constant	1.237	3.485	0.001
TD	0.091*	1.312	0.197
TL	0.215***	3.792	0.000
LIR	-0.030***	-3,224	0.002
R^2 = 0.395; R^2-Adj = 0.311; D-W = 2.176			

Note: *** indicates significant at the 1% level.

Furthermore, the higher level of bank's deposits sourced from the third party funds motivated the banks to distribute more loans to the SMEs. This, in turns, leads to higher probability of bad loans. This could be the reasons of why the total deposits positively related to the non-performing loans. In addition, this is worsened by the higher level of bank's lending interest rate. Since the study documented a negative relationship between the lending interest rate and non-performing loans, this confirmed that the higher level of lending interest rate caused the non-performing loans to increase. This finding is in line with the previous studies by Asantey and Tengey (2014), Haneff *et al.* (2012), Pratama (2010), and Zhang *et al.* (2015) who found that interest rate as the disincentive and detrimental for the SMEs to repay back their loans. If the government intend to further promote the SMEs, thus the lower level of interest rate should be imposed through robust expansionary monetary policy.

3.5. Bivariate Granger Causality

Having discussed the long-run relationship between the non-performing loans and their determinants, the findings from bivariate Granger causality between the variables is now reported in Table 5. Referring to Table 5, the study found bidirectional causalities between the non-performing loans and total loans and between the non-performing loans and lending interest rate at least at the 5% level of significance. Meanwhile, the study found a unidirectional causality running from the total deposits to non-performing loans at the 5% level of significance. These findings are very much in harmony with our findings of long-run relationship between non-performing loans and their determinants. Higher total loans allocated to SMEs caused the higher probability on non-performing loans; it consequently caused the bank to impose stringent SMEs' credit policy by increasing lending interest rate to reduce non-performing loans.

Table 5. The Bivariate Granger Causality

Causal Direction	F-Statistics	Probability	Remark
NPL → TL	4.369**	0.018	Bidirectional
TL → NPL	7.483***	0.002	
NPL → LIR	5.715**	0.023	Bidirectional
LIR → NPL	6.358***	0.007	
NPL # TD	0.458	0.636	Unidirectional
TD → NPL	5.081**	0.819	

Note: ***and ** indicate significant at the 1% and 5% levels, respectively.

Moreover, the study also documented a unidirectional causality running from the total deposits to the non-performing loans. As the bank gathered more funds from the third party, thus more loans could be provided for the public and SMEs that consequently led to higher level of non-performing loans. This finding implies that a stringent credit policy is needed by the bank if the bank intended to lower the non-performing loans.

3.6. Multivariate Causality

Having fulfilled the necessary condition of stationarity of variables and sufficient condition of cointegration among the variables, the study proceeded to estimate both short- and long-run relationships using the VECM. From this model, the causalities between the variables within the multivariate framework could be detected. The findings of the VECM are reported in Table 6.

Table 6. Multivariate Causality based on the VECM

Dependent Variable	Independent variable				
	$\Sigma\Delta NPL$	$\Sigma\Delta TD$	$\Sigma\Delta TL$	$\Sigma\Delta LIR$	ECT_{t-1}
ΔNPL	-	0.981** (0.026)	5.686*** (0.007)	3.982*** (0.000)	-0.343*** (0.000)
ΔTD	-0.889 (0.474)	-	0.020 (0.434)	2.008** (0.019)	-0.371*** (0.000)
ΔTL	-2.409** (0.042)	3.792*** (0.000)	-	-2.295** (0.020)	-0.236*** (0.000)
ΔLIR	-3.929*** (0.000)	-4.195*** (0.000)	-1.730* (0.090)	-	-0.261*** (0.008)

Notes: *** and ** indicate the 1% and 5% levels of significance, respectively. The figures in the bracket (.) are the value of probability.

Table 6 showed that the non-performing loans caused the bank to lower their total loans distribution and reduce its lending interest rate. On the contrary, the higher level of total loans granted to the SMEs at the higher level of lending interest rate caused the non-performing loans to increase. However, a unidirectional causality is found to be running from the total deposits to the non-performing loans. Higher level of deposits caused the bank to allocate more loans to the public and this in turn caused the non-performing loans to increase. A direct bidirectional short-run multivariate causality between non-performing loans and total loans and between non-performing loans and lending interest rate further confirmed the important for the bank to impose prudent credit policy with the lower lending interest rate if the bank targeted to have lower level of non-performing loans. Lowering lending rate would enable the SMEs to borrow more and face no difficulty in returning their borrowings.

Next, the study found that higher level of the total deposits caused the total loans to increase and lending interest rate to decline. As the bank having more funds available to be allocated the SMEs, the lending interest rate should be lowered. When the lending rate was higher, the SMEs reduced their borrowings in order to avoid their difficulty to repay back their loans to the bank, thus caused the funds of the bank to be unoccupied. A higher level of total loans because the non-performing loans to increase and the lending rate to lower, while the total loans has no causality with the total deposits. These findings suggested the important of the banks to diversify their credit disbursement with lower interest rate in order to ensure lower level of their bad loans.

Finally, in the last column of Table 6, the estimated error correction terms (ECTs) is presented. All the estimated coefficients of ECT were negative and significance at the 1% level, with the coefficients ranging from -0,261 to -0.371, denoting that the burdens of short-run adjustments to long-term equilibrium relationships were borne by all variables. Specifically, the significant estimated coefficients of the error correction terms of the non-performing loans, suggest that the last period of disequilibrium in this variables was corrected from 34.3% on the following quarter. In other words, any short-run disequilibrium among the variables it took about three quarters for the variables to move towards long-run equilibrium.

These findings further denote that when there was a divergence from long-run relationships in the non-performing loans as measured by the ECT, it was primarily due to the changes in the total loans, total deposits and lending interest rate that adjust to clear the disequilibrium. At this point, however, it is important to note that the findings of cointegration among the variables simply represented their long-run relationships and implied the existence of multivariate causalities among the variables, as discussed earlier.

Last but not least, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMQ) tests for stability of the selected ARDL models are illustrated in the following Figure 1. As observed from the figure, the statistical plots of CUSUM and CUSUMQ remained within the 5% of level of

significance of critical bounds. This implies that all ECTs were stable both in short- and long-run interactions between non-performing loans, total loans, total deposits, and lending interest rate over the period 2003-2015 in Indonesia.

Figure 1. Plots of the CUSUM and CUSUMQ
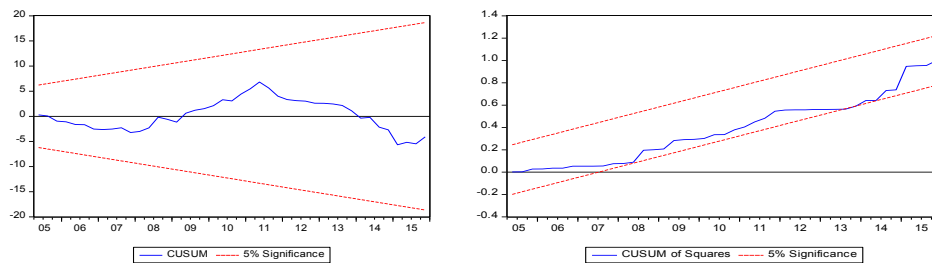
Conclusion

This study empirically explored the short-, long-term relationships, bivariate, and multivariate causalities between lending interest rate, deposits, and non-performing loans of the largest micro-lender in Indonesia over the period 2003-2015. Using the Autoregressive Distributed Lag (ARDL) and a Vector Error Correction Model (VECM) approaches, the study documented a cointegrated among variables, denoting a long-run co-movement among the variables. The non-performing loans of the banks were positively affected by their total loans and total deposits, but negatively impacted by the lending interest rate. As for the causalities, the total loans and lending interest rate bidirectionally Granger caused the non-performing loans, but unidirectionally Granger caused by the total deposits. These findings implied that to enhance the capital structure of the SMEs in the country through the distribution of small-scale loans by the largest micro-financing banks in Indonesia; the bank should design a proper policy for accumulating more deposits and well-managed non-performing loans. Additionally, these findings suggested the important of the banks to impose prudent credit policy and diversify their credit disbursement with lower interest rate in order to ensure lower level of their bad loans.

The findings of this study have offered empirical findings on the dynamics of non-performing loans from the perspective of the largest micro-lender from Indonesia, a potential area that deserve more attention for further studies on the topic of credit management. As this study merely explored the effects of bank's specific characteristics on the non-performing loans, future studies might focus on the potential influences of macroeconomic determinants or combined both internal and external factors on the non-performing loans. Additionally, the future researches should consider exploring non-performing loans of the banks in a wider geographical area to arrive at more comprehensive empirical findings.

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Subsistence Minimum as a Criterion of Poverty. Measurement, Facts and Politics

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Abstract:

The article is devoted to the study of the phenomenon of poverty in modern Russia, which is one of the key social indicators of the achieved level of the country's well-being and its national economic security. The idea has been put forward as a working scientific hypothesis that the poverty level of a particular country depends not only on the factors of its social and economic development, but also on the accepted methodology for its definition and measurement. In Russia, the official approach to measuring poverty is based on the absolute concept of poverty, according to which the poor are individuals and households with per capita incomes below the cost of the subsistence minimum (the minimum consumer basket). In accordance with the integrative approach, defined as the methodological framework of the study, and the system of subsistence level indicators, the level and depth of poverty in the RF in 1992-2017 was assessed. Clustering of territorial entities of the Russian Federation has been carried out and the ranks of the latter have been established, depending on the ratio of per capita money income to the subsistence minimum, indicating regional asymmetry and interregional differentiation of the subsistence minimum (one of the significant poverty factors) with a significant degree of "deprivations" in the society. The author's conceptual approach to the state economic policy intervention is substantiated in order to promote the real reduction in the (absolute and deprivation) poverty level in the country.

Keywords: poverty, subsistence minimum, per capita money income, low income, inclusive society, social policy.

JEL Classification: E24, D63, I31, I32, J31

Introduction

Poverty is a social problem inherent in all the countries of the world without exception, although this phenomenon is understood and manifested there in different ways. In compliance with the most popular poverty indicator in the global economy – the proportion of the population with incomes below the national poverty line, according to the CIA data, a traditionally high poverty level is noted in the countries of Africa and Central Asia; the poverty level not exceeding the maximum allowable value (below 10%) is registered in China, certain countries of Western Europe (France, Ireland, Switzerland, Estonia, Lithuania); the poverty level ranging from 10 to 20% is stated in the USA, Western and Eastern Europe, Kazakhstan, Canada, Chile, Australia, Russia and other countries. The situation with the poverty is complicated due to the growing socioeconomic inequality – one of the main problems of the 21st century not only for the so-called peripheral, but also for developed economies. According to the studies of Credit Suisse experts, currently 1% of the world's population possesses half of its total wealth (as reported by the expert.ru website). In Russia, the richest 10% of Russians own 87% of all the country's wealth. This is significantly higher than the situation in all other large countries [for reference: this indicator is 76% for the United States, for example, and 66% for China (Global Wealth Report 2015. Credit Suisse Research Institute).

1. Research background

The awareness of the need to move to a new paradigm is a distinctive feature of modern economic science, this paradigm being based rather on the persons themselves in all the abundance of their abilities and needs than on the material wealth (Brown and Lauder 2000, Maslova 2008, Ilyin 2017). In this sense, the economic person is replaced by a social person. This means that society removes the previous dominant function from him – to be a factor of production (Grigoriev 2014, Wallerstein *et al.* 2013).

According to Karl Marx, a person comes out of the production process, and stands outside it (Marx and Engels, 1979). From this perspective, we are talking about the transition from a "man in economics" to "economics for man." In such an economy, the dominant role is played not by private but by social (cumulative) capital, predetermining its functioning in accordance with the principles of humanistic development and an inclusive society where all social goods are available for every person, including education, health care, labor qualification, high-speed transport, an environmentally friendly habitat" (Gubanov 2011, 2014). It should be noted that the idea of an inclusive society is being actively tested currently by the leading countries of the European Union.

Against this background, the poverty level of the population is fairly included in the list of social indicators reflecting the effectiveness of the current state policy towards groups of households with low economic activity potential, the degree of deprivation and social exclusion of individuals and/or groups of persons from a certain set of goods, services and socially significant needs, the absence of which in any country is currently considered inadmissible (Sachs 2011). Despite numerous studies devoted to various aspects of poverty, this problem remains the subject of acute scientific and political discussions in both world and Russian science. Its main objects are still the definition of "poverty", as well as reliable methods and indicators of its measurement.

It should be noted that the assessment of the poverty level is never completely objective; as a rule, this assessment is determined by the standard set by the state, and also by the purpose of measurement (scientific, statistical or political). For this reason, a wide range of the poverty level estimates, both official and those based on the calculations of independent experts, is not surprising.

In all the diversity of indicators used in economic science and practice to characterize poverty, in opinion of the authors of this article, the so-called combined indicators that reflect both incomes and consumption (expenditures) of an individual and/or households are of the greatest interest in the context outlined above. These indicators include first of all the subsistence minimum, on the basis of which the (absolute and relative) threshold poverty line is calculated. In addition, the subsistence minimum is important for understanding the role and place of social support measures of the government in the overall poverty reduction strategy.

The unreasonable increase in social and economic disparity against the background of maintaining a high number of the poor, slowing the growth of real incomes of the population is a distinctive feature of post-Soviet Russia, which is caused by the lack of coherence of priorities and tactics of economic transformations with the priorities and pace of social reforms. According to the European Social Survey (ESS), it can be assumed that in the Russian Federation the inequality is not just high, but excessive. While over 1980-1990 the Gini coefficient, which shows how much the actual distribution of total revenue deviates from its uniform distribution, increased by 0.03 (from 0.28 to 0.31), over 1990-2015 it grew by 0.23 (from 0.31 to 0.54) and significantly exceeded the threshold value of this indicator (30-40%) (Ilyin 2017). In such a situation, the so-called "poverty trap" is formed, in which people are demotivated to actively engage in economic activities and the quality of human capital is reduced, and labor productivity growth is curbed. The "poverty trap" leads to inertia and dependency, an increase in budget expenditures and a decrease in economic returns from work efforts, which hampers socioeconomic development (Stiglitz 2015, Voeikov and Anisimova 2018).

It is no coincidence that in the World Bank's World Development Report (2006), the problems of inequality and poverty were put in the spotlight of a public debate on human development and economic growth. In the Strategy of Economic Security of the Russian Federation for the period up to 2030 (approved by the Decree of the President of the Russian Federation No. 208 of May 13, 2017), the reduction of the poverty level and property inequality of the population is included in the list of basic tasks for implementing such a priority area as human potential development.

2. Literature Review

Poverty is one of the most discussed and acute scientific problems, which in different time segments were dealt with in the numerous studies of scholars from different countries.

Two approaches to this problem dominated in foreign literature of the 18th century - the first half of the 20th century: according to the first one (A. Smith, D. Ricardo, Th. Malthus, H. Spencer, P.-J. Proudhon, K. Marx, F.

Engels, E. Reclus and others), it was considered as an abnormal position of society which requires combatting; supporters of the second approach focused on the personal responsibility of the poor.

In the 1970s and 1980s, the relative concept of poverty (relative deprivation) was developed, the leading role in the creation of which was played by Townsend, P. According to this concept, poverty is a natural phenomenon in the life of society; it will exist 'all the time and everywhere', since the differentiation of welfare will exist all the time and everywhere (Townsend, 1979).

In the newest foreign literature, the works of Sachs (2011), Stiglitz (2015, 2016), Piketty (2014), Krugman (2014), Milanovic (2017) and others which contain various interpretations of the hypothetical curve of Kuznets (the formula of the "fundamental law" of Piketty, the diagnosis of "systemic stage regression" by Krugman) evolved into a cause célèbre and are actively discussed. They form a modern theoretical and methodological framework for further study of the phenomenon of large-scale poverty and pauperism, not only in peripheral, but also in developed economies.

The problem of poverty has been the subject of research by Russian scholars since the early 1990s. For example, Voronkov (1995), Bogomolova (2006) and Rimashevskaya (2005) examined the sources of inequality formation that determine the formation of poverty. In the studies of Ovcharova (2005), Kostyleva (2011), and others, the features of the contemporary profile of Russian poverty are described in sufficient detail; the analysis of the relationship between economic inequality, poverty and economic development is presented in the studies of Shevyakov and Kiruta (2009, 2011), Buzgalin, Voeikov, and Traub-Mertz (2014), Anisimova (2016, 2018), and other scholars.

The reflections suggested in this article are devoted to the assessment of poverty (low income) in modern Russia on the basis of the subsistence minimum and the indicators derived from it that are used in monitoring the standard of living of the population and in the formation of social assistance programs.

The discrepancy in reducing the poverty level in terms of income (absolute poverty) and in terms of "grievances" (deprivation poverty) existing in today's Russia suggests that this discrepancy is caused by underestimation of the subsistence minimum used by Russian Federal State Statistics Service (Rosstat) as the official main indicator of poverty, which distorts the real picture in the sphere of living standards of the population. In such a situation, it is necessary to revise the state policy in the field of poverty reduction in the country.

2. Methodology

The methodological framework of this research includes:

- *Interdisciplinary (integrative) approach,* reflecting methodological and theoretical pluralism and involving historical, sociocultural, legal and political prerequisites in the study of economic phenomena and processes (Shevelev, 1998). In the conditions of the formation of a new paradigm of economic science, such a methodological approach must first of all be based on the principles of humanistic and inclusive development (Gubanov 2015, Stiglitz *et al.* 2016). In accordance with the indicated approach, the poverty level in the country depends not only on various factors of socio-economic development, but also on the methodology for its determination and measurement.

- *Indicative analysis methods* predetermined by the theory of economic security and used to diagnose the severity of the crisis situation in the economy and the main spheres of life activity on the basis of the threshold values of economic security indicators. This means that the indicators used to measure the phenomenon of poverty in the country should be supplemented with the recommended threshold (maximum allowable) values of such indicators (Senchagov 2015).

- *Cluster analysis*, the main purpose of which is to subdivide the set of objects under investigation, characterized by cumulative features into homogeneous groups (clusters) in the corresponding sense. On the basis of this method, the territorial entities of the Russian Federation were classified and the ranks of the latter were determined, proceeding from the ratio of per capita incomes of the population and the subsistence minimum.

- *The correlation-regression analysis method* with identification and verification of the constructed econometric model by testing a statistical hypothesis according to the Fisher and Student criteria. This method was used to determine the strength and direction of the relationship between the poverty indicator and the ranks of the territorial entities of the Russian Federation in terms of the average per capita income and the subsistence minimum. The constructed model is suitable for studying and forecasting the phenomenon of poverty in a particular territory.

3. Results

As noted above, the poverty level in a particular country depends not only on factors of socio-economic development, but also on the methodology for its determination and measurement. Establishing own rules for determining and measuring poverty, each country solves the following principal methodological issues:

- establishment of a poverty line, that is, the level of available income, gross income or consumption, below which a person is considered poor (Litvinov 2006);
- definition of adequate characteristics of the living standards of households, comparison of which with the poverty line makes it possible to refer the individual and/or family to the number of the poor.

In this regard, it should be noted that in 2016, the World Bank defined the global poverty line as an income of at least USD 1.9 a day. For comparison: in the US, the poverty level in 2014 was just over USD 1,000 per month, or about USD 34 per day (Voeikov and Anisimova, 2018). In Europe poverty is determined rather by the availability of material goods (deprivation approach) than by income. Eurostat distinguishes 9 types of material benefits: the ability to eat meat (poultry, fish) at least every other day, the availability of a car, washing machine, TV set, phone, the possibility of at least a week off from home, the ability to pay unforeseen expenses (the existence of savings) the ability to maintain the necessary temperature in their homes. If at least 3 of these material goods are not available, the family is considered poor (Senchagov 2015).

For modern Russia, an official approach to poverty determination is based on the absolute concept, according to which individuals and households with incomes below the subsistence minimum are classified as poor. The subsistence minimum is a normative, expertly calculated indicator – the level of income ensuring the acquisition of a minimum acceptable consumer set of material goods and services per a person with the achieved level of welfare in the society. The amount of the subsistence minimum per capita is determined quarterly for the main socio-demographic groups of the population as a whole in Russia and in the territorial entities of the federation on the basis of the consumer basket and data of the federal executive authority on statistics referring to the level of consumer prices for them.

The volumes of consumption for specific types of food products, non-food products and services that determine the consumer basket is approved by the Federal Law "On national consumer basket for the Russian Federation" (FZ 227, 2012). It is noteworthy that the share of basic food products in the consumer basket cost of the Russian Federation is about 50% (for comparison: in Western Europe it does not exceed 20%) (Voeikov and Anisimova, 2018), and the allocated volumes of their consumption do not correspond to scientifically substantiated standards (Table 1)

Table 1. The consumption of basic food products in the consumer basket of the Russian Federation (on average per one able-bodied person a year)

Product	Approved volumes of consumption, kg	Scientifically substantiated consumption norms, kg
Bread and bakery products (bread and macaroni products in terms of flour; flour, cereals, legumes)	126.5	110.0
Potatoes	100.4	97.0
Vegetables and melons and gourds	114.6	148.0
Fresh fruits	60.0	113.0
Sugar and confectionery in terms of sugar	23.8	40.0
Meat products	56.8	82.0
Fish products	18.5	18.2
Milk and dairy products	290.0	405.0
Eggs, piece	210.0	292.0
Vegetable oil, margarine and other fats	11.9	9.0
Other products (salt, tea, spices)	4.9	

Source: compiled by the authors based on Senchagov, 2015; the RF Government Regulation of 29.01.2013 No. 54 "On the approval of methodological recommendations for determining the consumer basket for the main socio-demographic groups in the constituent entities of the Russian Federation"

As calculated per one person a day, this food basket means consumption of 300 grams of bread, 280 grams of potatoes, 300 grams of vegetables, 160 grams of fresh fruit, 800 grams of milk and dairy products, 40 grams of vegetable oil and fats, 160 grams of meat, one egg once every other day, 350 grams of fish per week.

It should be added that the transformation of the list of goods and services included in the subsistence minimum, and the difference in prices in their dynamics for its individual components resulted in essential changes

in its structure in 2000-2017; against the background of a considerable increase in prices for services, there is a significant reduction in the share of expenditure for food and non-food products.

A number of indicators used to measure poverty are based on the monetary estimates of the subsistence minimum. The share of the population with incomes below the poverty line (the subsistence minimum cost) is the simplest indicator in understanding and practical application.

The conducted analysis enables to state the fact of restoring the pre-reform level of average per capita incomes and average wages in the Russian Federation if we take into account the labor compensation fund, hidden from observation, which in 2016 amounted to 26.6% of the total fund. The growth of household incomes was positively influenced by the state policy concerning remuneration for public sector employees; monetary social transfers and minimum wages, as well as economic growth in 2000-2007. During 2000-2012 there was a stable tendency to poverty reduction in the Russian Federation, which was interrupted by the autonomous recession in 2013 (Table 2). In general, over 1992-2017 the number of population with incomes below the subsistence minimum level decreased from 33.5% to 13.2%, respectively (Figure 1); however, the real value of this indicator still exceeds its threshold (no more than 7%), adopted in the systems of economic security (Senchagov, 2015).

Table 2. The dynamics of the RF population having monetary incomes below the subsistence minimum level and of monetary income scarcity from 1992 to 2017

Year	Number of population having monetary incomes below the subsistence minimum level:		Monetary income scarcity:		The subsistence minimum level[1] RUB per month; RUB thous. before 1998
	mn people	in % of total population	RUB bn (RUB tn before 1998)	in % of total volume of household income	
1992	49.3	33.5	0.4	6.2	1.9
1993	46.1	31.3	4.3	5.4	20.6
1994	32.9	22.4	11.1	3.1	86.6
1995	36.5	24.8	34.9	3.9	264.1
1996	32.5	22.1	42.8	3.2	369.4
1997	30.5	20.8	46.2	2.8	411.2
1998	34.3	23.4	61.5	3.5	493.3
1999	41.6	28.4	141.3	4.9	907.8
2000	42.3	29.0	199.2	5.0	1,210.0
2001	40.0	27.5	238.6	4.5	1,500.0
2002	35.6	24.6	250.5	3.7	1,808.0
2003	29.3	20.3	235.3	2.6	2,112.0
2004	25.2	17.6	225.7	2.1	2,376.0
2005	25.4	17.8	288.7	2.1	3,018.0
2006	21.6	15.2	277.1	1.6	3,422.0
2007	18.8	13.3	272.1	1.3	3,847.0
2008	19.0	13.4	326.7	1.3	4,593.0
2009	18.4	13.0	354.8	1.2	5,153.0
2010	17.7	12.5	375.0	1.2	5,688.0
2011	17.9	12.7	424.1	1.2	6,369.0
2012	15.4	10.7	370.5	0.9	6,510.0
2013	15.5	10.8	417.9	0.9	7,306.0
2014	16.1	11.2	478.6	1.0	8,050.0
2015	19.5	13.3	700.5	1.3	9,701.0
2016[2]	19.5	13.3	706.8	1.3	9,828.0
2017[3]	19.3	13.2	716.6	1.3	10,088.0

Source: estimated on the basis of the data from a sample survey of household budgets and the macroeconomic indicator of household income http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/population/level/#

Note: [1] Since 2000, the methodology for calculating the subsistence minimum has been changed. Since 2005, the composition of the consumer basket for determining the subsistence minimum level has been changed. Since 2013, the procedure for calculating the subsistence minimum level has been changed; [2] The data have been clarified in connection with the clarification of a number of indicators for the calculation of money incomes and expenditures and the results of selective monitoring of incomes and participation in social programs; [3] Preliminary data.

Figure 1. The dynamics of the RF population having monetary incomes below the subsistence minimum level from 1992 to 2017, %
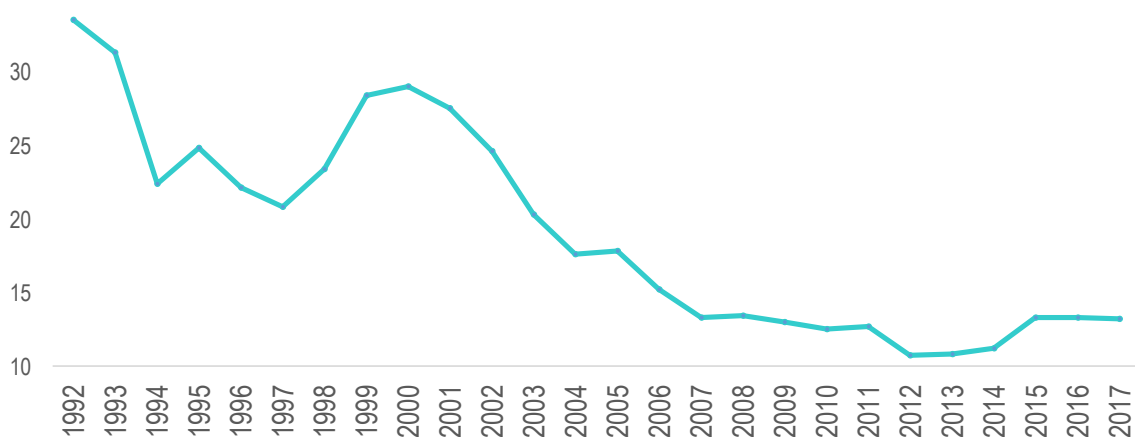
To more accurately assess the impact of the conducted social policy on the poverty incidence, the authors of this article calculated such indicator as monetary income scarcity, which characterizes the depth of poverty. As follows from the data given in Table 2, over 2000-2017 this indicator decreased by 4.6 times. Although this dynamic does not indicate a similar reduction in the depth of poverty, it emphasizes the importance of social support measures for the process of poverty reduction.

A special place among the indicators used to study the phenomenon of "poverty" is the indicator "the relationship between per capita income and subsistence minimum". It directly characterizes the standard of living in the country. In accordance with the threshold values of economic security indicators, taking into account the Russian conditions and the approach used in the Russian Federation to determine the subsistence minimum level, the optimal value of this indicator is 7-8 times or more; as for the threshold value, it is advisable to set it at the level of 5-6 times (Krivorotov *et al.* 2014). It is at this value of the indicator that a relatively decent level and quality of life of the population can be ensured in the Russian conditions. The current state (by the end of 2016) of the Russian economy is characterized by the relationship between per capita income and subsistence minimum by approximately 3 times; the value of this indicator ranges from less than 2 times (for the I cluster, which united 6 RF territorial entities); up to 3.5-4 times (for the V cluster, which includes 7 territorial entities of the Federation) (Table 3). The clusterization of constituent entities of the Russian Federation according to this criterion confirms the previously formulated hypothesis about the low level of life (low income) of the population of the Russian Federation as a whole, which complicates the solution of the problem of not only relative but absolute poverty and gives it a chronic character.

Table 3. The clusterization of constituent entities of the Russian Federation according to the value of the relationship between per capita income and subsistence minimum

Cluster/Number of the RF territorial entities in the cluster	The RF territorial entity	Per capita monetary income, RUB	Ranking of the RF territorial entity according to the value of the average per capita monetary income	Subsistence minimum level on average per capita, RUB a month	Ranking of the RF territorial entity according to the subsistence minimum level	Relationship between the average per capita monetary income and the subsistence minimum level, %
						Below 200
1/6	The Tyva Republic	13,800.3	82	9,697	39	142.3
	The Republic of Ingushetia	15,298	80	9,020	65	169.6
	The Republic of Kalmykia	14,948.2	81	8,669	71	172.4
	The Jewish Autonomous Oblast	23,386.2	54	12,497	11	187.1
	The Karachay-Cherkess Republic	17,436.3	79	9,022	64	193.3
	The Altai Republic	19,046.5	75	9,684	40	196.7

Cluster/Number of the RF territorial entities in the cluster	The RF territorial entity	Per capita monetary income, RUB	Ranking of the RF territorial entity according to the value of the average per capita monetary income	Subsistence minimum level on average per capita, RUB a month	Ranking of the RF territorial entity according to the subsistence minimum level	Relationship between the average per capita monetary income and the subsistence minimum level, %
						[200; 250)
2/30	The Kabardino-Balkar Republic	21,568.1	68	10,757	18	200.5
	The Mari El Republic	18,913.1	76	9,114	60	207.5
	The Chuvash Republic	17,834.5	78	8,567	75	208.2
	Kamchatka Krai	41,456.7	5	19,438	2	213.3
	The Republic of Karelia	26,729.8	35	12,528	10	213.4
	Transbaikal Krai	23,360.5	56	10,735	22	217.6
	Tomsk Region	23,543.1	53	10,747	19	219.1
	The Republic of Mordovia	18,073.4	77	8,157	82	221.6
	Pskov Region	23,374.9	55	10,545	24	221.7
	The Republic of Crimea	21,363.3	71	9,602	42	222.5
	Kurgan Region	21,208.3	73	9,530	45	222.5
	Irkutsk Region	22,412.1	63	10,043	30	223.2
	Kirov Region	21,519.0	69	9,508	46	226.3
	The Chechen Republic	22,337.8	64	9,754	37	229.0
	The Republic of Khakassia	21,362.6	72	9,289	55	230.0
	Saratov Region	19,869.0	74	8,607	73	230.8
	Novosibirsk Region	25,230.0	43	10,743	20	234.9
	Kemerovo Region	21,910.1	66	9,222	57	237.6
	The city of Sevastopol	24,082.8	50	10,106	27	238.3
	Volgograd Region	21,689.0	67	9,096	62	238.4
	The Republic of Sakha (Yakutia)	39,765.0	9	16,554	4	240.2
	Astrakhan Region	22,503.0	62	9,363	52	240.3
	Altai Krai	22,238.5	65	9,115	59	244.0
	Krasnoyarsk Krai	27,976.8	28	11,349	16	246.5
	Ulyanovsk Region	23,160.5	60	9,390	51	246.7
	Chelyabinsk Region	23,260.8	58	9,426	49	246.8
	Tver Region	24,686.5	47	10,000	32	246.9
	Penza Region	21,469.4	70	8,690	70	247.1
	Vologda Region	26,307.8	37	10,581	23	248.6
	The Komi Republic	30,843.2	18	12,405	13	248.6
						[250; 300)
3/28	The Republic of North Ossetia-Alania	22,640.1	61	9,032	63	250.7
	The Republic of Buryatia	24,566.1	48	9,777	36	251.3
	Novgorod Region	25,553.0	40	10,155	26	251.6
	Vladimir Region	24,002.5	52	9,467	48	253.5
	Smolensk Region	25,460.1	41	10,037	31	253.7
	Kaliningrad Region	26,683.0	36	10,510	25	253.9
	Ivanovo Region	24,959.2	45	9,816	34	254.3
	Kostroma Region	25,048.2	44	9,590	43	261.2
	Oryol Region	24,187.0	49	9,249	56	261.5
	Murmansk Region	37,898.1	10	14,230	6	266.3
	Primorsky Krai	33,468.8	14	12,408	12	269.7
	Orenburg Region	23,206.0	59	8,554	76	271.3
	Ryazan Region	24,893.2	46	9,174	58	271.3
	Stavropol Region	23,322.7	57	8,543	77	273.0
	Samara Region	26,803.4	34	9,808	35	273.3
	The Udmurt Republic	24,015.9	51	8,750	69	274.5

Cluster/Number of the RF territorial entities in the cluster	The RF territorial entity	Per capita monetary income, RUB	Ranking of the RF territorial entity according to the value of the average per capita monetary income	Subsistence minimum level on average per capita, RUB a month	Ranking of the RF territorial entity according to the subsistence minimum level	Relationship between the average per capita monetary income and the subsistence minimum level, %
	Arkhangelsk Region	33,474.6	13	12,043	14	278.0
	Magadan Region	50,146.2	3	17,957	3	279.3
	Amur Region	31,772.9	17	11,330	17	280.4
	Bryansk Region	26,867.1	33	9,536	44	281.7
	Omsk Region	25,243.2	42	8,877	67	284.4
	Rostov Region	27,725.6	30	9,667	41	286.8
	The Republic of Adygea	25,646.6	39	8,909	66	287.9
	Perm Region	28,822.7	24	9,978	33	288.9
	Khabarovsk Krai	37,801.3	11	12,954	9	291.8
	Yaroslavl Region	27,328.8	31	9,310	53	293.5
	Kaluga Region	28,721.7	26	9,739	38	294.9
	Tula Region	27,853.3	29	9,303	54	299.4
						[300; 350)
4/11	Leningrad Region	28,808.6	25	9,477	47	304.0
	Tambov Region	25,938.4	38	8,509	78	304.8
	Kursk Region	27,141.5	32	8,751	68	310.2
	Tyumen Region	41,314.3	6	13,108	8	315.2
	The Republic of Dagestan	29,649.3	22	9,405	50	315.3
	Chukotka Autonomous Okrug	65,564.2	1	20,194	1	324.7
	Krasnodar Krai	33,224.5	15	10,062	29	330.2
	The Republic of Bashkortostan	28,473.1	27	8,614	72	330.5
	Lipetsk Region	28,864.7	23	8,586	74	336.2
	Nizhny Novgorod Region	30,741.2	19	9,104	61	337.7
	Sverdlovsk Region	35,303.1	12	10,094	28	349.7
						[350; 400)
5/7	Moscow Region	41,184.0	7	11,667	15	353.0
	Voronezh Region	29,970.7	21	8,364	80	358.3
	Sakhalin Region	49,473.9	4	13,681	7	361.6
	Belgorod Region	30,419.7	20	8,310	81	366.1
	The Republic of Tatarstan	32,198.9	16	8,467	79	380.3
	St. Petersburg	41,127.9	8	10,737	21	383.0
	Moscow	61,357.9	2	15,865	5	386.8

To assess the impact of regional asymmetry and differentiation of the RF territorial entities on the poverty incidence, a correlation analysis was made and regression equations were constructed, including the main factor attributes that affect Y (the indicator of the relative gap between the per capita income and the subsistence minimum of the RF territorial entity population).

Factors influencing Y were chosen as independent variables:

- X_1 – Ranking of the RF territorial entity according to the subsistence minimum level;
- X_2 – Ranking of the RF territorial entity according to the value of average per capita monetary income.

A multiple correlation analysis was conducted to determine the nature, strength and direction of the relationship between the productive and factorial attributes of this study and a matrix of paired correlation coefficients was constructed (Table 4).

Table 4. The matrix of paired correlation coefficients between statistical attributes determining multiple regression equation

	Y	X_1	X_3
Y	1		
X_1	0.03	1	
X_3	0.80	0.53	1

The analysis of the data in Table 4 allows drawing a conclusion that there is no multicollinearity between the factorial attributes X_1 and X_2. A regression model of the dependence of Y on the presented factors was constructed, which has the following form:

$$Y = 19.41+0.55X_1 - 1.08X_2 + \varepsilon; F = 224.94; R^2 = 0.85 \tag{1}$$
$$(-10.57) \quad (21.20)$$

The analysis of the constructed regression model enables to conclude that the coefficients of the regression equations are statistically significant at a significance level of $\alpha = 0.05$ ($|t_{aj}| > t_{cr}$; t_{cr} (0.05; 82) = 1.99). The regression equation is reliable by the Fisher criterion with a significance level of $\alpha = 0.05$ ($F = 224.94 > F_{cr}$ (0.05; 2; 82) = 3.11) and, therefore, it is applicable for the study.

Thus, the constructed model is suitable for research and forecasting. Economic interpretation of regression coefficients is as follows:

- $a_1 = 0.55$, therefore, when the subsistence minimum ranking is increased by 1 unit, the poverty indicator will increase by 0.55 units at a constant value of per capita monetary income;
- $a_2 = -1.08$, therefore, when the ranking of the average per capita monetary income is increased by 1 unit, the poverty indicator will decrease by 1.08 units at a constant value of the subsistence minimum ranking fixed at the average level.

As for the poverty profile in Russia, it can be stated that persons of the active working age continue to be the largest group among the poor; the proportion of young people aged 16 to 30, women of the retirement age and men of the active working age is increasing. Together, this indicates a lack of correlation between economic growth and poverty level, the need for a corresponding transformation of the state's economic policy.

Thus, the foregoing allows stating that the official approach to the methodology for determining and measuring poverty underestimates its real level, gives the phenomenon of low incomes of the population a chronic character. This conclusion is supported by an assessment of the poverty level from the standpoint of the deprivation approach, according to which the poor are those whose consumption does not correspond to the social standard accepted in the society, who do not have access to a certain set of goods and services (Table 5)

Table 5. Poverty indicators in the RF and developed countries (in % to total population), 2016

Indicator	Country			
	Russian Federation	United Kingdom	USA	Germany (2014)
Income poverty	15.7	15.4	13.5	16.7
Deprivation poverty	25.0 (as of 2013)	15.4	17.3	16.7
Chronical poverty	10.0	6.0	9.3	9.5

Source: Nefedov, 2017.

4. Discussion

The change in the current situation in Russia, connected with the large-scale poverty (low income) of the population and the growing socioeconomic inequality, in the interests of ensuring a stable and inclusive development of the country depends on many factors (objective and subjective ones), however, it is determined, in the opinion of the authors of this article, by the economic policy pursued by the government and business, as well as by the system of institutions created. In this regard, it is appropriate to recall the position of the Nobel Prize Winner Professor P. Krugman: "... institutions, norms and political conditions are much more influential in the distribution of income, and objective market factors are much less influential than what they are trying to assure us in the basic economics course" (Krugman, 2009).

It is important to note that the world economy has accumulated certain experience of precisely this economic policy. The leading role in solving the problem of economic inequality and poverty is given to the mechanisms of

income redistribution, in the "taxation – social benefits" system (Zakharov and Golikova 2015, Voeikov and Anisimova 2018). The main means for implementing such a policy include:

- a non-deductible deduction from the average annual earnings of a worker, which is correlated with the minimum wage accepted or with the subsistence minimum;
- proportional taxation with a minimum rate of 10-30%, and in the case of progressive taxation with a maximum rate of 40-50% or more;
- direct payments to socially vulnerable groups of the population.

In this context, it should be recalled that since 2001 Russia has been practicing a single tax rate on personal income making 13%. According to the opinion of a significant number of scholars (Anisimova 2016, Buzgalin *et al.* 2014, Shevyakov 2011 and others) the application of a single tax rate for individuals is essentially an inequality multiplier that reduces the incomes of the poor and increases incomes of the rich.

To develop an effective economic policy aimed at reducing poverty and economic inequality in Russia, it is necessary to use modern foreign experience, as well as scientific and practical developments of Russian scholars, taking into account Russian realities, including the officially used methodology for determining and measuring poverty, and its profile features.

From these positions it can be argued that an effective social policy begins with an active industrial policy, with technological modernization of the economy in order to create new high-tech jobs that ensure the growth of productivity and labor remuneration. The basis of social policy will be formed by two areas: (1) labor market policies that promote: a) the withdrawal of a significant part of the employment of the population from poverty through the promotion of professional development and professional retraining in accordance with the requirements of new technologies, *etc*.; b) creation of conditions for finding paid employment by economically active population, ready and able to work and by the unemployed; (2) targeted programs of social support for the poor and socially vulnerable segments of the population, linked to the life cycles of the family and functioning on the principles of combining measures to stimulate self-sustainment and cash benefits.

Conclusion

At present, for any country (developed or peripheral one), the reduction of poverty associated with the risk of society degradation is one of the main tasks of the public policy to ensure sustainable and inclusive socioeconomic development and national economic security. Large-scale poverty and excessive social and economic disparities make it difficult to provide equal opportunities for all members of society, leading to a reduction in consumer demand and individual savings, which is holding back the growth of the country's economy. Growth of poverty (low income) and inequality exacerbate social problems, and under certain conditions can become a source of socio-political tensions and instability. Therefore, the government should rather manage the economy than monitor it, actively contributing, among other things, to the poverty level reduction in the country.

Acknowledgments

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Designing an Algorithm for the Marketing Substantiation of the Retail Property Concept in Order to Improve the Efficiency of Development Companies

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Abstract:

In this paper, the theory of choosing the concept of retail property is studied, as well as the marketing approach to the concept formation. Some concepts of retail facilities in Russia and abroad are analyzed; their main shortcomings are identified and the algorithm for the marketing substantiation of the concept is developed. In addition, the authors have developed a methodical approach to the marketing rationale for the conceptual foundation of retail property. Within the framework of the research, such general scientific methods as observation, description, and modeling have been used. The authors have come to the conclusion that many problems of the future work of shopping centers can be avoided at the design stage. It is important to pay attention to planning decisions, conceptual features and opportunities for subsequent development to ensure high competitiveness of the facility in the future. The marketing rationale is the most important part of the project. Its main goal is to collect sufficient data to understand how a commercial object planned for construction will have steady client flow and will be able to withstand competition.

Introduction

Some major projects of commercial real estate are attraction centers for different social groups. They can have the function of causing a sensation of belonging to the local community in people's hearts, their social and spatial self-identification, as well as expanding opportunities for the realization of their creative activity.

Some researchers face the lack of complex scientifically grounded approaches to the design, construction and subsequent service of retail properties. Such objects are built inspiredly and in a similar fashion with existing ones, which negatively affects their demand and efficiency in the future. This reason justifies the urgency of this work, the purpose of which is to implement a marketing rationale for choosing the concept of the project of a shopping and entertainment center.

Many experts were engaged in the study of issues related to the formation and development of retail and entertainment properties: Nyurenberger *et al*. (2014), Kanayan *et al*. (2005), Kultz *et al*. (2007), Kapp (2016),

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Nikolaeva (2013) and other researchers: Eckert *et al. (*1990), Gloudemans (1999), Gloudemans, Almy (2011), Jensen (2011), Kramer (2008), Bowen (2006), Schwanke (2003), Beyard *et al*. (2007), Beyard, O'Mara (1999), Miles *et al.* (2007), Peiser, Frej (2003), Aaronson (2008), Brett, Schmitz (2009), Charvat (2003), Stein (2008).

The empirical basis of the work is the following studies carried out by the authors: analysis of literary sources, statistical information, and information published in specialized publications and databases of scientific works, as well as analysis of sources on the Internet including specialized websites of individual retail properties.

1. Materials and methods

When writing this paper, the dialectical method of scientific cognition has been used and various points of view have been studied. Logical analysis has been used. The authors define a range of concepts according to which the issue of formation of the concept of retail facilities is considered. The search and selection of identical features of the commercial retail property are carried out according to which the characteristics are highlighted that make it possible to systematize the subject of research.

Some methods of description and generalization are used; the latter is based on the analysis of specific objects and phenomena and the isolation of similar features. Together with the method of generalization, the method of type designs of the commercial retail property is used.

In order to identify some typical relationships for the purpose of substantiating the concept of retail property, the abstraction method is used that facilitates the identification of key meaningful relationships without reference to the secondary characteristics of the projects.

One of the methods used in the study is the analog approach. The consideration of the issues concerning the formation of the concept of shopping centers is carried out based on the definition of their key signs and the conclusion that the objects can also be similar in other features.

The systematic approach is used in this paper, which consists in identifying methodological principles that facilitate the possibility of considering the studied object as a system.

2. Results

Currently, there is no ideal concept for a shopping center. In each case, there are specific features in the formation and subsequent development and maintenance of the concept. In order for the project to be effective, the trends in their development should be taken into account. This will help ensure the competitiveness of the shopping center for the long term, so it will be able to remain in demand among customers. Over time, the concept should be revised and modified so that customers keep engaged.

There is no universal formula, according to which one can develop a concept of a shopping center. Some experts who are involved in the construction of retail facilities (developers) understand that the sign of the success of a shopping facility is constant consumer flows, due to which the interest from tenants' side increases. Not all retail properties have high customer flows. The concept of projects should be developed individually and be oriented to target consumers taking into account the location and condition of the competitive environment (Shi, Wu, Wang, 2015).

Evaluating the foreign experience of the formation of shopping centers, it can be concluded that the principles of their design have recently changed significantly in order to prevent the degradation of the social structure of society and to provide sustainable support for its viability (Kapp 2016).

The first modern shopping center was built in the US in the 1920s. Malls gradually began to represent models of economic growth and increased consumption in the US, which became a worldwide trend. They demonstrated very large development potential (Shi, Wu, Wang 2015).

Some examples of the most popular shopping centers in the world with marked conceptual features are presented in Table 1.

Table 1. The largest most popular shopping centers in the world with marked conceptual features

No.	Mall name	Location	Conceptual features
1	"Mall of the Emirates"	United Arab Emirates, Dubai	The world's largest ski slope
2	"Mall of the Emirates"	United States, Minnesota	"Nickelodeon Universe" theme park, a golf course, a flight area for flight simulators
3	"The Grand Canal Shoppes"	USA, Las Vegas	It is surrounded by an artificial reservoir, where everyone can ride a gondola
4	"West Edmonton Mall"	Canada, Alberta	There is a lake in the center of the complex, where four sea lions live

Some clients highlight the theater as an additional conceptual advantage of the shopping center, and this is despite whether they visit it or not (Anuradha and Manohar 2011).

A number of approaches can be distinguished in the functioning of foreign shopping centers:

▪ the concept of "time-saving", which is focused on pedestrian connectivity from the place of residence, work or routes of movement of buyers. The main motive for the consumer in this case is the convenience in shopping;
▪ the price concept based on the availability of tenants working in the mid-segment or lower. Customers, in this case, are focused on low prices, not on high service;
▪ the theatrical concept, the feature of which is the visual effect. Much attention is paid to design;
▪ the information and familiarization concept presupposes the presence of predominantly specialized or monobrand stores.

The simplest concept is price. Others require extensive marketing support, the purpose of which is to promote the shopping center (Vershinina, Prosalova, Smolyaninova 2017).

A significant fact is that the construction of a shopping center does not begin without the preliminary development of the concept. It is necessary to analyze the location first, determine the target audience, area, format, number of levels and other characteristics of a shopping center, make a forecast of its profitability and then start its construction. So, for example, in Russia, it was not uncommon to find a situation when the owner of a project was thinking over the concept only when it was necessary to invite tenants (Kramer 2008).

Since Russia is considered one of the fastest growing and attractive markets for the construction of shopping centers, leisure services get extensive development. Entertainment has a powerful attraction. Therefore, shopping malls began to be complemented with entertainment components – cinemas, bowling, billiards, kiddie rides, amusement machines and others. Often consumers choose to visit that shopping center where they can spend time with the whole family and where they can not only buy different things but also get some additional services. Understanding that shopping is better combined with entertainment was due to a gradual increase in the incomes of the population and an improvement in the quality of life.

The concept of the shopping center determines the presence of various entertainments taking into account the location of the shopping center and economic feasibility. For example, some large shopping centers have their own entertaining claim to fame. The authors can indicate the following ones:

▪ "Mega" (Moscow) – rink;
▪ "Ramstor City" (Moscow) – 3D cinema IMAX, the first one in Russia;
▪ "Megacomplex na Moskovskom" (Samara) – indoor water park;
▪ "Shokolad" (Nizhny Novgorod) – fitness club with a swimming pool and sauna.

It is worth noting that often there is a reconstruction of old shopping centers and changing their format. At the same time, the demand of entertainment industry operators for renting space in shopping centers is often lower than the offer. Therefore, to increase interest in trade objects, a unique concept should be developed on the basis of location, trading area, target audience, and competition (Nikolaeva 2013).

The concepts of shopping centers combine different principles. One can distinguish some of them:

▪ creating an original entertainment component;
▪ using the potential of the landscape and natural environment;
▪ the use of nonstandard formats, which create a special atmosphere for customers;
▪ special architectural solutions and stuff.

CBRE Consulting Company conducted an analysis of the way how the above principles are implemented in various retail outlets in Russia and identified particularly popular shopping centers due to their conceptual features (Table 2).

Table 2. The most popular shopping centers in Russia due to their conceptual features according to CBRE's estimates

No	Name	City	Year of going into operation	Area, sq.m.	Features of the concept	Attendance per day
1	"Vegas" Shopping and Entertainment Center	Moscow	2010	134 thousand	It has a park of thrill rides. The concept is based on the features of the zoning of space, which consists of several zones in the form of streets designed in accordance with a certain idea.	Up to 90 thousand people

No	Name	City	Year of going into operation	Area, sq.m.	Features of the concept	Attendance per day
2	"Grand Canyon" Shopping and Entertainment Center	St. Petersburg	2006	53 thousand	The well-designed children's entertainment zone called "Divny gorod" has an area of 21.5 thousand square meters with 40 shops, a children's theater, creative workshops, an adventure park, a place of learning professions, climbing walls.	Up to 40 thousand people
3	"Piterland" Shopping and Entertainment Center	St. Petersburg	2012	80 thousand	Location near the picturesque park on the shore of the Gulf of Finland. It is balanced with the environment. Nature is an additional strong attraction. There is an indoor water park.	Up to 50 thousand people
4	"Mandarin" Shopping and Entertainment Center	Sochi	2013	17 thousand	It is organized in the format of "lifestyle", one of the first malls in Russia. Some concession stands are located in the open air and connected by pedestrian paths and recreational zones. A swimming pool, a nightclub, a viewing platform and a music venue with an amphitheater are attraction zones.	Up to 40 thousand people
5	"Tsvetnoy" Shopping and Entertainment Center	Moscow	2010	16.3 thousand	It is one of the most unusual shopping malls. Despite the fact that it has an entertaining component, it attracts customers who follow the world fashion trends. First basement floor has shops of designer furniture and household goods.	Up to 35 thousand people

Source: prepared by the authors

Currently, many shopping centers are in demand by the target audience due to the provision of comfort, comprehensive service, some functions that can save time. But it should be noted that many of the ideas as the basis of the retail facilities have long been outdated and do not correspond to advanced architectural solutions and cultural progress. In this regard, despite the fact that they attract consumers, they cannot fit seamlessly into the urban environment and provide a typical set of entertainment services. Thus, the development of retail facilities should be implemented along the path of providing quality opportunities for realizing the potential and needs of the population, and not at the expense of increasing areas and functions.

As far as the differences between the world and Russian shopping centers are concerned, shopping centers in America often have a fairly modest interior design and cheap material in their decoration. In Russia, customers want to see more expensive solutions.

In Russia, customers often prefer not to go up over the 4th level of the shopping center, while in the Asian countries, even 14-story retail facilities function successfully.

It is very important to consider trends in the formation of concepts and the development of shopping centers.

One of the possible directions for the development of shopping centers can become the popularity of the format of the outlet center. The anchored tenants are mainly manufacturers of clothing, electronics, and household appliances. Accompanying operators are service companies. They can be located in the bedroom community and other remote areas of the city. The advantages of this format for stakeholders are:
- opportunity for customers to purchase goods at discounted prices;
- tenants can realize the remains of goods and increase their profits;
- low cost of construction of retail facilities for developers.

The outlet format is a promising form of development of shopping centers, as it is able to minimize the cost of making a purchase. Moreover, a significant trend at the moment is the increased competition among shopping centers due to the implementation of quality facilities, which include projects with a thoughtful concept, competent choice of tenants and the right format.

The common criteria for the quality of shopping malls are:
- the area of the complex should be more than 3000 sq.m;
- the facility should be put into operation no earlier than 2010;

- it is mandatory to have an anchored tenant;
- availability of modern technical equipment;
- considered internal logistics and functional zoning.

The projects put into operation before 2010 can also be considered as qualitative ones if other conditions are met and there are marketing activity and timely offers.

Some other trends can be identified as well:

- in addition to improving the quality level of the projects, they are created in more large-scale formats that have a city and regional significance;
- the number of shopping centers increases with the growth of entertainment zones in them;
- a high demand from tenants;
- the consolidation of tenants and the majority of chain stores;
- aggravation of competition among shopping centers: a decrease in the level of profitability of tenants per 1 sq.m;
- stabilization and reduction of rental rates for anchored tenants;
- an increase in the payback period of projects, a decrease in profitability of investments;
- an increase in the importance of shopping centers in the life of the population;
- the growing importance of professional management of the retail property (Nyurenberger *et al.* 2014).

Many experts pay attention to the following trends:

- "freezing" of construction of retail facilities in cities with a high level of competition;
- food supermarkets, children's entertainment centers, shops with reduced prices, specialty stores selling alcohol are going to develop actively;
- district facilities are successful formats of shopping centers, since there are empty niches in new urban areas;
- as a separate segment, the conceptual filling of the retail infrastructure of new residential neighborhoods is being formed.

The following marketing trends in the formation of new shopping centers should be noted:

- increased demand for areas that meet international standards;
- increased size of shopping centers;
- increased value of the entertainment component;
- distribution of multifunctional centers;
- restructuring of network operators;
- further development of the franchise market;
- increased value of personal vehicles;
- extension of specialization of shopping centers;
- reconcepting and rebranding of existing shopping centers.

In the period of crisis in the economy of each country, there are changes in the aspect of choosing a retail facility by potential tenants and customers. Table 3 shows the trends that are characteristic of the main subjects related to shopping centers – tenants and visitors. Based on the data presented in Table 3, it can be concluded that comfortable galleries with various recreation areas and a wide range of food courts are in demand among consumers, as well as free access to the Internet via Wi-Fi. Parking spaces should be in sufficient quantity, and the parking itself should be convenient and, preferably, free of charge.

The value of additional services is increasing, which can turn into zones of attraction for customers and affect the growth of customer loyalty to the shopping center in general. It is necessary to note some of them:

- food court;
- a variety of services for everyday life;
- beauty spa;
- children's entertainment zone is often considered by visitors who have children as an opportunity to leave them in this area under supervision and go shopping;
- cloakroom.

Table 3. Trends typical for tenants and visitors to shopping centers during the crisis

	Tenants of shopping centers	Visitors to shopping centers
Trends in changing requirements and preferences	Thorough study of the location of the object	The growth of requirements to the quality of the object
	Keeping track of the indicators of predicted attendance	Increasing the convenience of stay in the mall
	Preference is given to working projects with a well-built concept	High requirements to the availability and characteristics of parking
	The size of rental rates is calculated based on the expected profit. The tenants refuse to overpay for the location of the property or the rented premises in the facility	The choice in favor of multifunctional or single-purpose shopping centers
	Increasing requirement to confirm the exact percentage of occupancy of the facility in accordance with the preliminary agreements	An increase in the share of purchases made via the Internet
	Evaluation of fame and reliability of "anchored" tenants	Convenient and easy navigation

Source: prepared by the authors

A very significant trend is the growth in the share of entertainment in the new regional and supraregional shopping centers. Despite the fact that income from rent payments of entertainment zones for children and adults is not comparable to the profitability of rent payments from shopping areas, developers focus on this zone in order to increase the comfort and time of staying in the shopping center due to the increased competition in the market. The operators of entertainment zones are going to subsequently prepare a proposal to cover a variety of categories of visitors and develop a variety of educational programs. There will be an increase in the number of shopping centers that include a so-called "town-park", where, if necessary, children can be left for a long time while parents employ other services of a shopping center. Other popular entertainment services can be the following ones: cinema (multiplex), children's entertainment center, children's educational center, ice skating rink, seaquarium, roller rink, indoor water park, animal farm, tenpin bowling, trampoline center, climbing wall, quest rooms, cooking schools, *etc*.

Shopping centers, regardless of their specifics and concepts of development, can be divided into new ones, the idea of functioning of which is entirely borrowed from abroad (mainly from the USA and Great Britain), and old ones that have a long history of existence in Russia. For example, GUM and TSUM in Moscow are the examples of successful old shopping facilities that have survived more than one historical epoch. Some old shopping centers are different from others by their uniqueness in various ways: location, the history of the formation of the shopping center and its brand, trade turnover, dominant name.

Consumers now want to visit those shopping centers that follow trade trends changing their direction in accordance with the requirements of consumers. The retailers are now interested in finding ways to present themselves in these modern buildings and adapt to rapidly changing consumer expectations. It can be concluded that at this stage of market development, experts tend to believe that the concept of a mall should be unique, rather than replicated (Eckert, Gloudemans, Almy 1990).

The presence of a full entertainment component in the shopping center is not just a trend, but an external reality. Only uniqueness and demanded services are able to provide the retail facilities with the sufficiently high profitability. For example, Russia is characterized by the presence of trends in the conceptual formation of shopping centers due to the complex development of this market in the world. Some developed countries have experience in the operation of retail facilities with the most successful formats and unique conceptual solutions that are gradually being implemented in Russia.

The concept of a commercial real estate object can be presented in the form of a document that describes the vision of the future shopping center. It is not accidental that this document is the first and the most significant one since a decision is made about the project on its basis.

The study of approaches to marketing tools used for realizing the concept of a retail real estate object allowed the authors to develop their own algorithm, which allowed choosing one or another concept of a commercial object. The algorithm of marketing substantiation consists of 9 consecutive stages due to which one can form an understanding of the necessity, timeliness, and expediency of construction of a retail facility. The algorithm is presented in Table 4.

Table 4. Stages of the marketing substantiation for choosing the concept of the retail property object

No.	Stage name	The essence of the concept development stage	The task of the stage
1	Site location analysis	Attractiveness and potential of the territory, transport accessibility, determination of the area of the proposed facility	Determination of location possibility a retail facility in a given territory
2	General characterization of the market situation	Number and level of incomes of the population, dynamics of turnover of retail trade and services	Formation of opinion about the degree of market prospects for the construction of an object
3	Evaluation of the competitive environment	The number and quality of retail facilities in the settlement of the expected construction, the need for additional construction of similar facilities, planned facilities	Substantiation of the degree of market saturation and the possibility of carving out a niche
4	Marketing research of the audience	The study of the interest of prospective audience in the retail facility, preferences regarding the desired filling through an opinion survey	Determination of product categories and types of services that should be in new facility
5	Preparatory brokerage	Conducting negotiations and studying the interest in a new facility by potential tenants	Identifying the operators who will define the way the object looks like and how quickly it will be possible to attract tenants
6	Determination of the format of the future object	Determination of the conceptual content, the type of activity of anchored tenants, the area of the object	Collection of data obtained at an early stage in the description of a particular object
7	Taking into account trends typical for the subsequent development of retail facilities	The inclusion of features peculiar to the market in general and the successful moments of the most successful shopping facilities in the formation of the planned shopping center	Creating a competitive facility for the future
8	Error exception	Fixing of mistakes that should be avoided at various stages of project implementation	Increasing the profitability of the object
9	Calculation of the feasibility of construction	Determining the cost of construction, profitability and payback of the object	Decision-making on the prospects and necessity of construction of a commercial object

Source: prepared by the authors

The approach presented above is logical and justified by the need for the project owner (developer) to answer a number of significant questions.

The authors have determined that when deciding on the construction of a trade facility, an owner should receive answers to 4 key questions:

- "Is it possible?"
- "Is it necessary?"
- "In what way?
- "Is it profitable?"

The proposed algorithm allows answering the above questions (Figure 1). The authors propose to examine in more detail the implementation of each stage in the framework of the proposed approach to the marketing substantiation for choosing the concept of a commercial object.

Step 1. Analysis of the site location

It allows identifying the factors that determine the prospects of the land chosen for the construction of the shopping center. At this stage, the following information is considered:

- location and main characteristics of the site of the proposed construction of a commercial object, its attractiveness;
- the nearest neighborhood of the site;
- transport and pedestrian connectivity of the site. convenience of approaching roads;
- determination of the trading area of the object.

The allocation of the primary zone, where about 70-80% of the total number of buyers within a radius of 1.5-2.4 km from the shopping center come from (8 km – for the district shopping center); secondary zone – from where about 20% of buyers come from; tertiary zone – 5-10% of buyers.

Figure 1. Questions to be answered in the marketing substantiation phase of the retail property concept
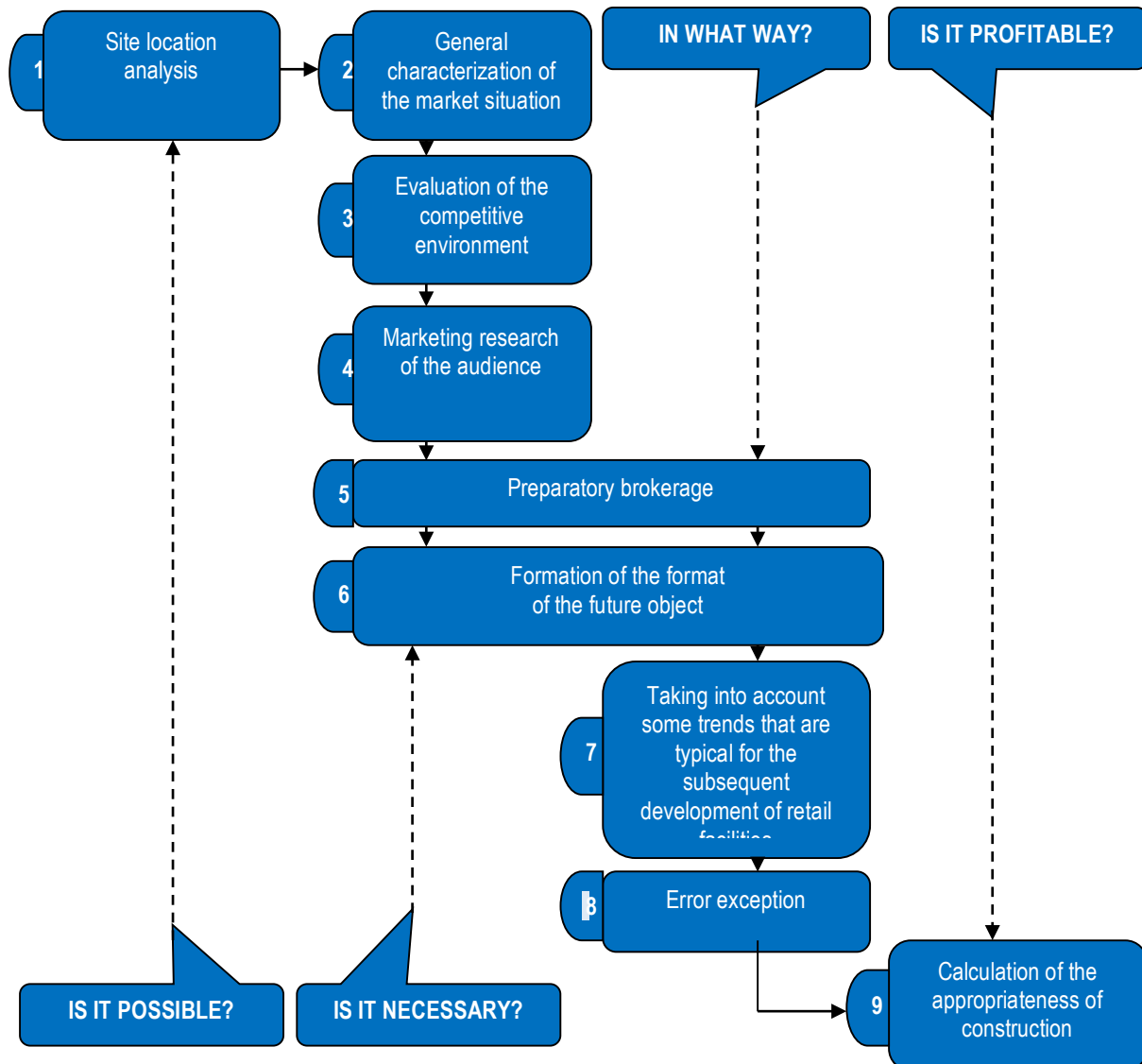
Source: prepared by the authors

The trading area will depend on the format of the shopping center. If the object is located in the center, the prospective trading area can become the entire city. For a shopping center of the district or microdistrict value, the trading area can be calculated by 10-15-minute automobile availability. For a large-scale facility, the trading area may include the entire population center and 30-40 minutes of car accessibility.

- prospects for the development of the territory in which the site is located for prospective construction;
- conclusions are drawn regarding the commercial attractiveness of the site for the implementation of the project for the construction of a shopping center.

Step 2. General characterization of the market situation

This stage involves determining the socio-economic development of the region/city including the consideration of the demographic situation and the development of retail trade.

Step 3. Evaluation of the competitive environment

At this stage, the following works are carried out:
- analysis of the retail real estate market in the area of the proposed placement of a commercial object
- selection and analysis of competitors of the future shopping center including planned projects.
- determinations of pros and cons of competitors.
- trade networks, which are represented in the competition zone.
- study of pricing and commercial conditions.

Step 4. Marketing research of the audience

The analysis of consumer preferences for the planned shopping center. The interest in the new facility is determined, as well as in the desired goods and services, which are going to be in demand. The survey is conducted directly in the form of interviews or questionnaires of potential consumers.

Step 5. Preparatory brokerage

It suggests conducting a survey of potential tenants for their interest in the shopping center under construction. As a result, it is necessary to form a vision of the size of the average rental rate in the planned shopping center. A preliminary pool of tenants is formed for the planned retail facility from the operators according to preferences of the clients. Possible conclusion of preliminary lease agreements.

Step 6. Determination of the format of the future object

Determination of the type of object, its size. Identification of the ratio of trade, recreational, entertainment, catering, technical and other areas. It should be based on the experience of successfully implemented projects, on the basis of which it is possible to allocate the average values of the ratio of areas that allow optimizing planning decisions. About 40-45% of the area is for the anchored tenants, 5% of the area is occupied by catering facilities, 10-20% – shopping gallery stores, and about 30% of the area is for the entertainment component of the shopping center.

Step 7. Taking into account trends typical for the subsequent development of retail facilities

The stage assumes carrying out of the review of the condition and the basic tendencies of the world and Russian market. When designing a shopping center, it is important to avoid outdated concepts and choose some advanced design ideas. The trade object should be balanced with a group of buildings of the territory.

Step 8. Error exception

It is necessary to take into account the most common mistakes in both design and management of a trading object. The new shopping center should be competitive, and therefore attractive, convenient, and cozy for visitors. At the same time, it should generate high enough revenue.

Some errors can be analyzed mainly on the basis of secondary information, as well as independent analysis of the sample of shopping centers for the factors of their success/failure and the existing disadvantages while operation.

Step 9. Calculation of the feasibility of construction

The volume of costs for the project is determined and the indicators of the effectiveness of the construction of the shopping center are calculated. The implementation of all stages of the marketing substantiation of the concept should be carried out in accordance with the consideration of the mutual influence of the analyzed factors and the development of the situation for the most predictable period. The more complex and large-scale the project is, the stronger its impact on the market is and the more complex and profound should be the preliminary analysis.

3. Discussion

The overwhelming majority of experts believe that the development of the concept of a shopping center begins with research:
- the location of the prospective shopping center with regard to infrastructure is estimated;
- socio-economic factors are studied;
- the analysis of competitors is carried out (taking into account prospective ones);
- an evaluation of the development trend of a given microdistrict or region in the long term is conducted.

After carrying out the research, it becomes clear whether the object is economically viable and how it should attract customers. Within the framework of the next stage, a concept is developed that formulates the basic economic idea. The economic idea indicates the way a commercially successful object should be built in a given location for a certain group of consumers.

The views of researchers on the issue of developing the concept of a commercial object are diverse. Many offer their vision of the structure and constituent elements of the concept.

Conclusion

Thus, for the purposes of developing the concept, it is necessary to take into account the development trends of retail real estate objects in the world and in Russia, in particular, and to understand the most common mistakes, which take place in the development of the concept.

The detailed study of the concept of the shopping center helps to avoid problems with its subsequent functioning. The availability of unique distinctive features in its concept attracts an additional client flow and directly affects the financial success of the facility.

The marketing substantiation is the most important part of the project. Its main goal is to collect sufficient data to understand how a commercial object planned for construction will have a steady client flow and will be able to withstand competition.

It can be stated that the approach proposed by the authors to the implementation of the marketing substantiation for the retail property concept consisting of 9 stages is not complicated, has logical structure and allows answering the main questions of an owner and determining how reasonable, efficient, and commercially viable can be the construction of a retail facility.

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Website Usability and User Experience During Shopping Online from Abroad

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Abstract:

User experience and website usability is an important factor during the online purchasing process. The main objective of our study was to analyze the website usability issues users have when purchasing products from abroad. In order to achieve our objective, we analysed the data from Consumer Barometer. We conducted the principal components analysis, followed by fuzzy clustering in order to determine the groups of users based on the perceived website usability problems during online purchasing. We determined and characterized 3 groups of users and assigned countries of origin of these users. These results can be used by companies operating on one or more of the observed markets in order to improve their performance when serving their potential customers. In addition, the results can be used in the educational process of educational institutions which field of study is focused on economics and business.

Keywords: website usability; user experience; online shopping; cluster analysis; consumer barometer.

JEL Classification: M31; M15; C38

Introduction

Website usability and user experience are key measures of website quality (Sivaji and Tzuaan 2012) and a key component of the websites that are commercially successful (Lowry *et al.* 2006). For today's users, there are so many options in the environment of the Internet that each misstep in meeting user's expectations might result in loss of the potential customer (Kakalejčík 2016). Krug (2014) consider the usable website to be a place where a person of average (or even below average) ability and experience can figure out how to use the website in order to accomplish something without it being more difficult than is the value obtained by using it. TheUsable website has several attributes. It is useful, learnable, memorable, effective, efficient, desirable and delightful. Moreover, Aziz, Kamaludin, and Sulaiman (2013) add satisfaction and accessibility as additional features. Casaló, Flavián and Guinalíu (2008) claim that perceived usability is an indirect factor that affects customer loyalty and positive word-of-mouth through satisfaction. In this case, usability helps to satisfy the needs of the customer and as a result, a greater level of loyalty and positive word-of-mouth will be created. Furthermore, Braddy, Meade, and Kroustalis (2008) found that positive company's website user experience can affect organizational attractiveness as a potential employer.

In order to ensure the website is user-friendly, user experience testing should be conducted. User experience testing is a method of obtaining direct user feedback on a website or other product by observing and interviewing user while they perform some tasks while using the website or product (Sivaji and Tzuaan 2012). However, in this case, the best practice would be building a website based on used conventions of user experience and then confirm its usability by user experience testing. This is partially connected to agile development during which product owner confirms that the website meets established functionality (Sutherland 2014). In this way, the

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company is prevented from additional development cost (Ries 2011). Cappel and Huang (2015) provide us with The Iceberg Model of Website Usability. This model is devided into three regions:

- The „tip" of the Iceberg: websites in this category are characterized by one or more serious design issues or problems that attract a lot of attention – shocking colors, oversized graphics etc. Users usually react by quick abandonment. These websites typically require moderate to radical redesign;
- „Middle Mishaps": this region focuses on the presence of errors, instead of following Web design practices. Some specific problems include grammar, spelling or punctuation errors, non-functioning links, poorly performing search function etc. These errors are less serious. Depending on the quantity and severity of the issues, these websites require remedial actions that are part of moderate redesign;
- Untapped Opportunities": this type of errors represents the unability to provide certain Web design elements that users have come to expect or it does not take full advantage of the World Wide Web. Websites might miss site map, search, and navigation or users' context to their current location within the website. These missing elements are not of dramatic nature and many users will not notice them. However, the overall impact is based on quantity and severity of missing elements (Cappel and Huang 2015).

Pallot and Pawar (2012) provide us with Holistic model of user experience, which is briefly presented in the following table:

Table 1. Holistic model of user experience

EXPERIENCE TYPE	DEFINITION	ELEMENTS
PERCEPTUAL	Reflect the experience of taking information via the senses	▪ Sensory (Sensitivity); ▪ Perceptive Appreciation
COGNITIVE	Reflect the cognitive experience in processing information and applying knowledge	▪ Cognitive Economics;
RECIPROCAL	Reflect the experience of distributed and situated cognition	▪ Distributed Cognition; ▪ Situated Cognition;
SOCIAL	Reflect the individual experience in a group	▪ Interpersonal Relationships; ▪ Social Interaction; ▪ Group dynamics; ▪ Group Enhancement; ▪ Group Confidence
EMOTIONAL	Reflect the complex psycho physiological experience of an individual's state of mind	▪ Physiological State; ▪ Emotional Connection;
CULTURAL	Reflect individual experience within a community	▪ Habits and conentions
EMPATHICAL	Reflect individual experience of being helpful with others	▪ Caring
TECHNOLOGICAL	Reflect individual experience of using technological artefacts	▪ Innovativeness; ▪ Performance; ▪ Friendliness;
ECONOMICAL	Reflect individual experience of the created value (business model)	▪ Satisfaction ▪ Inclusion;
LEGAL AND ETHICAL	Reflect individual experience of user protection	▪ Ownership; ▪ Privacy; ▪ Security.

Source: our own processing based on Pallot and Pawar (2012)

When comparing the Holistic model of user experience with The Iceberg Model of Website Usability by Cappel and Huang (2015), we can see that Holistic model takes more variables into the account. Model of Cappel and Huang is more focused on technical aspects of user experience and customary conventions. However, Holistic model tries to dive deeper and find other variables that are more related to user's inner feelings. We agree that user experience is based on more than usability of the website but we consider further variables to be intricately measurable. In fact, for users, it is difficult to describe their inner feelings and by observation of users, it is not possible to extract them, too. Furthermore, as Law and van Schaik (2014) discuss, in UX empirical studies, variables such as flow, aesthetic-beauty, emotion, enjoyment, affect, arousal/valence, hedonic quality, intrinsic motivation, presence, engagement, attractiveness, and satisfaction are observed. Dingli and Cassar (2014) proposed Intelligent Usability Evaluation framework which goal is to minimize the amount of human intervention necessary to evaluate the usability of the website. By entering a

homepage URL, the user issues a request to have a list of interior webpages to be evaluated for usability. The results of the experiments concluded that this tool adequately models human judgment when detecting usability violations. However, based on our real-world experience, we conclude that the human behavior is so unpredictable that the use of this framework is limited and its accuracy may vary from case to case.

1. The current state of discussed issue

The main objective of the study conducted by Zaied *et al.* (2015) was to propose usability testing technique to evaluate e-learning and e-training usability. In order to define user's perspectives about the existence of usability criteria that affect the success of the website, authors distributed a questionnaire to 80 students and 16 web developers. The study revealed that for students, personalization is the most important criterion of usability of observed websites. Accessibility, navigation and ease of use were in the first half of important criteria. The content was the least important factor. This is a paradox when e-learning and e-training websites are observed. However, for website developers, the content is the most important criterion, followed by navigation and ease of use. They also consider personalization as the least important. By comparing the results of this study, we can see that different groups of users might have different needs and expectations towards website usability.

Data analysis in the study of Pilar and García (2014) demonstrated that websites with a high level of usability significantly eases browsing and reduce the browsing time of users. Moreover, they reduce the number of errors user commits during the purchasing process, too. Due to good usability, the user also perceives risk at a lower rate. The results of a study by Liu, Li and Hu (2013) showed that the perceived website ease of use, visual appeal and product availability are important online impulses towards online purchases. Instant gratification and normative evaluation were found to mediate the effects of website cues on the urge to buy impulsively.

Our previous research (Bucko, Ferencová and Kakalejčík 2015) was conducted in February and March of 2015. The research sample consisted of 221 participants from Slovak universities. The results of questionnaire survey showed that selected factors of user experience are more important for users than others. Detailed pictures, description, and easy navigation were more important than the graphic design of the website, perceived security or mobile optimization. We were also focused on delivery time and payment methods (which will be subject of research in this study) that seemed to be more important. However, in this study, it was proved that the price is the most significant factor that can influence the online purchase.

Green and Pearson (2011) examined the website usability on e-commerce websites with the use of structural equation model. The sample consisted of 344 participants. The results showed that design satisfaction has a positive influence on intention to make a transaction with the website. Perceived usefulness, perceived ease of use were positive predictors of design satisfaction. Perceived risk is not a predictor of design satisfaction. Trust in the website was found to be a significant and negative predictor of perceived risk. Perceived ease of use had a significant and positive relationship with perceived usefulness. Design credibility was found to be a significant and positive predictor of trust. Content and interactivity were found to be a significant predictor of perceived usefulness. Navigability, responsiveness, and download delay are significant predictors of perceived ease of use. Many of these findings can be considered as expected and in the case of opposite results, we would be able to talk about a paradox.

Results of mentioned studies help us compare our findings that will be presented in the following parts of our paper.

2. Objectives and methods

The main objective of our study was to analyze the website usability issues users have when purchasing products from abroad. By decomposition of the main objective, 2 partial objectives were defined. The first partial objective was focused on the determination if there are any correlations among variables so the appropriate factors could be created. The second partial goal was focused on the definition of groups of website users based on the similarities in behavior during the purchasing process. In order to achieve given objectives, the secondary data from Consumer Barometer was used. Data in the Consumer Barometer is gathered from two sources:
- core questionnaire that is focused on the population of adults;
- connected customer study that is used to enumerate the total audit population and is used to weight the results (Consumer Barometer 2015).

The sample consists of the nationally representative population (online and offline) with the age of 16+ in each country surveyed except China, India, South Korea, Malaysia, Philippines, Vietnam, and Japan (age of 20+). Sample consisted of 85,180 participants from 56 countries [n (Europe) = 29, n (Asia) = 17, n (America) = 5, n (Africa) = 3, Australia and New Zealand] (Consumer Barometer 2015).

Surveys were administered by TNS Infratest on behalf of Google. Survey data was collected in all countries via telephone or face-to-face interviewing. Surveys were administered from January to March 2014 and from January to March 2015. For the purpose of this study, we used the answers on question "Which of these website issues - if any - have ever prevented you from purchasing a product online from abroad?"

In order to achieve our goals, we conducted principal components factor analysis. Afterward, in order to find groups of users based on their similarities, we used fuzzy clustering. In fuzzy clustering, the object is not assigned to one particular cluster but instead, each object is spread out over the various clusters. The degree of belonging is quantified by means of membership coefficient that range from 0 to 1. The main advantage of hard clustering is that it yields more detailed information on the structure of the data (Kauffmann and Rousseeuw 2005). In addition, we also used Pearson correlation and descriptive statistics (table, bar plot, mean, standard deviation).

3. Results and discussion

In the beginning of our analysis, we conducted principal components factor analysis. By creating a correlation matrix, we found out that the majority of variables correlate. This indicated that the use of factor analysis might be a proper procedure to analyze our data. However, we had to conduct additional tests in order to make sure the method is suitable. For the following computations, we used psych package in R. First, we conducted Kaiser-Meyer-Olkin test in order to determine if the use of factor analysis is appropriate. The overall value of 0,82 confirmed that factor analysis was a suitable method for data analysis. With the use of Bartlett's sphericity test, we were able to reject the null hypothesis that the variables are orthogonal as observed p-value equals 4.479266e-75. After this initial steps, we needed to determine how many components (factors) will be used in the analysis. As presented in Table 1, it was recommended to use 3 components which describe 77% of the cumulative variance.

Table 1. Importance of components

	Standard deviation	Proportion of Variance	Cumulative Proportion
Comp.1	2,53	0,49	0,49
Comp.2	1,61	0,2	0,69
Comp.3	1,02	0,08	0,77
Comp.4	0,79	0,05	0,82
Comp.5	0,71	0,04	0,86
Comp.6	0,66	0,03	0,89
Comp.7	0,59	0,03	0,92
Comp.8	0,55	0,02	0,94
Comp.9	0,48	0,02	0,96
Comp. 10	0,44	0,01	0,98
Comp. 11	0,37	0,01	0,99
Comp. 12	0,33	0,01	0,99
Comp. 13	0,28	0,01	1

Source: our own processing using R

Afterward, we conducted principal components analysis with 3 components (PC1, PC2, PC3) without any rotation. Standardized loadings didn't show clear results. Instead, we weren't able to conclude which variable belongs to which factor. Based on this, we used Varimax rotation in order to make the results definite. To rotate the factors, we used GPArotation package in R. The summary is displayed in Table 2.

Results in Table 2 points to the fact, that 2 variables (Process for ordering wasn't clear, Poor design) do not befit to one particular component. Based on this fact, we removed those 2 variables from the dataset and repeated the analysis. Kaiser-Meyer-Olkin test (Overall MSA = 0,82) and Bartlett's sphericity test (we rejected H0 with p-value = 1.486896e-63) proved that the use of factor analysis is appropriate.

Table 2. Principal components analysis, rotation = Varimax

Problem	PC1	PC2	PC3	h2	u2	Com
The website crashed	0,87	0,15	0,06	0,79	0,21	1,1
Loading was too slow	0,84	0,11	0,26	0,78	0,22	1,2
The website didn't run on my mobile device	0,91	-0,06	0,03	0,84	0,16	1,0
Navigation was confusing	0,78	0,24	0,16	0,70	0,30	1,3
Process for ordering wasn't clear	0,23	0,69	0,50	0,78	0,22	2,1
No proper translation in my local language	0,38	0,07	0,86	0,89	0,11	1,4
Poor design	0,53	0,65	-0,21	0,75	0,25	2,1
Poor or badly written content	0,35	0,80	-0,03	0,76	0,24	1,4
The website seen insecure	0,28	0,87	0,10	0,84	0,16	1,2
No contact or help desk available	0,78	0,29	0,19	0,73	0,27	1,4
Delivery times too long	0,63	0,21	0,33	0,56	0,44	1,8
No international shipping offered	-0,03	0,89	0,00	0,80	0,20	1,0
No suitable or convenient payment methods	-0,06	0,84	0,38	0,85	0,15	1,4

Source: our own processing using R

The analysis of the importance of the components presented in Table 3 suggests that for this analysis, 2 components are suitable. Those 2 components describe 71% of the cumulative variance.

Table 3. Importance of components

	Standard deviation	Proportion of Variance	Cumulative Proportion
Comp.1	2,33	0,49	0,49
Comp.2	1,55	0,22	0,71
Comp.3	0,93	0,08	0,79
Comp.4	0,78	0,06	0,85
Comp.5	0,65	0,04	0,88
Comp.6	0,6	0,03	0,92
Comp.7	0,57	0,03	0,95
Comp.8	0,47	0,02	0,97
Comp.9	0,38	0,01	0,98
Comp. 10	0,35	0,01	0,99
Comp. 11	0,32	0,01	1

Source: our own processing using R

We again run principal components analysis with 2 components (PC1, PC2) without, and afterward, with the use of Varimax rotation. Table 4 presents standardized factor loadings after the rotation procedure.

Table 4. Principal components analysis, rotation = Varimax

Problem	PC1	PC2	h2	u2	com
The website crashed	0,86	0,11	0,76	0,24	1,00
Loading was too slow	0,88	0,11	0,78	0,22	1,00
The website didn't run on my mobile device	0,89	-0,09	0,80	0,20	1,00
Navigation was confusing	0,81	0,24	0,71	0,29	1,20
No proper translation in my local language	0,58	0,15	0,36	0,64	1,10
Poor or badly written content	0,35	0,76	0,70	0,30	1,40
The website seen insecure	0,31	0,86	0,84	0,16	1,30
No contact or help desk available	0,81	0,26	0,72	0,28	1,20
Delivery times too long	0,70	0,21	0,53	0,47	1,20
No international shipping offered	-0,01	0,91	0,82	0,18	1,00
No suitable or convenient payment methods	0,05	0,89	0,80	0,20	1,00
	PC1	PC2			
SS loadings	1,00	1,00			
Proportion Var	0,42	0,29			
Cumulative Var	0,42	0,71			
Proportion Explained	0,6	0,4			
Cumulative Proportion	0,6	1			

Source: our own processing using R

In Table 4, we can see that component or factor 1 contains 7 variables and factor 2 contains 4 variables. We can conclude that the rotation was effective as it is possible to see that almost each variable has a high degree of belonging to the particular factor. The exception is represented only by the variable "No proper translation in my local language". However, it is clear that this variable belongs to the principal component 1. As an interpretation of these factors wouldn't be clear we decided to skip this step. As the last action in factor analysis, we created a correlation matrix from the factor score. As displayed in Table 5, correlation coefficients are close to 0, as was expected.

Table 5. Correlation matrix of factor score

	PC1	PC2
PC1	1.000000e+00	-2.175974e-16
PC2	-2.175974e-16	1.000000e+00

Source: our own processing using R

We used factor score in order to perform cluster analysis. We chose to use fuzzy clustering. As was defined in Objectives and Methods, the fuzzy logic shows a degree of belonging to cluster for each point rather than belonging solely to one cluster. In the beginning, we needed to determine the optimal number of clusters for analysis. We accomplished that by computing the optimal number of clusters using several other, more frequently used, clustering methods – Ward, Median, and k-means. Ward method suggested that an optimal number of clusters is 3. The median method suggested an optimal number of clusters of 2. For determination of clusters with Ward and Median method, we used R package NbClust.

Graph 1 displays the suggested number of clusters recommended by k-means. As possible to see, the optimal number of clusters is 3. Based on suggestions of above-mentioned clustering methods, we decided to use 3 clusters in our analysis. To conduct a fuzzy clustering analysis, we used FANNY package in R. During execution of fuzzy clustering analysis, we computed the degree of membership to particular clusters (C1, C2, C3) as long as belonging to particular cluster (M). Results are presented in Table 6.

As degrees of membership are presented in Table 6, we can claim that when analyzing some of the countries (for example Romania), we cannot confirm that the analyzed country belongs unambiguously to one particular cluster. It is possible to observe that the degrees of memberships are very close and this distance among degrees of membership to the particular cluster should be a subject of further discussion.

Graph 1. K-means optimal number of clusters
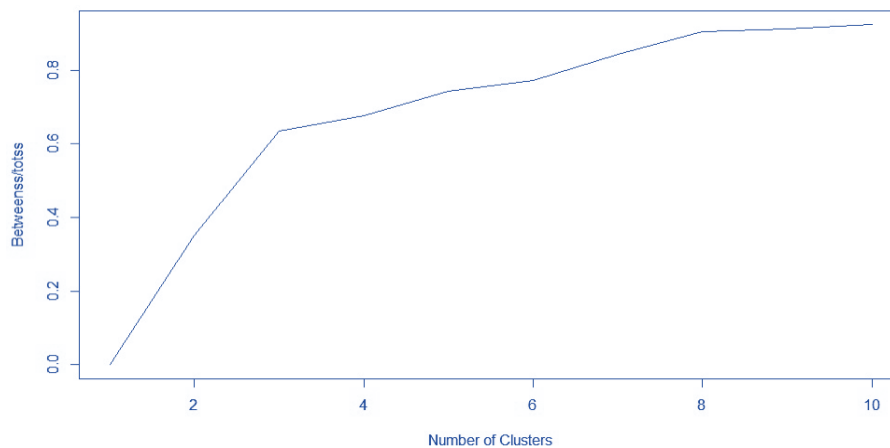
Source: our own processing using R

Table 6. Degree of cluster membership and clustering of analyzed countries

Country	C1	C2	C3	M	Country	C1	C2	C3	M
Austria	0,43	0,24	0,33	1	Ukraine	0,20	0,58	0,23	2
Belgium	0,58	0,20	0,23	1	United Kingdom	0,30	0,47	0,23	2
Bulgaria	0,30	0,46	0,24	2	Kenya	0,28	0,32	0,39	3
Croatia	0,30	0,48	0,21	2	Nigeria	0,27	0,48	0,25	2
Czech Republic	0,27	0,55	0,18	2	South Africa	0,27	0,46	0,27	2
Denmark	0,26	0,57	0,17	2	Israel	0,44	0,19	0,37	1
Estonia	0,62	0,20	0,18	1	Saudi Arabia	0,24	0,41	0,35	2

Country	C1	C2	C3	M	Country	C1	C2	C3	M
Finland	0,48	0,22	0,30	1	Turkey	0,20	0,57	0,23	2
France	0,42	0,21	0,36	1	UAE	0,28	0,29	0,43	3
Germany	0,64	0,17	0,19	1	Argentina	0,22	0,61	0,17	2
Greece	0,25	0,58	0,17	2	Brazil	0,23	0,23	0,55	3
Hungary	0,31	0,50	0,19	2	Canada	0,63	0,16	0,21	1
Ireland	0,44	0,19	0,38	1	Mexico	0,27	0,26	0,47	3
Italy	0,23	0,56	0,21	2	USA	0,27	0,50	0,23	2
Latvia	0,62	0,20	0,18	1	Australia	0,50	0,18	0,32	1
Lithuania	0,31	0,51	0,18	2	China	0,24	0,22	0,54	3
Netherlands	0,52	0,28	0,20	1	Honk Kong	0,33	0,19	0,49	3
Norway	0,48	0,32	0,20	1	India	0,23	0,45	0,32	2
Poland	0,19	0,60	0,21	2	Indonesia	0,22	0,50	0,28	2
Portugal	0,63	0,16	0,20	1	Japan	0,20	0,61	0,19	2
Romania	0,37	0,27	0,36	1	Malaysia	0,29	0,20	0,51	3
Russia	0,22	0,57	0,21	2	New Zealand	0,44	0,20	0,36	1
Serbia	0,54	0,27	0,20	1	Philippines	0,24	0,19	0,56	3
Slovakia	0,24	0,60	0,17	2	Singapore	0,31	0,22	0,47	3
Slovenia	0,48	0,23	0,30	1	South Korea	0,22	0,47	0,30	2
Spain	0,27	0,55	0,18	2	Taiwan	0,30	0,18	0,52	3
Sweden	0,60	0,21	0,19	1	Thailand	0,23	0,22	0,55	3
Switzerland	0,58	0,18	0,24	1	Vietnam	0,26	0,23	0,51	3

Source: our own processing using R

As clusters couldn't be explained based on the factors, we calculated the mean of each variable in order to find differences among clusters. Graph 2 presents the comparison of clusters. As we can see in the Graph 2, there are significant differences in perception of problems connected to Factor 1 by users from countries in Cluster 3. These users are more sensitive to website usability compared to countries in Cluster 1 or 2. Moreover, they demand the availability of customer support and they are not willing to purchase products which delivery takes too long. Nevertheless, there are not significant differences between Cluster 3 and Cluster 1 in problems connected to Factor 2, we can see that users in these countries might have a problem during purchasing process when there are not suitable payment methods available, no international shipping available or when the website seems insecure. The majority of countries in Cluster 3 are from the east of Asia, accompanied by UAE, Mexico, Brazil, and Kenya. However, in this particular cluster, Kenya and UAE represent the outliers. We can conclude that online retailers should be more focused on website usability when addressing the potential customers from these countries, as there is a higher probability that users abandon the website because of poor user experience during the online purchasing process.

There is an evidence that perception of usability issues of users from countries associated in Cluster 2 is lower compared to Cluster 1 or 3. As we can see, the main issue when purchasing products online from abroad is the delivery time. As presented in Table 6, this cluster is composed of countries from Asia, Europe, the rest of the African countries, USA. We can conclude that users from this cluster of countries are not affected by user experience when purchasing a product online from abroad. Cluster 1 is very similar to Cluster 2, however, we can see some of the issues that are crucial for this type of user. We can see that users from Cluster 2 demand the assurance of website security, they are concerned about the impossibility of international shipping and their purchasing process might be disrupted when there is not a convenient payment method. When comparing the rest of the variables, values are very similar to those in Cluster 2. This cluster is composed of countries of Europe, Israel, Canada, Australia and New Zealand. We can also see, that the length of delivery time is a key issue in the online purchasing process for users in each cluster.

Graph 2. Visual interpretation of conducted fuzzy cluster analysis
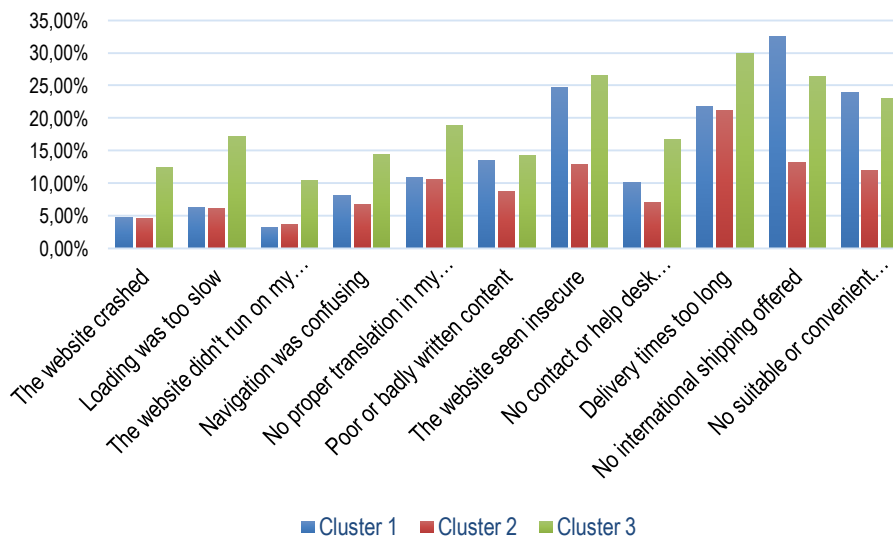
Source: our own processing using R

However, characteristics of the clusters cannot be generalized across all countries in particular clusters. Notice, that the results of fuzzy clustering presented the degree of membership to the particular cluster. Based on this, we recommend combining the characteristics of the clusters when analyzing countries where degrees of memberships to the clusters are close to each other. This combination of characteristics will ensure the higher accuracy of user experience and website usability.

Conclusions

Website usability affects the purchasing behavior and willingness of users to purchase a product online. The main objective of our study was to analyze the website usability issues users have when purchasing products from abroad. The topic of website usability was examined in our previous study and in the studies by Zaied *et al.* (2015), Pilar and García (2014), Liu, Li and Hu (2013), and Green and Pearson (2011).

By using factor analysis, we created two factors consisting of variables explaining website usability issues. Moreover, with the use of fuzzy clustering, we created and described three groups of users based on their perception of website usability issues during online purchasing from abroad. These results can be used by marketing, sales and IT professionals in companies operating on some or more of the observed markets in order to better prioritize their efforts towards potential customers. In addition, the results can be used in the educational process of educational institutions with economic- and business-oriented field of study.

Acknowledgement

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Experimental Study of Mobile Number Portability – Could It Be a Potential Breakthrough in Indonesia Telecommunication Market?

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Abstract:

This research emphasized on the moderation effect to customer knowledge which linked between MNP and switching attitudes. The result would led to the compositon domains, from call quality, customer complement, customer attachment, and corporate reputation on switching attitudes moderated by knowledge of MNP. Experimental method was excuted to 168 cellular card users in Indonesia. The experimental group further discrete into two catagories as 85 respondents with MNP knowledge and 83 respondents for control group. Analyzing the moderating model using multi-group PLS-SEM. The results demonstrate that the presence of moderation for knowledge of MNP did not affect significantly on switching attitudes for both groups. It indicated that the implementation of MNP will not interfere on the substantial ratio of customer switch to telecommunication industry in Indonesia. The originality of this study is by conducting the MNP experimental research in countries that have not applied MNP and adding switching attitudes with the moderation role from knowledge of MNP.

Keywords: corporate reputation; call quality; customer complement; customer attachment; switching attitudes; mobile number portability; knowledge of MNP

JEL Classification: C91; D21; L20; L96

Introduction

Mobile Number Portability or commonly known by the MNP abbreviation is technological innovation of telecommunications industry that provides convenience for customers who will switch to other operators without having to change the phone number they have. As an industry and technology development trend, MNP has been adopted in many countries. It does not only play an important role in stimulating competition and customer behavior, but also raising industry concerns due to the increased switching attitude and significant customer loss ratio (Shi *et al*. 2002, Beuhler and Haucap 2004, Podvysotskiy 2006, Shin *et al*. 2007, Park *et al*.2007, Hui 2009, Wen-Hua *et al*. 2010, Smura 2015, Marhayanie *et al*. 2017, Handoko *et al*. 2017). MNP was first introduced in Singapore in 1997, then Hongkong (1999), Spain (2000), Australia (2001) and Tanzania (2017) and to date there are 82 countries around the world implementing MNP policies with porting fee from free to paid and varying service activation times (Beuhler and Haucap 2003, Nimako *et al*. 2016). Before MNP was implemented in Finland, the ratio of customer losses (churn rate) of two major operators Telia Sonera and Elisa fluctuated about 15%, but after the implementation of MNP churn rate increased significantly 30% -50% for both operators (Smura 2015).

Research on MNP shows that MNP affects consumer switching and affects to switching intentions (Nimako 2014), Kaur and Sambyal (2016). Meanwhile, other research also conducted by Nimako *et al*. (2016) shows that customer still has low knowledge on the benefits of MNP so it is considered not to provide many benefits. Shin *et*

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al. (2007) explains that MNP provides an important role in the telecommunications industry in the US, but customers still consider the barriers to switch still high, thus discourage the intention to switch to other operators.

In the mobile telecommunications sector, corporate reputation is one of the boosters for the costumer to switch (Lu *et al.* 2011). The same research conducted by Kaur and Sambyal (2016) also suggests that the company's reputation has an effect on switching attitudes. Deng *et al.* (2010) describes customer perceptions of company include the attributes such as integrity, company ability or experience are important in building and maintaining long-term relationships with customer, because customers who feel that a company is trustworthy and have extensive experience will give satisfaction and company reputation is an important booster for customer satisfaction. Mobile Number Portability has not been applied in Indonesia. MNP has been discussed in 2011 by the Government. However, there is still resistance from the operator to start the implementation. In addition to the possibility of revenue decrease, another problem is the possibility of customers porting in large number from big operators to smaller new operators (Rizal *et al.* 2013). Mobile users in Indonesia mostly use prepaid services (95%). This reflects the importance of mobile number portability implementation in Indonesia. A frequent prepaid costumer will make the availability of block number limited and this will cause waste (Fauzan *et al.* 2013). Therefore, this research uses experiments. The contribution of this research result can provide input for government and telecommunication provider about the MNP application to switching attitudes. This research aims to meet the shortcomings or fulfill research gap from previous researchers. First, previous MNP research conducted based on customer perspectives (customer side) that examines the perceived price, customer satisfaction, switching cost, switching barriers perceived by customers, such as the research by Kim *et al.* 2004, Huan *et al.* 2005, Shin *et al.* 2007, Kumaravel and Kamdasamy 2011, Sreeejesh 2013, Martins *et al.* 2013, Singh *et al.* 2015, Nimako *et al.* 2016. Otherwise, this research examines the influence of corporate perspectives that include corporate reputation, call quality, which is prepared by the company for the customer (customer complement) and the relationship between the company with its customers (customer attachment) that has not been examined in particular. Second, previous research has been conducted only in countries that have experienced the implementation phase of MNP implementation, while very little research on MNP is conducted in countries that have not implemented it yet. Third, previous research used survey methodology in data collection while this research used experimental method. Fourth, this research used moderation factor of knowledge of MNP, and different from previous research that is conducted without moderation factor.

1. Literature review

1.1. Theory of technology innovation adoption

MNP is an innovation in the field of telecommunication technology, its application will be closely related to the basic theory of technological innovation adoption with the swithing intention. Some theories relevant to the application of MNP include Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Decomposite theory of Planned Behavior, The Unified Theory of Acceptance and Use of Technology (UTAUT) and The Unified Theory of Acceptance and Use of Technology2 (UTAUT2). These theories suggest that the trusts, beliefs, conveniences, benefits and experience of a technology will affect the attitudes and intentions of consumer switching (Nimako *et al.* 2014, Davis 1989, Taylor and Todd 1995).

Theory of Planned Behavior (TPB) uses the basic assumption that human beings as the main actors are rational beings so that the behaviors and actions that are actualized also depend on the information they receive systematically. One will calculate the possibilities and consequences before performing an action. This theory has provided very important information, how attitudes, subjective norms and behavior control (PBC) affect planned behavior and actual behavior (Bansal and Taylor 1999).

1.2. Switching attitudes

Based on the previous research, some experts concluded that the attitude is a part of customer evaluation before purchasing certain product or service. The most important concept of attitude can be used to predict behavior and has influence on customer final purchase decision (Ramadania *et al.* 2013, Peter and Olson 2010).

Kaur and Sambyal (2016) explained that the switching attitudes that plays a role in predicting switching intentions has not been widely discussed in the mobile telecommunications sector. Generally, attitude is more widely used for matters relating to the attitude and intention of individuals in behaving (Ajzen 1991). Bansal and Taylor (1999) revealed that attitude to switching is the main determinant of switching intention. Switching attitude is influenced by subjective norms and consequently affects the switching intention of consumer. Bansal and Taylor (1999) also concluded that switching attitudes was associated with switching intention. Price, reputation, service

quality, promotion, forced switching and other party recommendations are factors that cause the customers move to competitors (Keaveney 1995).

1.3. Knowledge of Mobile Number Portability (MNP)

Knowledge of MNP Innovation is defined as how far a customer knows and understands MNP that includes processes, perceived benefits, administration and time so that these services can be used by customers (Nimako *et al.* 2014). According to Roger (2003), in the process of using new technological innovations, knowledge plays an important role in which users will determine attitudes toward innovation in the form of rejecting or accepting in a series of evaluation processes over time.

Meanwhile, according to Cordell (1997), customer knowledge on the product or service is the main factor affecting the adoption process. According Marcketti and Shelley (2009) consumer knowledge on the product has a positive influence toward attitude. The more consumer knowledge and understanding of MNP policies and their implementation increases, the higher the tendency to understand the benefits or uses of MNP.

1.4. Conceptual framework

The research model consists of independent variables of call quality, customer complement and corporate reputation. While customer attachment acts as an mediating variable, and switching attitudes as dependent variables of research. Knowledge of MNP as a moderating variable.

Figure 1. Research Model
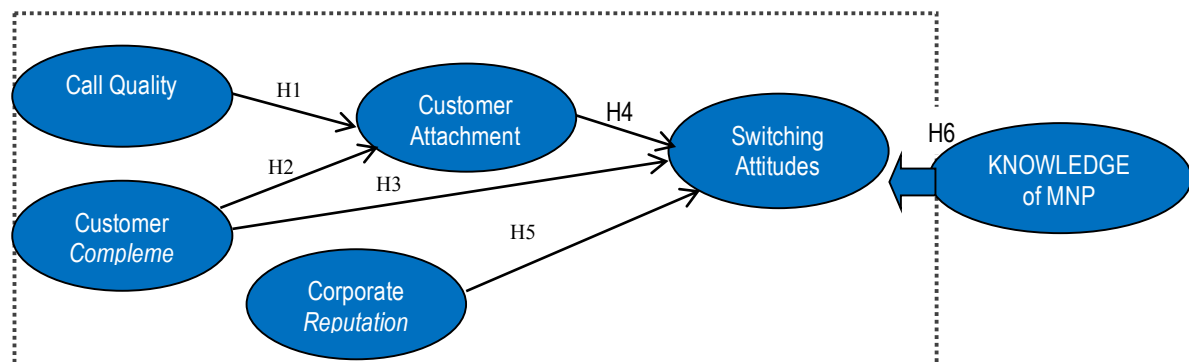
1.5. Research hypothesis

The relationship between call quality and customer attachment

Call Quality is defined as the quality of the network that includes the clarity of the phone's voice, the coverage and the speed of access internet perceived by the customer and is a key issue that creates customer satisfaction (Kim *et al.* 2004, Gerpott *et al.* 2001, Lee *et al.* 2001, Kim and Yoon 2004) and the customer's primary consideration to assess service products (Wen-hu *et al.* 2010).

Keller (2003), Brankus *et al.* 2012 and Schmitt (2009) explain that Customer attachment is a strong relationship between a customer and a company's product. The impact of high service quality, especially in the telecommunication provider industry could attract customers, and when they are satisfied, they will stay longer with their service provider even if the company charges a premium price (Ramadania *et al.* 2018). This strong attachment will increase the loyalty and experience perceived so it can decrease the vulnerability of migrating customers. Call quality will form the experience and form customer attachment relationship between the customer and the product and affect the switching attitudes as described by Keller (2003), Gerpott *et al.* (2001), Lee *et al.* (2001), Kim and Yoon (2004).

H1: Call Quality has a positive influence on customer attachment.

The Relationship between customer complement and customer attachment

Customer attachment is a close relationship between customers and companies that will generate experience for customers (Keller 2003). This experience can be a product or other service experience. The relationship between customers and companies can be bridged by preparing service facilities in order to serve customers maximally by preparing service outlets and call centers and customer centers as completeness required by customers (Wen-hua 2010). The easier the customer gets and the means to connect with the company will give effect of satisfaction and

decrease switching attitudes. The relationship between customer complement and customer attachments as described by Keller (2003), Wo and Fock (1999) can be explained by the following hypothesis:

H2: Customer complement has a positive influence on customer attachment.

The relationship between Customer Complement and Switching Attitudes

Wo and Fock (1999) explains that customer attachment facilities such as customer service are ranked fourth of the factors that lead the customers switch to other products. Relational switching costs: consisting of personal relationship loss and brand relationship loss costs, this type of switching cost involves psychological or emotional discomfort due to the loss of identity and the breaking of bonds. In their studies, they stated that all the three switching cost types appear to drive consumers" intentions to stay with their current provider (Ramadania *et al*. 2018, Burnham, Frels and Mahajan 2003). Narayan and Jain (2011) describes this as a major factor that causes customers to switch to competitors.

H3: High customer complement have the effect of lowering switching attitudes.

The relationship between Customer Attachment and Switching Attitudes

Customer attachment is a strong relationship between customers, products and companies that will increase loyalty and reduce the risk of switching customers and create experience between products and companies Keller (2013) and Schmitt (2009). Several researches have shown that customer attachment relationships are the main predictors of retention-related, especially in switching attitude and repurchase intention (Bansal *et al*. 2005, Fullerton 2003, Jones *et al*. 2000).

H4: High customer attachment will decrease switching attitudes

The relationship between corporate reputation and switching attitudes

Reputation is defined as an important social and intangible identity and contributes significantly to the performance and viability of the company (Rao 1994). Reputation is a key asset for companies that are valuable, distinctive, difficult to duplicate, non-replaceable, and give companies a sustainable competitive advantage (Wang, Lo and Hui 2003). Muffatto and Panizzolo (1995), Wang *et al*. (2003) explain that reputation plays a key role in measuring customer satisfaction and is the main thing to retain customer, consumer attractiveness and retention. Deng *et al*. (2010) explains that customer perceptions of companies related to attributes such as integrity, ability or experience are critical to buildand maintain the long-term customer relationships. When the customers feel that companies are trustworthy and have extensive experience, they feel more satisfied and the satisfaction will decrease switching attitude.

H5: High Corporate Reputation has a positive influence on switching attitudes.

Moderation hypothesis of knowledge of mobile number portability

This switching barrier is reduced if the customer has the experience and knowledge of the various alternatives available. In addition, knowledge of products or services, have the ability to evaluate alternatives, obtain and process information and consequently make decisions more in line with their needs (Bell *et al*. 2005, Sharma and Patterson 2000, Bigné *et al*. 2011, Muda *et al*. 2017).

In the context of consumer knowledge of MNP is defined as to what extent the consumers have adequate information and understanding of MNP policy, its implementation process, its usefulness and requirements. Consumer knowledge of new technologies and innovations is an important requirement for the adoption of innovation or technology (Rogers 2003 and Muda *et al*. 2017). Cordell (1997) empirically finds that consumer knowledge of existing product or service categories is a main factor influencing the adoption process. Similarly, Marcketti and Shelley (2009), Huang, Hsieh and Chang (2011) state that consumer knowledge to the product has a significant positive effect on the intention of switching. The more consumer knowledge and understanding to the MNP policy and its implementation improve Customers are increasingly likely to understand the perceived benefits or uses of MNP, have a positive attitude towards MNP.

H6: Knowledge of MNP has a positive influence on the group with MNP knowledge compared to the group without knowledge of MNP.

2. Methods

This research uses quantitative research and processed by using SmartPLS software. The experimental method is a quantitative method and defined as a research method that can be used to find the effect of treatment in a

predetermined condition. There are two groups, manipulation and final measurement with posttest. Then the researchers conducted a comparison of post test in the experimental group and control group, then tested statistically to determine the significance of the differences. Each subject receives a one-manipulation between subject design factors. The subject determination will be a member using a randomization technique so that each subject has the same chance of getting one of those manipulations.

There are 168 people and data collection through questionnaires. The respondents were grouped into two groups, namely experimental and control groups with equal proportion of 49% of the respondents in the control group and 51% of the respondents in the experimental group (Table 1). The selection of respondents by purposive sampling method with the criteria of respondents are customers who have used cellular cards at least 1 year ago which means that respondents are old mobile service users and not a new user using mobile phone service.

Table 1. Respondent Characteristics

	Total Group N = 168		Experimental Group N = 85		Control Group N = 83	
	Total	%	Total	%	Total	%
Gender						
Male	84	50%	42	49%	42	51%
Female	84	50%	43	51%	41	49%
Age						
16-24	137	82%	71	84%	66	80%
25-40	22	13%	11	13%	11	13%
>40	9	5%	3	4%	6	7%
Education						
High School	118	70%	57	67%	61	73%
Diploma	34	20%	20	24%	14	17%
S1	13	8%	8	9%	5	6%
S2	3	2%	0	0%	3	4%
Occupation						
Student	105	63%	53	62%	52	63%
Civil Servant	23	14%	10	12%	13	16%
University Student	31	18%	18	21%	13	16%
Private Employee	9	5%	4	5%	5	6%
Phone Fee/Month (Rp)						
< 20.000	66	39%	33	39%	33	40%
20.000 - 59.000	55	33%	26	31%	29	35%
60.000 - 99.000	16	10%	10	12%	6	7%
> 100.000	31	18%	16	19%	15	18%
Change the Phone Number in the last one year						
Never	76	45%	37	44%	39	47%
< 3x	70	42%	35	41%	35	42%
> 3x	22	13%	13	15%	9	11%
Mobile Operator						
Telkomsel	67	40%	39	46%	28	34%
Indosat	24	14%	16	19%	8	10%
Tree	42	25%	21	25%	21	25%
XL	1	1%	1	1%	0	0%
Not Answer	34	20%	8	9%	26	31%

Source: Results of the Researcher's Processed Data (2017).

Table 2. Construct and Measurement Items

Construct	Measurement Items	Source
Call Quality	▪ My mobile service provider has a clear voice call quality; ▪ My mobile service provider has a wide network; ▪ My mobile service provider has a satisfactory speed of Internet access.	Kim, Moon-Koo, Park, Myeong-Cheol, Jeong, Dong-Heon (2004); Wen-hua, Shi, Wu, Zhou, Jing-yi, Liu (2010)
Customer Complement	▪ My cellular service provider already provides service facilities like call center and good service office to serve customers.	Wen-hua, Shi, Wu, Zhou, Jing-yi, Liu (2010)

Construct	Measurement Items	Source
	▪ Service facilities prepared by mobile companies can be quickly and easily utilized.	
Customer Attachment	▪ I still want to establish a good relationship with my mobile phone company; ▪ My mobile service provider paid special attention to serve me; ▪ I am satisfied for the attention given by your current cellular company.	Sreeejesh (2013)
Corporate Reputation	▪ I believe that the cellular service provider I use has a good reputation; ▪ I think that my cellular service provider sells high quality, innovative and reliable services; ▪ In general, I am satisfied to use product / brand from cellular service provider that I use today; ▪ My mobile service provider provides an explanation of the various services they have (through advertising and other media).	Kaur, Gurjeet, Sambyal, Ritika (2013)
Switching Attitudes	▪ For me, switching to another provider is a good idea; ▪ For me, switching to another provider is a very useful and important thing; ▪ For me, switching to another provider is a profitable thing; ▪ For me, switchingto another provider is the right decision and wise; ▪ For me, switching to another provider is great fun; ▪ For me, switching to another provider is the thing I really want.	Kaur, Gurjeet, Sambyal, Ritika (2013); Nimako et al. 2016

3. Result and Discussion

3.1. Result

Checks manipulation of experimental group

Check manipulation is carried out to the experimental group after the manipulation process in the form of the MNP knowledge granting is done. A total of 85 respondents answered the check manipulation with the questionnaire. From the result of check manipulation, the respondents know and understand clearly all the manipulation items provided with the mean values in the range of 3.08 to 4.

Table 3. Checks manipulation of experimental group on MNP knowledge

	MNP in general	Benefit of MNP	Fee of MNP	Duration of Activation	Terms of MNP	Contract Bonding
Mean	3,99	3,96	3,08	4	3,90	3,66
SE	0,08	0,08	0,11	0,08	0,09	0,09
Median	4	4	3	4	4	4
SD	0,72	0,70	1,05	0,74	0,79	0,81
Range	4	3	3	3	3	3
Min	1	2	2	2	2	2
Max	5	5	5	5	5	5
Sum	339	337	262	340	328	311
Count	85	85	85	85	85	85

Source: SmartPLS software Result Test (2017).

Pre Check of Control Group

In the control group, respondents were also asked whether they knew about the previous MNP services or not. From 83 respondents of control group, 6 people answered never knew about MNP service.

Table 4. Pre check of control group

Respondent	Total	%
Total Respondent	83	100%
Know MNP	79	93%
Do not know MNP	6	7%

Source: SmartPLS software Result Test (2017).

Model evaluation

Model evaluation consists of outer model evaluation (measurement model) and inner model evaluation (structural measurement). In the outer model evaluation, this research used a reflective evaluation model.

Convergent validity

The Outer model evaluation was performed by evaluating the loading factor value > 0.6, the composite reliability (CR) > 0.7 and the AVE value > 0.5. After analyzing, the result ofX12value has a loading factor of < 0.7, so that the indicator should be removed and re-tested for outer model.

Table 5. Confirmatory factor analysis of measurement

		Total Sample = 168			Experimental Group (MNP) N= 85			Control Group (Non MNP) N= 83		
		Loading (>0.6)	Reability (> 0.6)	AVE (> 0,5)	Loading (>0.6)	Reability (> 0.6)	AVE (> 0,5)	Loading (>0.6)	Reability (> 0.6)	AVE (> 0,5)
1	CQ		0,869	0,689		0,864	0,682		0,870	0,690
	X1	0,773			0,702			0,827		
	X2	0,855			0,861			0,857		
	X3	0,858			0,901			0,807		
2	CC		0,895	0,810		0,891	0,803		0,898	0,815
	X4	0,889			0,873			0,900		
	X5	0,910			0,918			0,905		
3	CA		0,878	0,703		0,874	0,701		0,875	0,702
	X6	0,740			0,707			0,767		
	X7	0,885			0,879			0,886		
	X8	0,881			0,911			0,855		
4	CR		0,888	0,727		0,881	0,712		0,894	0,738
	X9	0,825			0,838			0,848		
	X10	0,882			0,824			0,920		
	X11	0,850			0,868			0,806		
5	SA		0,949	0,759		0,960	0,795		0,928	0,682
	X13	0,857			0,861			0,828		
	X14	0,875			0,922			0,807		
	X15	0,890			0,885			0,892		
	X16	0,909			0,935			0,865		
	X17	0,844			0,881			0,785		
	X18	0,848			0,874			0,773		

Source: SmartPLS software Result Test (2017).

Discriminant validity

Discriminant validity is performed by evaluating the AVE quadratic root ratio with the correlation of the constructs value and make sure the value is greater than the correlation value of each construct (Table 6) and indicating that there is no discriminant validity problem in the overall model.

Table 6. Reliability and Discriminant Validity

Contruct	Correlation of The Constructs Fornell-Larcker Criterion														
	Total Group (N=168)					Experimental Group (MNP) N=85					Control Group (Non-MNP) N=83				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
(1) SA	**0,87**					**0,89**					**0,83**				
(2) CQ	-0,31	**0,83**				-0,37	**0,83**				-0,32	**0,83**			
(3) CR	-0,24	0,60	**0,85**			-0,28	0,64	**0,84**			-0,27	0,54	**0,86**		
(4) CA	-0,11	0,44	0,47	**0,84**		-0,26	0,45	0,49	**0,84**		-0,01	0,44	0,45	**0,84**	
(5) CC	-0,19	0,37	0,44	0,42	**0,90**	-0,33	0,36	0,43	0,43	**0,89**	-0,09	0,37	0,46	0,41	**0,90**

Source: SmartPLS software Result Test (2017).

Evaluation of inner model

The analysis by evaluating the value of R^2 and the value of Q^2 (predictive relevance) that serves to validate the model. A good Q^2 result if the value is > 0 means that exogenous latent variable as explanatory variable able to predict its endogenous variable (model has predictive relevance).

Table 7. Inner Model Evaluation

Effect on Endogenous Variables	Total = 168	Experimental Group (MNP), N= 85	Control Group (Non MNP), N = 83
Customer Attachment (CA)	R^2 = 0,266/Q^2 = 0,159	R^2 = 0,278/Q^2 = 0,169	R^2 = 0,261 / Q^2 = 0,142
Switching Attitudes (SA)	R^2 = 0,065 / Q^2 = 0,035	R^2 = 0,138 / Q^2 = 0,090	R^2 = 0,088 / Q^2 = 0,041

Source: SmartPLS software Result Test (2017).

The results of inner model evaluation for the whole model (total group) show that the prediction power of the model can be seen from the value of R^2 for each endogenous variable.

Measurement Invariance of Composite (MICOM)

Measurement Invariance evaluation should be performed before conducting multi group analysis so that the researcher believes that the group differences in the research model are generated not from other factors, but from latent variables in the whole group and measurement scale.

Table 8. Measurement Invariance of Composite (MICOM) Test

MICOM Step 1				
Configural variance established? Yes				
MICOM Step 2				
Composite	Correlation c value (=1)	5% quantile of the emperical distribution of c	p-value	Compositional Invariance Established ?
SA	0,996	0,973	0,751	Yes
CQ	0,990	0,982	0,197	Yes
CR	0,987	0,909	0,553	Yes
CA	1,000	0,983	0,951	Yes
CC	0,998	0,989	0,572	Yes
MICOM Step 3				
Composite	Difference of Composite's mean value (=0)	95% Confidence Interval	p-value	Equal mean values ?
SA	0,531	-0,259 ; 0,238	0,000	No
CQ	0,160	-0,240 ; 0,281	0,157	Yes
CR	0,088	-0,241 ; 0,259	0,303	Yes
CA	0,179	-0,244 ; 0,257	0,136	Yes
CC	0,073	-0,244 ; 0,266	0,345	Yes

Source: SmartPLS software Result Test (2017).

Table 8. Measurement Invariance of Composite (MICOM) Test

MICOM Step 3				
Composite	Logarithm of The Compostite's variance ratio (=0)	95% Confidence Interval	p-value	Equal variance ?
SA	0,454	-0,390 ; 0,412	0,038	No
CQ	-0,009	-0,377 ; 0,330	0,491	Yes
CR	-0,160	-0,364 ; 0,380	0,217	Yes
CA	-0,210	-0,388 ; 0,353	0,180	Yes
CC	-0,206	-0,394 ; 0,396	0,203	Yes

Source: SmartPLS software Result Test (2017).

In this research at MICOM Step 1 (Configural Invariance) and Step 2 (Compositional Invariance) it has been seen that the original correlation value for each variable has p-value> 0,05 which means that the original correlation for each variable is not significant and it is concluded that compositional invariance has been established for all construct items and multigroup analysis can be conducted. However, if there is problem in measurement invariance in Step 1 and Step 2 (p-value < 0,05 for each original correlation value), then the researcher cannot continue multigroup analysis (Hanseler, Ringle and Sarstedt 2016) and should conduct analyze group separately (Hair, Sarstedt, Ringle 2017). The next analysis is step 3. In MICOM Step 3, it is seen that the composite mean value for Switching Attitudes (SA) is outside the confidence interval and the p-value <0.05. The composite invariance value for Switching Attitudes (SA) is also outside the confidence interval and the p-value <0.05. This indicates the limitations of measurment invariance, and therefore partial measurement invariance has been established, so that

this result allows the comparison of standard path coefficients (standarized) across the group by multigroup analysis (Hanseler, Ringle and Sarstedt 2016).

3.1.8. Multigroup analysis and significance

Table 8. Direct and Indirect effect. Bias-corrected 95% confidence interval and indirect effect of multigroup comparation result

Effect on Endogenous Variables	Total Group = 168			MNP Group = 85			Non MNP Group = 83		
	Direct Effect	T-Value	p-value	Direct Effect	T-Value	p-value	Direct Effect	T-Value	p-value
CA	$R^2 = 0,266/Q^2 = 0,159$			$R^2 = 0,278/Q^2 = 0,169$			$R^2 = 0,261 / Q^2 = 0,142$		
H1 : CQ	0,320***	4,129	0,000	0,320***	2,438	0,008	0,332***	3,006	0,001
H2 : CC	0,304***	3,360	0,000	0,320***	3,004	0,001	0,285***	2,040	0,021
SA	$R^2 = 0,065 / Q^2 = 0,035$			$R^2 = 0,138 / Q^2 = 0,090$			$R^2 = 0,088 / Q^2 = 0,041$		
H3 : CC	-0,111	1,176	0,120	-0,235***	1,826	0,034	0,285***	2,040	0,021
H4 : CA	0,035	0,353	0,362	-0,095	0,605	0,273	0,140	0,684	0,247
H5 : CR	-0,204***	2,391	0,009	-0,129	0,978	0,164	-0,336***	2,394	0,009
Indirect Effect	**Total Group**			**MNP Group**			**Non MNP Group**		
CQ --> CA --> SA	0,011	0,349	0,364	0,030	0,518	0,302	0,047	0,643	0,260
Percentile 95% bootstrap confidence	[-0,044 ; 0,062]			[-0,139 ; 0,048]			[-0,099 ; 0,137]		
CC --> CA --> SA	0,011	0,323	0,374	-0,030	0,547	0,292	0,040	0,563	0,287
Percentile 95% bootstrap confidence	[-0,038 ; 0,073]			[-0,122 ; -0,074]			[-0,060 ; 0,172]		

Note: ***significant at 0,05
Source: SmartPLS software Result Test (2017).

The output of PLS through the bootstrapping process, the results of the main hypothesis H1, H2, and H5, are accepted, while H3, and H4 are rejected and not statistically significant.

Table 9. Main Hypothesis

Relationship	Path	P-Value	Hypothesis
H1 : Call Quality→ Customer Attachment	0,320	0,000	Accepted
H2 : Customer Complement → Customer Attachment	0,304	0,000	Accepted
H3 : Customer Complement → Switching Attitude	-0,111	0,120	Rejected
H4 : Customer Attachment → Switching Attitude	0,035	0,362	Rejected
H5 : Corporate Reputation → Switching Attitude	-0,204	0,009	Accepted

Source: SmartPLS software Result Test (2017).

3.1.9. Analysis of Moderation Effect

Knowledge of MNP as a moderator is conducted to find out whether the variable of knowledge of MNP affects MNP Group and Non MNP Group in every hypothesis proposed and then analyzed with MGA (Multigroup Analysis).

Table 10. Moderation Hypothesis

Hypotesis		Path MNP	Path Non MNP	Diff.|MNP - Non MNP|	Permutation test p-value	Parametric test p-value	Welch-Satterthwait Test p-value	Test of Hypotesis
H 6	CC → CA	0,320	0,285	0,035	0,423	0,832	0,833	Rejected
	CC → SA	-0,235	0,013	0,247	0,898	0,213	0,215	Rejected
	CA → SA	-0,095	0,140	0,235	0,830	0,349	0,351	Rejected
	CR → SA	-0,129	-0,336	0,207	0,104	0,237	0,239	Rejected

Source: SmartPLS software Result Test (2017).

The result of multigroup analysis is concluded that the moderation hypothesis (Knowledge of MNP) did not affect MNP Group and Non MNP group. Therefore, all hypotheses were rejected.

3.2. Discussion

3.2.1. Analysis of main hypothesis

The purpose of this research is to know the effect of MNP knowledge moderation to switching attitudes. The model also analyzes the variables related to call quality, customer complement, customer attachment and corporate reputation. The result of research model measurement shows reliability and validity value, loading factor value, AVE, Composite Reablity which is in accordance with SEM-PLS requirements. The Measurement Invariance of Composite Model (MICOM) shows that configural (Step 1), compositional invariance (Step 2) and composite mean and variance (Step 3) are established and show partial measurement invariance results, so multi group analysis can be conducted (Hanseler, Ringle and Sarstedt 2016).

The main hypothesis analysis shows that Call quality significantly affects customer attachment. The relationships between companies and customers can be realized and perceived by customers through quality (Keller 2003). The quality of voice calls, the speed of internet access and the breadth of the signal coverage will improve the good relationship and satisfaction between customers and companies. This research showed significant results with a path coefficient of 0.320 and a significance value (p-value = 0,000), thus H1 was accepted. These results are also supported by research conducted by Brankus *et al.* 2012 and Schmitt (2009) states that the use of products will result in experience for customers and impact on the relationships building between customers and companies.

Significant influence also occurred on H2 hypothesis between customer complement and customer attachment with statistical research result showed coefficient of lane 0,203 and significance value of p-value = 0,000, hence H2 also accepted. Customer complement is company facilities for customers to get maximum service is the relationships actualization and customer needs. The research results also produced the same thing with the research conducted by Kaur and Sambyal (2013) and Wen-hua *et al.* (2010).

On the other hand, the facilities provided by the company to customers in the form of call center and customer service are not significant factors to reduce the switching attitudes, thus hypothesis (H3) is rejected. This condition can be explained that in the competitive climate of today's telecommunication industry competition, customers consider these facilities as basic necessities that should be provided by the company. Wo and Fock (1999) explains that customer attachment in the form of customer service facility is only ranked fourth which becomes the factor causing the switching of customer to competitor company.

The company relationship to customers through products and services (customer attachment) also cannot be a factor for the customer not to move to another company. Statistically, the relationship between customer attachment and switching attitudes is not significant (p-value = 0.362) and hypothesis (H4) is rejected. Nowadays, all cellular companies pay the same attention to customers with products and strategies to retain the customers. So the company's attention to the customers is perceived almost the same for all operators and not the barrier factor of switching attitude.

The analysis of main hypothesis shows that switching attitudes is significantly influenced only by the company's reputation. The higher the company's reputation the lower the switching attitudes. This is indicated by the path coefficient value of -0.204 (negative) and p-value = 0.009 (<0.05), so the hypothesis (H5) is accepted. The same results are shown by the research results by Kaur and Sambyal (2016) and Raza *et al.* (2012). In contrast to the research of Wen-hua *et al.* (2010) who found that the company's reputation has no effect on switching attitudes. This can be understood from the context of research that is only conducted on a single operator in China that is China Mobile operator. Customers are very loyal because China Mobile is the largest operators in China today, so the company's reputation does not provide significant results on switching attitudes.

3.2.2. Analysis of moderation hypothesis

This study provides the fact that MNP Knowledge does not provide a moderation role, so it cannot give a big impact to the proposed hypothesis and prove that the effect of moderation has not affected the switching attitudes. The research conducted by Hui (2009) assures that the benefits of MNP application can be maximally felt in telecommunications market conditions in the maturity phase (Mature Stage).

Currently, the Indonesian telecommunications market has entered the phase of saturation (has passed the phase of rapid growth).This can be seen from the data mobile subscription vs population that has reached 149.13%, (www.itu.int/ (2018). Nimako *et al.* (2014) explains that in the TPB theory to MNP, the customer will evaluate whether MNP policy provides benefits or not. In a broader sense, the evaluations give the possibility for the

customer to switchto a competitor. Subjective norm in TPB explains that perception of other people / social will give influence to individual to do something. Others have the influence to support or hinder to carry out a behavior, an individual will tend to behave if motivated by others who approve it to do the behavior. Behavioral Control (Perceived Behavioral Control) is the perception of ease or difficulty of a person in performing a behavior. This relates to beliefs about the availability of support and resources or the obstacles to do something. The MNP knowledge provided in this research has not been able to provide a social influence (the subjective norm) and the convenience that can be perceived directly by mobile service users. The knowledge provided is limited to general knowledge of MNP (prices, procedures, benefits, terms and contractual bond) which will be enforced by the cellular company if the service is implemented.

Conclusion and Implication

Conclusion

The research results found no significant change if MNP services are enforced. MNP does not have a significant effect on switching attitudes. The research in US by Shin *et al*. (2007) and Kaur and Simbiyal (2016) proves that customers still consider the high barriers to switch to other operators. So that undo the intention to move to another mobile operator even though MNP has been implemented. This research shows that the company's reputation is a factor that significantly influences the switching attitude. While other factors are facilities and attention to the company does not give effect.

Implication

This is an input to the industrial world to provide a proportional cost allocation in improving facilities and paying attention to customers. The main priority beside the company's reputation is paying great attention to network quality like as call quality, coverage, and speed of internet access.

Limitation and further research

One of the limitations in this research because the research respondents only in Pontianak and surrounding areas. So it needs to be careful to be generalized. Further research that can be conducted as a follow-up to this research is the use of an analysis tool with CB-SEM which requires normal distributed research data. The latent variable of research that influence switching attitudes should be added, not only customer attachment, customer complement and corporate reputation so it is expected to generate higher prediction of research model. The research results show that MNP knowledge has not been able to give significant influence to switching attitude, so it is necessary to do further in-depth research to analyze the cause. So if MNP is implemented in Indonesia, the cellular companies will have sufficient research information to determine appropriate strategies for MNP implementation.

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Methodology for Determining Materiality in Audit and Applying it when Assessing Detected Misstatements

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Abstract:

The goal of this study is to develop theoretical and methodological provisions, as well as practical recommendations for determining and applying the materiality level at all stages of audit, which ensures the efficiency of audit planning and minimizing the risk of revising the audit strategy at the final stage. The article substantiates the methodology on general determining of materiality levels for financial reporting for its essential items, performing audit procedures and the amount below which misstatements would be clearly trivial. The research novelty of the study is the rational mechanism developed by the authors to determine and substantiate the materiality levels in the audit. The methodology is focused on full and transparent documenting of determining and applying materiality at all stages of the audit. The authors' multilevel mechanism for determining the materiality is also a key criterion for the audit quality, because it ensures the compliance of the opinion from the auditor's report with the detected audit evidence.

Keywords: materiality; level; financial reporting; performance materiality; misstatements; trivial; auditor; opinion.

JEL Classification: M40; M42

Introduction

One of the most important aspects of using professional judgment when performing an audit is to determine and apply materiality. The evaluation of materiality in the context of applying international standards on auditing (ISA) becomes an element of not only audit planning, but also performing audit procedures for substantiate verification, development, and stipulation of the auditor's opinion.

At the same time studies of national (Bogopolsky 2013, Zhminko and Petukh 2011, Zhminko *et al.* 2013, Sokolov 2014) and foreign researchers (Curtis, Hayes 2002, Strojek-Filus 2013), practical experience of Russian and international audit companies (Schilder 2015, Materiality in audits, PwC 2011) differ considerably in terms of the methodology on determining materiality for audit purposes. The volatility of information materiality for the same reporting as determined by various auditors affects not only the quality of the audit, but also the opinion of a wide range of those who use auditor's reports, because it inevitably causes the possibility to manipulate the auditor's opinion (Cohen, Simnett 2015).

The purpose of this study is to develop theoretical and methodological provisions and practical recommendations for defining and applying materiality at all audit stages that allow quickly and efficiently planning and performing audit procedures, and evaluating their results, as well as controlling the quality of the audit task.

In accordance with the set goal, the following main tasks were solved:
- to substantiate the main factors influencing the determination of materiality in the audit;
- to develop a multilevel model for determining materiality and applying materiality levels for financial reporting as a whole, for performing audit procedures and audit evaluation of misstatements.

1. Material and methods

The object of the study was the ISA adopted by the International Federation of Accountants (IFAC), and their use by audit organizations.

The study used such general research methods as observation, abstraction, analogy, deduction, abduction, induction, analysis, synthesis, formalization, modeling, and grouping of data. The authors' method is peculiar by modeling internal audit standards of determining and applying materiality in various concepts for financial reporting

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based on detecting labile areas of auditor's opinion and neutralizing them by fixing boundaries of professional judgment.

During the study, the intercompany audit methodologies of two large audit networks (PwC and Ernst's' Young), the audit instruments used in the most demanded by Russian auditors auditing programs (Audit XP, IT-Auditor), and the intercompany quality control rules of 12 small audit organizations were surveyed and critically analyzed. Local regulatory documents for compliance with the requirements of ISA were analyzed. The theory and practice of analytical procedures for evaluating the aggregate and certain misstatements detected during the audit and the mechanism of their impact on the auditor's opinion in the auditor's report were studied.

2. Results and discussion

Materiality is recognized to be very important "marker" of the audit quality, and numerous international firms reveal and substantiate the procedure of determining it in key audit issues. For example, in the text of the auditor's report on the financial reporting of PJSC "*Gazprom Neft*" for 2016, the *PwC* audit company specifies and substantiates the level of materiality (Table 1).

Table 1. Disclosure of Information on Materiality in the Auditor's Report of PwC about Financial Reporting Made According to the RAS (Russian Accounting Standards)

Materiality in accounting as a whole	RUB 4,500 mln.
Method of defining	5% of the profit before tax
Substantiation of the applied materiality level	It was decided to use the profit before tax as the benchmark for determining the level of materiality because the Company is profit-oriented, and this benchmark is believed to be the most often considered by users for evaluating the Company's activity; besides, it is a universally recognized benchmark. Materiality was determined on the level of 5%, which is within the range of quantitative thresholds of materiality applicable to profit-oriented enterprises in this sector.

At the same time, while auditing the consolidated statements of the PJSC "*Gazprom Neft*" Group compiled in accordance with IFRS, in 2016, when determining and interpreting the materiality of misstatements, the auditing company was guided by another basic indicator (Table 2).

Table 2. Disclosure of Information on Materiality in the Auditor's Report of *PwC* about Consolidated Financial Statements

Materiality in the consolidated financial statements of the Group as a whole	RUB 10,500 mln.
Method of defining	2.5 % of the corrected EBITDA index
Substantiation of the applied materiality level	It was decided to use the corrected EBITDA index as the benchmark for determining the materiality level, because this benchmark is believed to be the most often used to evaluate the Group's activity. The top management uses the corrected EBITDA to evaluate the Group's operating efficiency because it shows the dynamics of revenues without taking into account the impact of some accruals. The materiality was determined on the level of 2.5%, which was within the range of acceptable quantitative thresholds of materiality in accordance with audit standards.

These examples show the following conceptual aspects of new stage of applying materiality in the audit, including:

- reasonable confidence of those who use financial reporting in its reliability is to a large extent substantiated by the auditor's opinion that in its turn is considerably determined by the auditor's professional judgment (Cohen *et al*. 2013). The threat of the subjective approach is neutralized by rather detailed interpretation of judgments about materiality applied by auditors. Today, the obligatory determination of materiality is not only documented in auditor's files (Schilder 2015), but is also voluntarily specified in the auditor's report. It improves understanding of the audit essence and the degree of trust of a wide range of users both to the audited financial reporting and to the auditor's report itself (Hollingsworth, Li 2011);
- the auditor's key tasks when planning and applying the level of materiality are to determine the primary user of the audited financial information and his information needs (Orlov 2014). It is the primary user's benchmark that should be basic for determining the auditor's materiality;
- the choice of the benchmark depends on the concept (rules, principles) of compiling the audited accounts (Hoffman 2016);

▪ the values of shares (percent) applied to the benchmark are variable. Their choice is also based on the auditor's professional judgment, but it must be within the range of acceptable values established by the audit standards (ISA 320, Handbook of International Quality Control, Auditing, Review, Other Assurance and Related Services 2015-2016).

The methodology of implementing the above key approaches to materiality in the audit based on International Standard on Auditing 320 "Materiality in Planning and Performing an Audit" will be considered (ISA 320, Handbook of International Standards on Quality Control, Auditing, Review, Other Assurance, and Related Services 2015-2016).

The standard acknowledges that it is difficult to define the materiality taking into account that the term is formulated with a various degree of accuracy in the rules for reporting under IFRS and according to the standards of many countries. Paragraph 2 of ISA 320 says: "... Although the concepts of financial reporting can differently describe the materiality, as a rule, they contain the following provisions:

▪ misstatements including omissions are considered to be substantial if they can reasonably be expected to separately or jointly have an impact on the users' economic decisions made on the basis of financial reporting;

▪ judgments about materiality are formed taking into account the associated circumstances and depend on the size and (or) nature of the misstatement;

▪ judgments on which issues are substantial for the users of financial reporting are formed taking into account general needs in financial information among users as representatives of a single group" (On the Enactment of International Standards on Auditing on the Territory of the Russian Federation: Order of the Ministry of Finance of Russia No. 192n dated 24.10.2016).

Thus, in accordance with IFRS, materiality is one of the elements of the broader concept of "pertinence" (relevance, urgency), which in its turn is one of the main qualitative characteristics of information that must be complied with when preparing IFRS financial reporting (IFRS International Accounting Standards Board (IASB), September 2010). In addition to the relevance, the Conceptual Principles of IFRS (Framework) also require the following characteristics from the reporting:

▪ understandability;

▪ reliability;

▪ compatibility, comparability (conceptual framework for financial reporting, 2010).

Analyzing the level of materiality according to the IFRS Concept, it is necessary to apply the combination of qualitative and quantitative characteristics of information. The main practical rules related to the concept of materiality, include the following:

▪ each substantial class of similar items should be presented in the financial reporting separately;

▪ nonsubstantial items should be grouped by nature or functions;

▪ items that are not substantial enough for the main reports may be specified in the notes to the accounts (IFRS Foundation, International Accounting Standards Board (IASB) September 2010).

Unfortunately, Russian legislative acts do not refer to the materiality of financial reporting, but the materiality of items of financial reporting is still specified in the Russian Accounting and Reporting Regulations and certain Accounting Regulations. Thus, the concept of "materiality" is revealed in RAR 4/99 "Accounting statements of the organization". As a whole, it is similar to IFRS, but it is focused on the impact on the users' judgment about the financial state and financial performance of the organization. According to clause 11 of RAR 4/99 "... indicators on individual assets, liabilities, income, expenses and business transactions should be presented in the financial reporting separately in case of their materiality, and if it is impossible to evaluate the financial state of the organization or financial results of its activity without the interested users' awareness about them". Thus, RAR 4/99 relates materiality to economic decisions of users of the accounting reporting. Some issues related to the materiality as applied to certain objects of accounting are disclosed in other RAR. For example, cl. 3 of RAR 22/2010 "Correction of errors in accounting and reporting" contains explanations as for the materiality of the error made in accounting and/or reporting. In particular, it is specified that an error is recognized as substantial if separately or jointly with other errors for the same reporting period it can have an impact on the users' economic decisions taken on the basis of the accounting reporting made for this reporting period. At the same time, the organization determines the materiality of the error independently, based on both the size and the nature of the relevant item (items) of the accounting reporting (Petukh 2012).

From a practical perspective, the level of materiality (the materiality threshold) is still to a greater degree a

quantitative indicator. However, despite this, there is no clear regulation of the figures in terms of materiality of an item in RAS, IAS (as well as in USA GAAP standards) (Kolobaeva, Brovkina 2017). Apparently, these standards mean that the determination of the level of materiality is more a matter of judgment rather than a mere calculation. More specifically, the issues on determining materiality are covered in the ISA. After all, such information is extremely necessary for auditors to perform their basic work (Piliuk 2016).

Thus, ISA establish the auditor' rights and duties on determining and applying several levels of materiality (Table 3).

Table 3. Levels of Materiality Determined for Planning and Auditing (Developed by the Authors)

Materiality level	Applying at various audit stages			Auditor's obligations on determining the value of materiality level	Value calculation
	Planning	Substantive procedure	Evaluation of misstatements at the final stage		
Level of materiality for the financial reporting as a whole (ML_{FR})	+ Calculated and applied for calculating other levels	-	A benchmark for taking decisions about materiality of aggregate misstatements and modifications of the auditor's report	Obligatory indicator (cl. 10 ISA 320)	$ML_{FR} = \frac{V_{Bm} \times L_m}{100}$, where V_{Bm} is the benchmark value, L_M is the level of materiality for the benchmark, %.
Level (levels) of materiality applied to certain types of transactions, account balance or revealing information (LM_A)	+ Calculated and applied to develop a strategy of audit for substantial types of transactions, account balance and revealing information	-	A benchmark for taking decisions about materiality of some misstatements in substantial items of the financial reporting and modifications of the auditor's report	Optional indicator (cl. 10 ISA 320). It is defined if under certain circumstances of the organization there is one or several certain types of operations, account balances or revealing information whose misstatements for the values being lower than the materiality level for the financial reporting as a whole can have an impact on users' economic decisions taken based on the financial reporting.	$LM_A = \frac{VI \times L_M}{100}$, where V_{BM} is the value of certain indicator (a certain type of transaction, account balance or revealing information), L_{MC} is the level of the materiality for the indicator, %; $LM_A \leq ML_{FR}$.
Performance materiality (M_P)	+ Calculated and applied to develop certain auditing procedures	+ Applied as the main criterion when selecting substantial auditing elements and aggregates (levels)	+ Applied as the main criterion to define the need to revise the audit strategy and plan (in case of detecting substantial misstatements)	Obligatory indicator (cl. 11 ISA 320).	$M_P = \frac{ML_{FR} \times L_{EV}}{100}$, where L_{EV} is the level of expected veracity of the financial reporting, %; as a rule, it is determined on the level of 50-80%; $M_P \leq ML_{FR}$.
Amount below which misstatements	-	-	+ Applied as a value below which	Obligatory indicator (cl. 15 ISA 450). It determines the level	$A_{MT} = \frac{ML_{FR} \times L_{MM}}{100}$, where L_{MM} is the "minimum" level of

Materiality level	Applying at various audit stages			Auditor's obligations on determining the value of materiality level	Value calculation
	Planning	Substantive procedure	Evaluation of misstatements at the final stage		
would be clearly trivial (A_{MT})			misstatements would be clearly trivial	of misstatements, the sums' accumulation of which will not clearly have substantial impact on the financial reporting	materiality, %; as a rule, it is determined on the level of 5-10%.

Most levels of materiality are determined at the planning stage, when it is not yet possible to predict what corrections the benchmarks will undergo during the audit. That is why ISA 320 obliges the auditor to revise the materiality for the financial reporting as a whole, and if applicable, for certain types of transactions, for account balances or revealing information in cases when during the audit he learns the information that would make him determine another value. If the materiality is revised downward, the auditor should determine whether it is necessary to revise the materiality for performing audit procedures, and whether the nature, terms and extent of further audit procedures remain relevant, *i.e.* it can be necessary to revise the audit strategy and plan (On Enactment of International Standards on Auditing on the Territory of the Russian Federation: Order No. 192n of the Ministry of Finance of the Russian Federation dated October 24, 2016).

Thus, our studies have shown that the most important aspect for substantiating a professional judgment related to the materiality for practicing auditors is a certain scenario for establishing separate (obligatory) levels of materiality for the purposes of fixing in intercompany standards of audit organizations and individual auditors.

3. Level of materiality for financial reporting as a whole

The scenario of determining the level of materiality for the financial reporting is based on the information needs of primary users of this reporting. At the same time, ISA 320 acknowledges that such users must have a rather high level of competence to use financial information for their own purposes (Figure 1).

Figure 1. Key Features of the Primary User of Financial Reporting
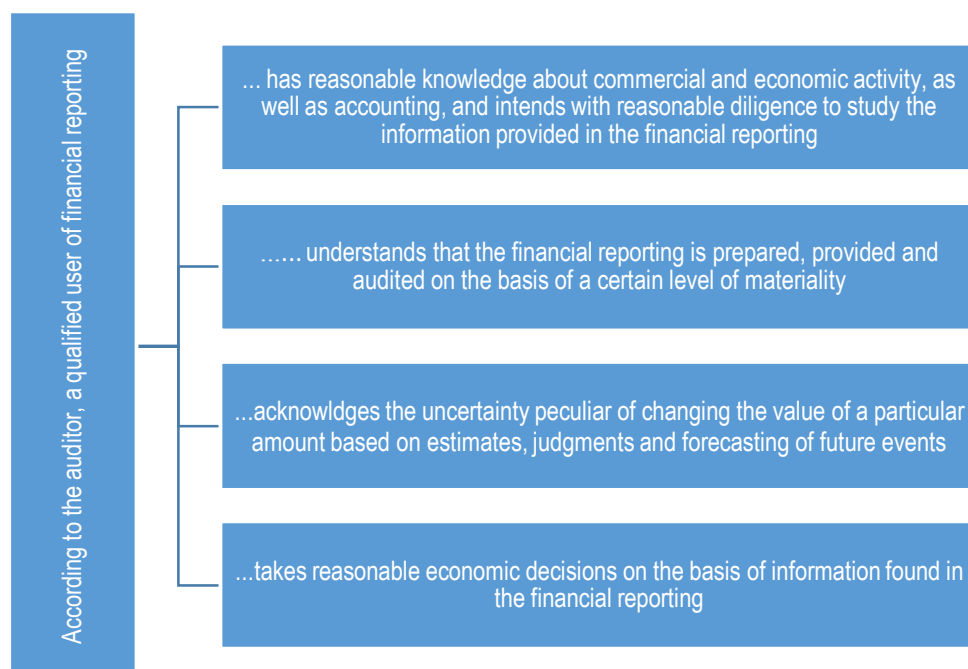
According to Table 1, the selected benchmark and the level of materiality for this indicator, in percent, have an impact on the level of materiality for the financial reporting as a whole.

The algorithm for determining the benchmark should be established by the intercompany standard of the audit organization and, for example, can look like the following:

- it is necessary to establish the primary user (users) of the financial reporting and his (their) key information needs. For example: for most owners of commercial organizations, the indicator of profit (before tax, net, etc.) is of top priority for taking management decisions; if the reporting of a commercial organization is submitted to a bank for review of a loan application, the value of net assets, revenues can be an appropriate choice; if the primary user of the reporting is the owner of the property (state), it is appropriate to choose the value of assets, and for a nonprofit organization, the key performance indicator is expenditures;
- if the chosen indicator is volatile in time or considerably differs from the expected value (industry average, planned, etc.), it is reasonable to consider other variants of the benchmark;
- the procedure for determining the level of materiality in percent for the benchmark is also fixed in the intercompany standard. At the same time, the recommended values are found in the Application Guide and other explanatory materials to ISA 320 (cl. A7): for the volume indicators (the value of assets, revenues, and expenditures) it is reasonable to use the level of 1-2%; for profit indicators – not more than 5%, and for individual cost indicators (structural elements of assets, liabilities, cash flows, etc., for example, net assets) – 5-10%.

When choosing a certain level from the above intervals, it is necessary to take into account the value of the risk of a substantial misstatement of the financial reporting and follow the rule of the inverse interdependence between the risk of a substantial misstatement and the level of materiality. Thus, in the initial audit when the risk is high, it is reasonable to select the minimum value of the materiality level in the interval (for example, 2% of profit or 1% of revenue).

4. Level of performance materiality

The goal is to determine the "threshold" of the values in the aggregates of elements under study that are considered important for this audit task. The practice of auditing allows mentioning the situations when it is appropriate to apply this criterion:

M_P is determined, as a rule, in the amount of 50-80% of ML_{FR}.

ISA 320 demands from the auditor to determine this criterion on a level of not higher than the materiality for the financial reporting as a whole. Why, after all, is it reasonable to reduce the level of materiality for performing audit procedures?

"Discounts" to the level of materiality in the amount of 20-50% appeared in international audit companies due to the accumulated experience of revising the materiality when evaluating the detected misstatements (PwC 2011). If the benchmark is considerably corrected downwards as a result of the detected misstatements, the level of materiality for the financial reporting as a whole should be revised. As a consequence, it requires correcting of the audit strategy, new audit procedures in terms of the aggregates and elements that were previously evaluated as nonsubstantial, which is rather difficult at the stage of completing the audit task. If the correction of the materiality level for the financial reporting as a whole is found within the "discount" interval, the strategy should not be revised.

Undoubtedly, the unreasonably high materiality "discount" for the financial reporting as a whole causes unnecessary labor intensity of the audit. That is why the level of materiality for performing audit procedures should be determined based on the level of expected misstatements, as well as risks of substantial misstatement of reporting on its qualitative (nonsummary) criteria. The higher the risk is, the greater the "discount" to ML_{FR} is. For example, in a primary audit, it is reasonable to set M_P on the level of 50% of ML_{FR}.

5. Level of amounts below which misstatements would be clearly trivial

ISA 320 does not define this criterion. Consequently, at the first glance the auditor does not have the duty to determine it at the planning stage and take it into account when performing the audit procedures. The need to understand the value of the amount below which misstatements would be clearly trivial appears before accumulating and interpreting the revealed misstatements.

Thus, in accordance with cl. 5 of ISA 450 "Evaluation of misstatements detected during the audit" "... misstatements detected during the audit, except for the amounts below which misstatements would be clearly trivial, should be accumulated by the auditor." Consequently, even at the stage of performing audit on substantive procedures and documenting its results, the auditor or other task performer should know the value of the threshold of the amounts below which misstatements would be clearly trivial. In fact, it makes it reasonable to determine A_{MT} at the stage of planning, simultaneously with other levels of materiality.

Thus, the goal of calculating A_{MT} is to determine the "threshold" of the values in the studied sets of elements that are considered to be nonsubstantial for this audit task. The misstatements below A_{MT} that are not related to dishonest actions can be recorded by the auditor, but obviously they do not require either any modifications in the auditor's report, or corrections of the strategy and plan of the audit (increase in the sampling size, improvement of the reliability of audit procedures, etc.). That is why ISA 450 allows not to specify the previously documented errors below this criterion in the working document on accumulating detected misstatements.

A_{MT} is set, as a rule, in the amount of 5-10% of ML_{FR}. This interval can be substantiated by the recommendations given in cl. A2 of ISA 450: "... The amounts below which misstatements would be clearly trivial have a completely different (smaller) value than the materiality determined in accordance with ISA 320, and unambiguously will not have consequences, regardless of whether they are taken separately or collectively, and which criteria of size, nature or circumstances were used to evaluate them".

The determination of the amounts below which misstatements would be clearly trivial is a new indicator for the countries that have not previously applied ISA, for example, Russia. However, it is possible to state that this criterion considerably enhances the rationality of the audit and allows auditors not to focus their attention on errors that neither individually nor collectively can have an impact on the reliability of reporting.

Developing the use of the criterion for rationalizing the audit, it is possible to recommend using it to exclude from the verification certain clearly insignificant items at the planning stage of the audit subject to:

- there is no or insignificant risk of dishonest actions when reflecting data of accounting objects;
- the accounted object is not a "marker" of significant requirements of regulatory legal acts,
- the violation of which can cause substantial financial sanctions and/or threat of violating the organization's going concern principle.

Conclusion

The studies have shown that materiality is a key criterion for the efficient organization of audit, an instrument for forming an opinion in the auditor's report, and subsequent evaluating of the quality of the performed audit task.

The level of materiality for the financial reporting as a whole is the most important component of forming an audit strategy, because it is the basis for calculating other levels of materiality. In addition, this criterion is the "threshold" for modification of the auditor's opinion at the final stage of the audit. The authors' mechanism that includes the evaluation of the priority information needs of those who use financial information and volatility of the basic indicators ensures the objectivity of performing the audit task.

Performance materiality is the basic indicator for identifying important markers of veracious financial reporting and sampling items. The authors' mechanism for determining a "discount" to the level of materiality when determining this indicator aims at implementing a risk-oriented approach to planning and obtaining sufficient audit evidence.

The authors introduce the level of an amount below which misstatements would be clearly trivial in the multilevel system of materiality indicators. Its determination reduces the complexity of the audit without compromising its quality.

Summarizing the results of the study, the authors consider the developed multilevel model of materiality to be the most rational for implementing the following aspects of the audit:

- to form the audit strategy, select important elements for selective detailed testing, and exclude elements below which misstatements would be clearly trivial;
- to form a sufficiently complete and transparent audit dossier;
- to substantiate the compliance of the auditor's report at the stage of evaluating the materiality of misstatements with the detected audit evidence.

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Corporate Social Responsibility and Company's Economic Efficiency: Russian Experience

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Abstract:

The article attempts to identify and analyze the relationship between corporate social responsibility (CSR) of the company and its economic efficiency. The technique of E.N. Kharitonova to assess the impact of CSR on the company's economic performance was applied. The originality and practical importance of the research consist in revealing the relationship between the socially responsible behavior of the company and its performance indicators. The purpose of this study is to assess the impact of corporate social responsibility (CSR) policies on the company's economic performance. Within the framework of this goal, it is expected to solve two main tasks: 1) to identify the impact of corporate social responsibility programs on the company's economic efficiency; 2) to reveal the features of the implemented CSR programs in Russia and positioning of corporate social responsibility from the viewpoint of managers, owners and shareholders of the company. The technique of E.N. Kharitonova was used by the authors as a tool for assessing the CSR impact on the company's economic efficiency. The study was conducted on the basis of the financial statements of the research object – the Gazpromneft Company. The originality of the research is in identification of the impact of CSR measures on the company's economic efficiency. The novelty of the research consists, first, in the application of Kharitonova's methodology to the analysis of the CSR policy influence on the economic efficiency of the commodity sector company. Second, the results of the analysis of the CSR policy positioning by the company's managers and shareholders are presented. The authors selected E.N. Kharitonova's technique as a scientifically grounded method of studying corporate social responsibility in terms of its influence on the economic efficiency of the company. The results of the research: 1. Based on statistical and analytical data, the authors justified the existence of a direct correlation between the implementation of corporate social responsibility programs and the company's economic efficiency; 2. The authors analyzed the attitude to the corporate social responsibility policy on the part of managers, owners and shareholders of the company, which revealed the different content and positioning of the CSR activities and different expectations from its implementation in the assessments of these groups of respondents. The study can be used as a practical

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basis for analyzing the relationship between the CSR policies being implemented by the company and its economic efficiency for forecasting the trends of its development.

Keywords: corporate social responsibility; economic efficiency; social obligations; socially responsible behavior; Kharitonova's model; Russia.

JEL Classification: A13; L21; Q51; P35

Introduction

In Russia, corporate social responsibility (CSR) is traditionally associated either with environmental activities, or with improvement of working conditions and increase in internal corporate culture, or with charity. Much more rarely CSR is associated with the positioning of the company in relations with business partners, business ethics and business reputation. Not many leaders of Russian companies fully realize the importance of corporate social responsibility, when combining commercial and public interests. The issue of the degree of economic viability of the CSR programs in the aspect of the conflict of financial interests of the companies themselves and the formation of the desired image among partners and in the society remains very debatable and ambiguous. This issue obviously has quite definite urgency and requires a substantiated response (Malysheva 2014).

The accumulated practical experience of the relations between manufacturing companies, the public and the state in the developed countries allows judging that there is no significant dissonance between private and public interests if the companies adhere to a balanced social policy.

With regard to the truly significant issue of the role of corporate social responsibility in the development of relations between all the participants in reproduction relations in the national economy, the authors set the goal of the study, which is to evaluate the impact of the Gazpromneft corporate social responsibility policy on its economic efficiency.

It is expected to achieve this goal as a result of a consistent solution of two main tasks, the first of which is the need to confirm (or refute) the existence of a relationship between the company's economic efficiency and its corporate social responsibility programs. The second target is to disclose features of the CSR programs implemented in the Russian context from the perspective of the hired personnel and the public.

The Gazpromneft Company is the object of this study, which carries out its activities in the field of hydrocarbon production. The data of financial and non-financial statements of Gazpromneft and information on its social programs is the subject of the study.

The research is based on the Kharitonova's methodology of evaluating socially responsible activities of industrial enterprises. The methodology is aimed at transforming the CSR qualitative characteristics into quantitative parameters (Kharitonova 2009).

In the global economy, corporate social responsibility is one of the factors for strengthening the business reputation of the enterprise, obtaining 'profitable' loans, and assuring investors of the company's stability. Modern companies of the developed countries (the US, Japan and Western Europe) take full advantage of the potential of socially responsible behavior, which enables them to create a good reputation, goodwill, and provide consumer confidence. Since 2001, the European Union has been implementing the project "*Policy for Corporate Social Responsibility: the EU experience*", which has brought its results in many European countries. For Russia, such socially responsible behavior is, rather, a rare exception; in general, the corporate climate is difficult to call socially responsible, companies are just beginning to adapt to the global trends.

Considering corporate social responsibility as a voluntary contribution of business to the social and economic development of the society and ecological strengthening of the territories, and extending beyond the minimum defined by the law, the authors understand how difficult it is for the private corporate sector of Russia to integrate into the already established world trends in the culture of doing business.

Corporate social responsibility began to form as a stable practice in the United States in the second half of the 20th century and overcame three consecutive stages in its development:

- the first stage took place from the 1960s to the mid-1970s, it was characterized by charity activities carried out by American companies and corporations. Business reputation and social image of companies were not related to each other during this period; participation in social projects was carried out not only in cash, but also in kind; the social assistance targets were determined by the political or business interests of the private sector;
- at the second stage, from the mid-1970s to the early 1980s, relations of a philanthropic nature began to form between the corporate sector and society; business interests began to be tied to the strategic corporate goals;

▪ since the late 1980s, the time has come for active socially-oriented investments; the amalgamation of state, public and private corporate interests began in solving social problems (Tyapukhin 2013).

Today, there is an absolutely definite attitude to socially responsible behavior, which can be divided into two types: in the first case, social responsibility is perceived as something ethical, loyal to the employees, state and society, and in the second case, it is regarded as a certain measure of the legal stability of business. Another position is based on the philosophical perception of social responsibility – the transformation of relations between business and society, "requiring leadership to implement and sustain it over time" (Palazzi and Starcher 1997).

Companies are trying to create a socially responsible reputation not only to justify the expectations of the society in the formation of high social standards, but also to contribute to raising the level and improving the quality of life of the population. In 1979, American scientist A. Caroll proposed the concept of corporate social responsibility, which was based on the economic, legal, ethical and discretionary expectations of society regarding the company. According to Carroll (1979), corporate social responsibility is a multi-level responsibility, called the 'pyramid of Carroll'. The pyramid principle is implemented consistently: at a basic level (economic responsibility), the company is responsible for its obligations to owners and consumers; the second level (legal responsibility) involves obligations to the state; moving to the third level (environmental responsibility), the company undertakes commitments to comply with moral and ethical principles; at the fourth (philanthropic) level – it voluntarily contributes to the support of science, education, cultural projects. The conceptual representation of corporate social responsibility is based on the fact that business – the first level of the pyramid – is the basis of socially oriented positioning. The transition to higher levels is possible only with such a distribution of resources between investments in the productive and social spheres, which allows optimizing economic and social interests. Later, in 1995, this concept formed the basis for the Clarkson model, which described methods for estimating CSR that are widely used in modern studies (Clarkson 1995).

In a number of cases where the research findings do not reveal the obvious positive impact of corporate social responsibility on the economic efficiency of the business, indirect influence is taken into account – the growth of employees' motivation (and, as a consequence, the growth of their labor productivity), which ultimately leads to an increase in market capitalization.

The features of the research object allow the authors to believe that for the purpose of this study Gazpromneft Company will be indicative and reliably reflecting the situation in the Russian hydrocarbon industry.

1. Literature review

The evaluation of corporate social responsibility implies, according to the authors' deep conviction, a comprehensive review of methods and approaches. Formation of approaches and methods for assessing the CSR impact on the economic performance of a company first began in the 1970s. Prior to this time, socially responsible behavior was mainly discussed in terms of the substantive position of the relationship between business and society. The first publications on this topic were published in the mid-1970s (Ramanathan 1976). The information on the involvement of businesses in social issues that was disclosed on the companies' initiative was analyzed by Abbott and Monsen (1979). However, the researchers asked themselves which parameters should be evaluated. The answer to this question allowed evaluating the qualitative content of social responsibility and the effects obtained by the company.

The discussion of the 1980s on the consensus on the importance of CSR for companies and society has made significant progress by developing terminology, in particular, the term 'the party concerned' – 'stakeholder'. 'Stake' made it possible to move from general CSR assessments to definite effects. Clarkson (1995) noted that corporate social performance can be analyzed and evaluated more effectively proceeding from the management of the company's relationship with stakeholders (the parties concerned) rather than on the basis of models related to the perception of CSR performance by the society.

At the turn of the 1980s-1990s, the concept of corporate social activity (CSA) was formed, which introduced the notion of 'performance' and fundamentally shifted the emphasis from evaluating abstract social responsibility to the results of real activity. Corporate social responsibility aroused a wide scientific and public interest in the impact of business on society through socially oriented projects and programs. Such an influence, ultimately, does not involve the description of intentions, but rather definite consequences and performance that can be evaluated (Preston and Windsor 1988).

In 1997, Lachman and Wolfe (1997) proposed the use of the new term 'organizational social efficiency' (OSE), which reflected the functional effectiveness of the impact of companies' activities based on the perspectives of the perception, business area, level of analysis, and time series. Despite the rather successful use at the start, in the future, the idea of OSE did not go any further, because Lachman and Wolfe were not the only ones who tried

to apply similar evaluation models from other areas of science. In particular, in 1998 Ruf, B. and coauthors (1998) proposed to use the concept of the "Analytic Hierarchy Process" (AHR), developed by Saaty (1980), to measure the CSR performance. The application of this method involves the decomposition of the analyzed company, then a comparative analysis of the data and the synthesis of the results obtained. The decomposition of socially-oriented activities is extremely important, in particular, it is commonly believed that the company's attitude to its consumers; labor relations between employees and the employer; respect for the rights of women and minorities; environmental policy and principles of building relations with local authorities and the public are the key areas (Ruf *et al.* 1998).

The concept of evaluation decomposition has become widespread in theory and in practice. Later, in 2000, based on similar principles, a similar design of the three-level CSR evaluation was proposed by Mitnick (2000):

- the metric of performance evaluation that implies assessment of commitments, involving the identification of the values underlying the corporate social responsibility or the company's activities, which allows balancing values that contradict each other;
- the metric of performance measurement that evaluates achievements and ratifies the declared values;
- the metric of performance perception and belief, necessary to understand the results of CSR by stakeholders.

The studies of Margolis, Elfenbein and Walsh made it possible to distinguish three levels of corporate social responsibility assessment (Margolis and Walsh 2003, Margolis *et al.* 2007):

- legitimacy from the viewpoint of institutional business;
- value from the position of the companies themselves;
- effectiveness from the perspective of the CSR stakeholders.

The practice of assessing the effectiveness of socially responsible behavior enabled to develop the most effective tool, which became the method of 'Triple Bottom Line Reporting'. This method relies on the collection, processing and analysis of an array of financial and economic data, which allows giving a full description of the company's financial status and evaluate its capabilities in the implementation of socially-oriented projects and programs.

The work of Berman *et al.* (1999) widely acknowledged in scientific circles, is devoted to the consistency of the interests of the stakeholders and management with the strategy and financial performance of the company. In particular, two models were proposed:

- a strategic stakeholder management model proceeding from the fact that managerial solutions depend solely on its ability to improve financial performance of the company;
- an intrinsic stakeholder commitment model determining a normative (moral) commitment of the company to treating stakeholders in a positive way, and this in turn, shapes the company's strategy and ultimately the dynamics of its financial performance.

Obviously, however, financial performance cannot be the company's sole goal, since such a goal, in fact, is instrumental and to a certain extent discredits the idea of moral obligations.

The actively discussed by the scientific community the impact of the company's industry affiliation on the generated CSR performance led to the creation of several concepts. In particular, Griffin and Koerber (2006) singled out five industry characteristics that affect relationships with employees, consumers, communities and the natural environment: regulation, concentration, industry rivalry, industry visibility, the manufacturing sector.

The need to include industry parameters in the methods for analyzing the CSR effectiveness is obvious, and Heinze *et al.* (1999) has empirically proven that industry features affect the nature of the CSR relationship to the financial performance of companies of different industry affiliation. It is quite reasonable that industry features should be reflected in the parameters and coefficients of CSR evaluation, as it determines the areas of social investments, influences the effectiveness of the social programs being implemented, and also predetermines the choice of the categories of shareholders, the power of their influence and legitimacy.

Orlitzky and Benjamin (2001) examined in detail the mutual influence of the company's socially responsible behavior and the risks with which its social activities are associated. Their findings allowed them to justify the necessity of incorporating the effects of market and financial risks into the parameters of the CSR program effectiveness evaluation. They managed to show that the market will primarily react to changes in socially oriented activity of the company: strengthening the relationship with stakeholders positively affects the reputation and investment attractiveness of the company. This eliminates the risk of a decline in stock prices and does not enable to 'fall' significantly the market capitalization of the company. The inflow of investments opens access to resources, which reduces financial risk and strengthens the ability to financial planning for different time horizons. The latter circumstance makes it possible to definitely plan the social budget. At the same time, Orlitsky and Benjamin

concluded that there is a direct and reverse link between market and financial risks depending on the amount invested in socially oriented projects.

Studies of the topic of socially responsible corporate behavior remain relevant to this day, which is manifested not only in the strengthening of its globalizing role, but also in the development of positive economic effects for the companies themselves. Current publications on topics related to CSR in various fields of research affect a wide range of industry areas in many countries. Depending on the degree of theoretical and practical orientation, they are of undoubted scientific interest in the study of issues related to:

- justification of the expediency to prolong corporate socially responsible programs in the US commercial banks in the conditions of crisis manifestations (Cornett *et al.* 2016);
- the influence of the implementation of corporate social responsibility on the quality of the products produced by the company (Banerjee and Wathieu 2017);
- the impact of CSR on the company's capital allocation efficiency (Bhandari and Javakhadze 2017);
- the company's productivity and the formation of social capital (Jha and Cox 2015) and the effectiveness of its operation (Kadłubek 2015);
- the corporate tax policy (Laguir *et al.* 2015).
- the impact of local corporate social responsibility activities on the company's shareholder value (Byun and Oh 2018);
- quality of managing corporate social responsibility and financial performance of the company (Wang and Sarkis 2017).

Economists and politicians often turn to the concept of creative economy in search of new drivers of economic growth. This topic is especially relevant in the context of searching for alternative sources of development of Russia's resource economy (Tolokonnikova 2014). The solution of this problem cannot be found without innovative technologies in all spheres of the company's activity – from the production technology to the methods of personnel management and sales of products. The use of innovation, however, always involves risks and high costs, whereas corporate social responsibility projects offer a wide range of favorable opportunities that are not risky and have enormous potential.

The largest companies and organizations of Russia, branches and subsidiaries of international corporations began to implement socially oriented projects, pay more attention to employees, and follow the tax culture in good faith, since they have financial capabilities. However, most medium and small companies do not have such an opportunity, and therefore the prospects for implementing corporate social responsibility programs are not obvious for them. They also do not understand the preferences that can be made available if the concept of CSR is followed (Razumovskaya *et al.* 2017).

In the Russian business environment, there are practically no sustainable mechanisms for the formation of conscious integration into corporate social responsibility programs. To a large extent, the absence of such mechanisms is compensated by state social policy regulating many social guarantees in the country. In this connection, the integration processes in the Russian corporate sector can be considered the most positive factor – it will to some extent determine the nature of the attitude of business to the concept of corporate social responsibility and the prospects for long-term development of socially-oriented business. When the importance of CSR and its positive external effects become apparent to the business itself, the need for state paternalism will be leveled (Musgrave and Musgrave 1989).

The notions of 'corporate social responsibility' and 'business reputation' formed by socially responsible behavior create goodwill – a prestige that is able to act as a long-term asset that can be valued and can influence the market capitalization of the company (Sharkov 2010). The potential of goodwill is determined by a number of factors: the quality of products and services of the enterprise, management effectiveness, and the attitude of the state, consumers and business partners to the company. It is important for the society in what ways the company achieves its goals, by which social principles it is motivated in its activities.

2. Materials and methods

In the Russian public practice of assessing corporate social responsibility, there are methods for measuring the social investment index the official authorities rely on (Blagov *et al.* 2014, 23–30).

1. The index of relative social investment:

$$IL = \sum_{i=1}^{n} C_i / \sum_{i=1}^{n} L_i \,, \tag{1}$$

where: C_i is the amount of social investments of the *i*-th company (voluntary and committed expenditures); L_i is the average number of employees in the *i*-th company; *n* is the number of companies participating in the study.

2. Modification of the social investment index:

$$IS = \left(\sum_{i=i1}^{n} C_i / \sum_{i=1}^{n} S_i \right) \times 100\%,$$ (2)

where: S_i is the gross sales volume of the *i*-th company.

3. The index of social investment profitability:

$$IP = \left(\sum_{i=i1}^{n} C_i / \sum_{i=1}^{n} P_i \right) \times 100\%,$$ (3)

where: P_i is the amount of profit before tax of the *i*-th company.

However, these methods do not, first, presuppose an assessment of the relationship between corporate social responsibility and the company's economic efficiency and, second, do not have normative meanings, which makes the analysis findings less specific and too volatile to be interpreted; third, the formats of the presented indices assume only an internal corporate evaluation, and therefore, there is no possibility to evaluate the external effects for the company itself from its social policy.

The implementation of CSR projects is only available to major Russian companies and their subsidiaries due to a high cost of such activities. Unified taxation and administrative standards for all business categories including small and medium-sized ones hamper the implementation of social programs, especially in outlying regions far from the central part of the country, their funds being simply inadequate for CSR. Small businesses can only afford to hold occasional charitable activities or to participate in some events at the regional or local level. Factors that complicate the allocation of funds for social activities include the country's historical past, macroeconomic instability, and geopolitical conditions, partly – the climate and geographic location, the unevenly populated extended territory, the business mentality, concentration of resources in the central region of the country.

Russian companies do not have ample opportunities for integration into international financial and economic relations and access to foreign investment, which is due to both weak domestic demand in Russia and geopolitical trends. Open access of Russian corporates to the world financial and commodity markets could become a strong incentive for the CSR development in Russia and would encourage economic growth and increase competitiveness. Nevertheless, quite well-defined traditions in Russia are being formed associated with understanding the meaning of social responsibility and its content. Undoubtedly, the specifics of Russian business and the sectoral composition of the economy have been making a certain impact on the scope of the term 'CSR'.

The composition of corporate social investment is largely determined by the industry affiliation of companies: some pay more attention to environmental protection and cost-effective resource use, while others focus on staff development and employee health care or other social projects (Figure 1).

Figure 1. The composition of corporate social investment
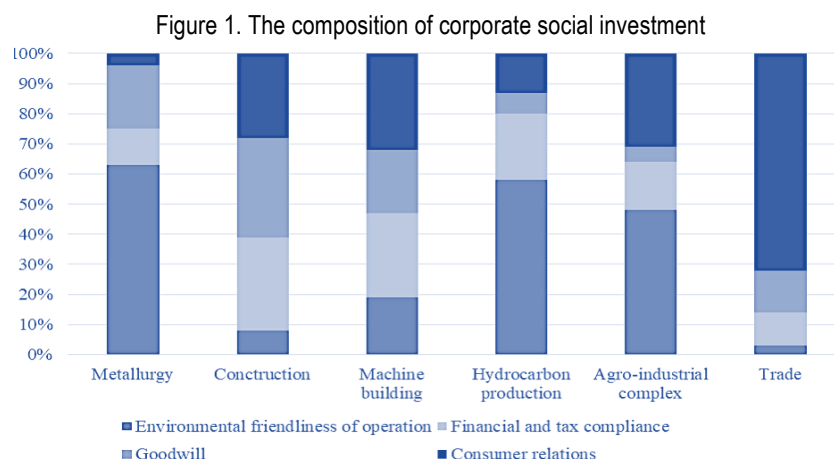
Source: Compiled by the authors, based on Blagov *et al.* 2014.

As follows from the figure, socially-oriented programs in different sectors are very unevenly distributed. Such differences are due to the industry characteristics of environmental impact and health damage to the staff employed by companies, many of them being city-forming in the environment where they are located. The structure of activities that are part of the corporate socially responsible conduct is understood and treated differently by the population and the company management. The population's opinion is that CSR involves quality product release (35.5%), compliance with laws (30.4%), environmental friendliness of production (30%), and improvement of working conditions (22.5%). Other components of the CSR composition are shown in Figure 2.

Figure 2. Opinion of the population on the CSR composition

Source: Compiled by the authors based on Gazpromneft, http://ir.gazprom-neft.ru/
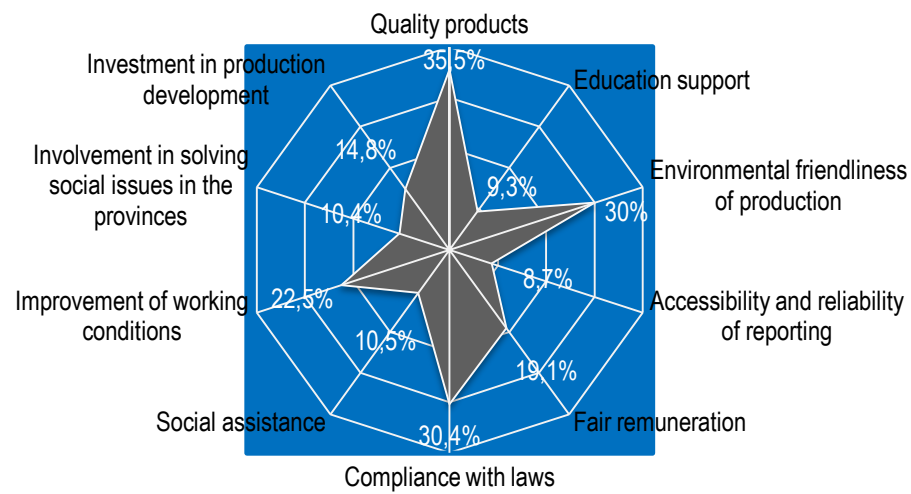
The company's management team in a slightly different ratio refers quality product release (35%), environmental friendliness of production (32%), improvement of working conditions (33%), and compliance with laws (28%) to the social responsibility of business, which is shown in Figure 3.

Figure 3. Opinion of management on the CSR composition
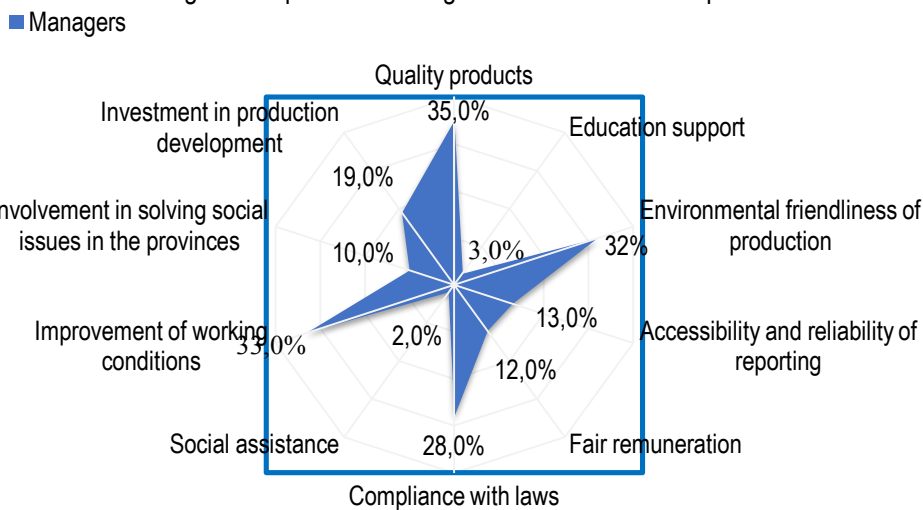
Source: compiled by the authors on the basis of Gazpromneft. Available at: http://ir.gazprom-neft.ru/

The greatest differences, as can be seen in Figures 2 and 3, are observed in such aspects as education support, social assistance and remuneration. According to managers, these aspects are less significant in social responsibility. In addition, the integrity of the employer company, transparency of reporting, investment in production and improvement of working conditions are essential for social responsibility, according to the management.

Speaking about the amount of corporate social responsibility financing, it is necessary to draw on comparable data on the hydrocarbon industry as a whole for a considerable period of time. The authors provide the volume of financing for a set of focus areas that can reasonably be considered to be socially oriented: environmental safety of operations, sponsorship and charity, development of business regions, financing of grants and scholarship programs, social infrastructure and social investments by the major hydrocarbon industry players in Russia over eleven years (Table 1 and Figure 4).

Table 1. The volume of Corporate Social Responsibility financing, million rubles

Companies/periods	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
LUKoil	15,890	14,667	19,254	19,720	22,754	23,770	42,311	82,058	71,274	25,017	23,444
Gazpromneft	23,859	22,022	28,910	29,609	35,221	37,851	67,266	128,216	104,815	65,834	41,382
Rosneft	65,684	60,627	79,589	81,514	91,413	84,332	162,111	271,817	192,374	165,243	108,943
Bashneft	8,756	8,082	10,610	10,866	11,834	14,648	23,475	48,722	33,541	24,161	15,438
Surgutneftegaz	8,828	8,148	10,698	11,012	12,609	12,604	24,888	43,593	38,782	24,358	14,557
Tatneft	9,782	9,029	11,853	12,002	14,722	15,884	26,233	52,569	40,878	26,991	17,043
Total:	132,799	122,575	160,914	164,723	188,553	189,089	346,284	626,975	481,664	331,604	220,807
Average industry value	22,133	20,429	26,819	27,454	31,426	31,515	57,714	104,493	80,277	55,267	36,801

Source: calculated by the authors based on Gazpromneft data, http://ir.gazprom-neft.ru/.

Visually, the trends in financing socially oriented activities are presented in Figure 4.

Figure 4. Trends in CSR financing dynamics for hydrocarbon companies in Russia, million rubles
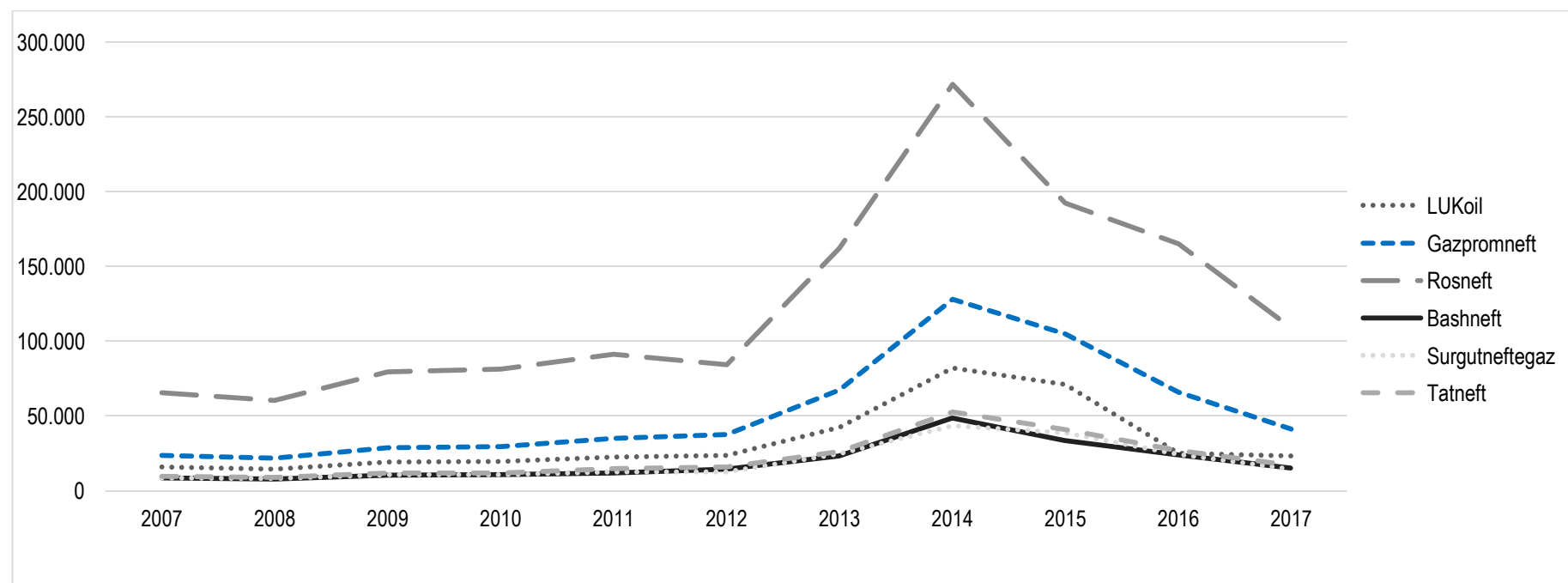
Source: compiled by the authors based on financial and non-financial statements of the companies.

The clearly visible trend in the dynamics of financing social activity lines can be explained by quite obvious reasons: the fall in international prices for hydrocarbons and, as a result, devaluation of the Russian national currency, that is, ruble against the currencies of developed countries. In the context of Russia's national economic dualism, when a large part of the budget and gross domestic product are provided by two sectors – the hydrocarbon (through oil and gas exports) and financial ones, which largely serves the interests and monetary flows of the first, a high degree of interdependence of these industries and, in turn, the entire economy depending on them make the economy extremely vulnerable. The challenge for Russia consists in the fact that it cannot affect the situation – the external environment is determined by a wide range of factors that are beyond the competence of particular states.

The devaluation shock period in the second half of 2014 led to a significant curtailment of spending on socially oriented activities in all the hydrocarbon sector companies. This equally applies to Gazpromneft. The volumes and dynamics of specified social expenditures of Gazpromneft are presented in Table 2.

Table 2. Social Spending Behavior of Gazpromneft, million rubles

Expenditure areas/periods	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Environmental compliance	14,315	13,213	17,924	16,285	20,428	21,151	41,342	76,929	62,889	42,917	23,038
Sponsorship and charity	1,432	1,321	1,445	2,073	2,813	2,648	4,036	7,693	6,288	3,633	3,664
Regional development	668	572	887	643	774	844	2,754	3,718	3,207	1,975	2,247
Scholarships and grants	224	264	431	524	282	446	913	1,426	938	825	957
Social infrastructure and social investment	7,158	6,606	8,191	9,058	10,866	12,733	18,182	38,414	31,462	16,458	11,643
Other	62	46	32	26	58	29	39	36	31	26	33
Total:	23,859	22,022	28,910	29,609	35,221	37,851	67,266	128,216	104,815	65,834	41,582

Source: compiled by the authors based on Gazpromneft data. Available at: http://ir.gazprom-neft.ru/

The data presented in Table 3 allow one to conclude that 2014 was a turning point for Gazpromneft when the trend changed from a growing one to a downtrend. The conclusion that the company has become less socially responsible is unlikely to be just, since the objective factors that have already been mentioned have affected it as well.

Table 3. Determination of the Social Expenditure Ratio (K_i) Relative to the Reference Values for Gazpromneft in 2007

Areas of social expenditure and cost effectiveness indicators	2007, million rubles	Reference value, million rubles	K_i	ω_i	$K_i \times \omega_i$
Environmental compliance	14,315	31,857	0.45	1.2	0.54
Charity and sponsorship	1,432	3,368	0.43	1.1	0.47
Staff remuneration	33,684	53,027	0.64	1.0	0.64
Regional development	668	1,663	0.40	1.3	0.52
Taxes, charges and duties to the budget	250,726	453,065	0.55	0.85	0.47
Social contributions to extra-budgetary funds	7,149	11,219	0.64	1.1	0.7
Social infrastructure and social investment	7,158	17,521	0.41	1.2	0.49
Goodwill	38,415	54,754	0.7	1.1	0.77
Education support (scholarships and grants)	224	657	0.34	1.2	0.41
Dividends paid to shareholders	53,018	36,920	1.44	0.85	1.22
Total	406,789	664,051	0.61	–	6.23

Source: calculated by the authors based on Gazpromneft data, http://ir.gazprom-neft.ru/.

As can be seen in Figure 5, the surge in social spending concurred with very difficult 2014, which is due to the need to preserve the social safeguard for the provinces in the face of devaluation shock and international price declines for hydrocarbons.

When building up strong relationship with regional authorities, Gazpromneft draws upon implementation of a wide range of investment, educational, and social projects. The company finances environmental protection activities and formation of social infrastructure in the regions of Russia consolidating its reputation as a socially responsible employer and business partner.

Figure 5. Dynamics of CSR financing volumes by Gazprom

Source: Calculated by the authors based on Gazpromneft data, http://ir.gazprom-neft.ru/.
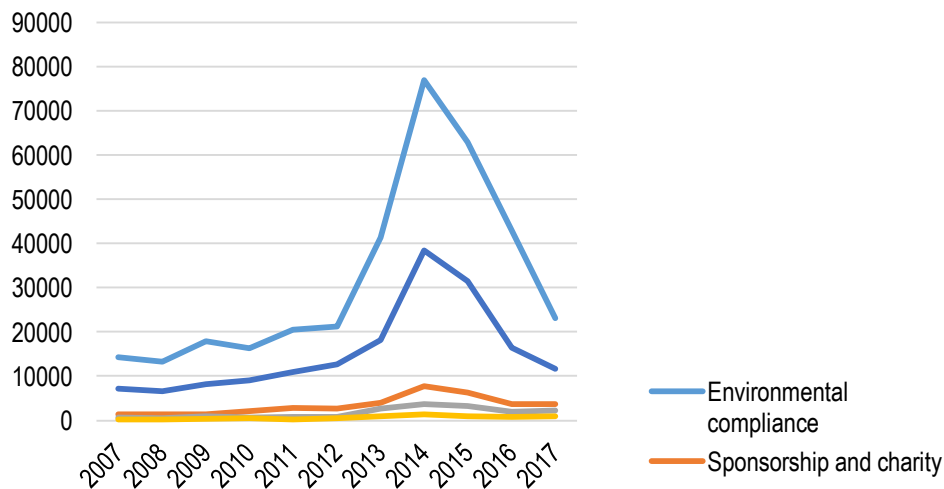
The company's dynamic development is undoubtedly promoted by a positive image that is seen as a competitive advantage in a wide range of areas including the attitude of the public and local authorities. This Gazpromneft positioning assigns certain obligations to it, as it does not only presume dynamic development and application of advanced technologies in hydrocarbon production but also implementation of socially oriented corporate policies through internal corporate events and participation in regional social projects.

To quantify the relationship between corporate social responsibility and a company's economic efficiency, the authors consider it expedient to use methodology by Kharitonova (2009) approved in Russia. The authors consider the methodology results to be indicative from the standpoint of assessing the CSR impact on economic efficiency on the basis of objective criteria: the amount of net profit, stockholder equity, dividends paid to shareholders. Obviously, the selected methodology can be subject to fair criticism, in particular, from the perspective of subjectivity of the weighting factors significance for certain indicators (ω_i) and the need to monitor their relevance for different time periods and market conditions. Nevertheless, for stationary conditions (for example, a particular branch of the national economy), this methodology could, according to the authors, qualify for a mechanism for assessing the impact of corporate social responsibility on a company's economic efficiency. Tables 4 and 5 present baseline data for a comparative assessment of the relationship between the company's social expenditures and its economic performance.

The reference value is determined based on the arithmetic mean of the respective Gazpromneft indicators for eleven years (from 2007 through 2017 inclusive). The authors proceeded from solving the dilemma regarding selection of a criterion to determine reference values between average industry and average internal indices. The decision in favor of the latter is, first of all, due to significant differences in the scale of companies forming the hydrocarbon industry, hence, such a comparison would not be meaningful. The value (K_i) represents a deviation of the current period indicator (2007 and 2017, respectively, in Tables 3 and 4) from the reference value.

Table 4. Determination of the social expenditure ratio (K_i) relative to the reference values for Gazpromneft in 2017

Areas of social expenditure and cost effectiveness indicators	2017, million rubles	Reference value, million rubles	K_i	ω_i	$K_i \times \omega_i$
Environmental compliance	23,038	31,857	0.72	1.2	0.86
Charity and sponsorship	3,664	3,368	1.1	1.1	1.21
Staff remuneration	86,314	53,027	1.63	1.0	1.63
Regional development	2,247	1,663	1.35	1.3	1.76
Taxes, charges and duties to the budget	556,644	453,065	1.23	0.85	1.05
Social contributions to extra-budgetary funds	20,629	11,219	1.84	1.1	2.02
Social infrastructure and social investment	11,643	17,521	0.66	1.2	0.79
Goodwill	71,092	54,754	1.30	1.1	1.43
Education support (scholarships and grants)	957	657	1.46	1.2	1.75
Dividends paid to shareholders	52,643	36,920	1.43	0.85	1.22
Total	828,871	664,051	1.24	–	17.42

Source: Calculated by the authors based on Gazpromneft data, http://ir.gazprom-neft.ru/.

Calculation of the complex coefficient that characterizes the company's spending on socially responsible activities – K_{SRB} (Social Responsibility of the Business) is based on the methodology by Kharitonova (2009):

$$K_{SRB} = \Sigma \ (wi \times ki) \tag{4}$$

For Gazpromneft in 2007, the K_{SRB} was 6.23; in 2017, it was 17.42. Following the logic of the selected methodology, the obtained values of the indicators should be compared with the normative value corridors (Table 5) where an adapted scale of social responsibility assessment is to be found.

Table 5. The Company's Social Responsibility Assessment Scale

Ranges of K_{SRB} coefficient values	Amount of social expenditures	Social responsibility level
$K_{SRB} \geq 7.65$	over 90 % of reference value	Social contribution
$7.65 \geq K_{SRB} \geq 5.1$	60 – 90 % of reference value	Social response
$5.1 \geq K_{SRB} \geq 2.55$	30 – 60 % of reference value	Social commitments
$2.55 \geq K_{SRB} \geq 0.3$	less than 30 % of reference value	Social obstruction

Interpretation of the results allows for a conclusion that in 2007, Gazpromneft was at the level of social responsibility corresponding to 'social response'. For eleven years there have been changes, including an increase in the company's social expenditures, which enabled it to take a higher level of social responsibility in 2017, that is, 'social contribution'. Comparing the averaged values of total social expenditures in 2007 and in 2017, one can see that this indicator (K_{SRB}) has doubled: from 0.61 to 1.24 (Tables 3 and 4, respectively).

The authors regard the CSR dynamics of Gazpromneft as very significant, given the serious negative factors, such as the global and geopolitical crises of 2008 and 2014 that have had different effects on the state of the Russian national economy. Strengthening the company's socially responsible policy during this difficult period means that it follows legal and ethical norms in its operations participating in social programs and projects.

At the next stage of the research, the authors intend to analyze the return on equity indicators over the same period of time in order to identify or dispel the existence of a cross-impact of the CSR indicators and the company's economic efficiency.

3. Results

Based on the financial statements of the company, Gazpromneft allowed the authors to calculate the coefficients of return on equity and a comprehensive assessment of CSR, on the basis of which a correlation analysis has been carried out and the relationship between the specified coefficients has been found (Table 6).

Table 6. Performance Indicators of JSC Gazpromneft

Periods/ indicators	Equity	Net Profit	Return on Equity, ROE
2007	267,085	106,061	0.397
2008	346,233	116,486	0.336
2009	511,987	97,668	0.191
2010	568,084	104,363	0.184
2011	733,412	164,258	0.224
2012	875,431	182,583	0.209
2013	998,021	196,201	0.197
2014	1,129,785	126,656	0.112
2015	1,157,069	116,196	0.100
2016	1,441,671	207,392	0.143
2017	1,622,498	247,852	0.153

Source: calculated by the authors based on Gazpromneft data, http://ir.gazprom-neft.ru/.

As can be seen from Table 6, Gazpromneft has a significant increase in equity capital (6 times) and net profit (2.33 times). At the same time, such an important indicator as return on equity has decreased by 61.5%.

Further, based on the selected methodology, it is necessary to conduct a correlation analysis that will allow for a conclusion on the nature and significance of the relationship between the indicators of corporate social responsibility and the economic efficiency of Gazpromneft (Table 7).

Table 7. Data for correlation analysis

N	Year	ROE X	K_SRB Y	ROE × K_SRB X × Y	ROE² x²	K_SRB² y²
1	2007	0.397	6.24	2.48	0.16	6.14
2	2008	0.336	5.59	1.88	0.11	3.53
3	2009	0.191	6.54	1.25	0.04	1.56
4	2010	0.184	6.60	1.21	0.03	1.47
5	2011	0.224	7.64	1.71	0.05	2.93
6	2012	0.209	8.76	1.83	0.04	3.35
7	2013	0.197	12.43	2.45	0.04	6.00
8	2014	0.112	19.64	2.20	0.01	4.84
9	2015	0.100	26.64	2.66	0.01	7.10
10	2016	0.143	13.93	1.99	0.02	3.97
11	2017	0.153	17.42	2.67	0.2	7.10
Total	–	2.25	131.43	22.33	0.54	47.98

Source: calculated by the authors based on Gazpromneft data, http://ir.gazprom-neft.ru/.

As can be seen from the presented data, since the sample obtained has no 'overshoots', in the following step, the authors calculated the Pearson correlation coefficient that is intended to reveal the presence of a linear relationship between two metric variables:

$$r = \frac{n \times \sum xy - \sum x \times \sum y}{\sqrt{[n \times \sum x^2 - (\sum x)^2] \times [n \times \sum y^2 - (\sum y^2)]}}, \tag{5}$$

The Pearson coefficient for Gazpromneft has the following value:

$$r = \frac{11 \times 22.33 - 2.25 \times 131.43}{\sqrt{(11 \times 0.54 - 2.25^2) \times (11 \times 47.98 - 131.43^2)}} = -0.003 \tag{6}$$

The result (a negative value of the correlation coefficient) allows for the conclusion that there is a weak negative relation. Despite the growth of absolute economic indicators, such as the company's return on equity and net profit, the expenses interpreted as socially significant are growing rapidly. It is not referred to financing ecologically oriented activities and social investments, the effectiveness of which is apparent for a specific company in the provinces in a relatively short time horizon. The class of other expenditures indirectly characterizing socially responsible conduct of the company, that is, payment of taxes and social contributions to the budget and extra-budgetary funds, staff remuneration, payment of dividends and goodwill, may be associated with increased costs that reduce the company's economic efficiency.

In addition, the authors consider such conditions of the external environment as the significantly reduced prices for hydrocarbon raw materials since 2014 and the Russian national currency devaluation against world currencies to be extremely important factors adversely affecting the economic efficiency of Gazpromneft and the entire hydrocarbon industry.

In this regard, the authors tend to believe that the result obtained on the extremely weak negative correlation between corporate social responsibility and the company's economic efficiency is not the only evidence of the negative CSR impact on the economic situation. The context conditions have a significant impact on the company's self-positioning and its decisions about whether to pursue socially oriented policy.

In addition, the dual structure of the Russian economy is of paramount importance for the findings of the research conducted by the authors, as previously noted. Of course, under such conditions, the companies of flagship industries that are subject to state backing in the form of special financing conditions and opportunities to raise foreign investment (before the imposition of sanctions against the Russian Federation) also have a different, enhanced level of social responsibility both as employers and as sources of funds for regional development and as major taxpayers. Therefore, if the macroeconomic environment deteriorates, such companies as Gazpromneft cannot merely resort to market mechanisms and cutback to social commitments funding to maintain its cost effectiveness indicators; they maintain and even increase social expenditures as they form a corporate social platform in the national economy.

Awareness of the importance of these factors holds out a hope of building sustainable and transparent corporate relationship of the corporate sector with society and the state in the long term. As part of the study, Gazpromneft, according to the authors, should be recommended an internal social audit to assess the impact of external factors on the results of its socially responsible conduct.

Another authors' opinion is the need to develop methods for expanding the range of indicators that should be taken into account when analyzing the impact of a company's social policy on its economic efficiency. Moreover, such methods should be adapted to the conditions of particular industries, business regions and macroeconomic and political conditions in countries. It is clear that companies of developed countries, such as the United States, are less dependent on external political or economic environment. Of course, this does not mean that companies of developed countries are not exposed to external risks and their economic efficiency is unshakable, however, under the conditions of a well-diversified economy and sufficiency of domestic investment resources for development, the factors determining economic risks differ from the Russian ones. The existence of sectoral characteristics does not mean an increased taxation burden in crisis periods in a developed economy and does not enhance the role of corporate social policy.

Conclusion

Awareness of the importance of these factors holds out a hope of building sustainable and transparent corporate relationship with society and the state in the long term. As part of the study, Gazpromneft, according to the authors, should be recommended an internal social audit to assess the impact of external factors on the results of its socially responsible conduct.

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In general, international practices of assessing corporate social responsibility have formed a rating traditionally having a scale of three categories: A, B and C. The highest estimates of AAA, AA and A were received in 2012 for the first time by nine Russian companies: Ingosstrakh, Novard, Transaero (ceased to exist in 2015), Baltika Brewery (ceased to exist in 2015), MTS, Rostelecom, RusHydro, OTP Bank, and Tekta Grup. At year-end 2015, the internal rating of the ten most socially responsible companies included: Gazprom, LUKoil, Aeroflot, Russian Railways, Rosatom, Transneft, VTB Bank, Severstal, Rostec and Surgutneftegaz. The changes that have taken place over the three years during which the most significant crisis occurred in the national economy of Russia are dramatic: some companies ceased to exist failing to meet their obligations to the state and counterparties. And, on the contrary, partially government-owned companies having social significance in their industries have been included in the rating.

In the 'Global Reptrak' top ten of the world rating of 2016, annually compiled by the Reputation Institute, there are world-famous multinational corporations: Google, Microsoft, The Walt Disney Company, BMW, LEGO, Daimler, Apple, Rolls-Royce, ROLEX, Intel. World leaders in corporate social responsibility represent different economic sectors from different countries. It is characteristic that there are no Asian companies on the list, which is obviously explained by different legal provisions in the developing Asian market (China, South Korea) and a different corporate culture (Japan).

Turning to the object of research and summarizing the findings, the authors consider it expedient to state that the main objective of any company's business operation including Gazpromneft is to generate profit. The growth and development of a company inevitably leads to the need for transparent, socially responsible business operations. However, this does not mean that a company should have excessive social obligations that threaten its economic efficiency and, ultimately, financial sustainability. It is important to develop conditions mutually acceptable for both the state and society on the one hand, and for companies themselves, on the other. It is likely that such time will also come for Russia – even though, the period of socially painful reforms has not yet been completely overcome and market relations are not strong enough; the legal framework in society (including social relations) has been continuously evolving and undergoing changes over the 26 market years.

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Brexit and the United Kingdom's Domestic and International Value Chains. Part - Exploring the Trade in Value-Added Perspective

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Abstract:

UK insertion in global value chains is analysed through the specific angle of inter-industrial relationships and international supply chains. The article is divided in two parts. The first one provides a global network perspective and several synthetic indicators related to the strengths and weaknesses of UK's insertion in global value chains. About 6 million jobs are directly or indirectly created in the UK through its exports. North America generates the highest demand for UK business services skills, EU is the main driver for low-skill industrial jobs while exports to Asia embody medium to highly skilled jobs. Because a hard Brexit is expected to increase trade costs and affect prices, a forthcoming second part will estimate the impact of additional tariff and non-tariff trade costs on the competitiveness of key sectors.

Keywords: Brexit, *value-added perspective, value chains*

JEL Classification: C43; C67; F14; F15; O50

Introduction

The trade dimension of Brexit has been extensively analysed by scholars and international experts. The present essay aims at contributing to this burgeoning literature by exploring trade data through the specific angle of inter-industrial relationships and global value chains. The article starts with a short review of the literature related to the analysis of Brexit from a trade perspective. The review will be brief for Global Value Chains (GVC) trade due to the reduced volume of literature published up to now on this specific subject. As mentioned by De Backer and Flaig (2017): *"The empirical evidence evaluating the potential impact of (the structural shifts affecting the world economy) largely lags behind [the theoretical debate], which makes these discussions somewhat speculative"*.

With this caveat in mind, the core of the paper offers an analytical review of UK's insertion in the global economy and its comparative advantages. The investigation, which uses traditional trade statistics as well as network and input-output analysis, covers both trade in goods and services as well as trade in tasks (or trade in value-added). This mapping identifies the tasks embodied in UK's exports, allowing to estimate the number of jobs created by exports of final and intermediate goods and services. The second part of the article (to be published in a forthcoming issue) will focus on three key sectors, selected for their relevance in global value chains (Transport equipment, Electronics and Chemicals). It will include an estimation of the impacts of Brexit's related trade costs on UK's export competitiveness.

1. Brief review of the literature

The Brexit referendum has generated an enormous literature, in particular on its impacts on trade and welfare. Two kinds of empirical models have been used to estimate them. Bilateral flows are usually simulated through gravity equations, factoring-in the trade-creation effect of joining the EU (and therefore, the negative outcome of leaving it). The economic effects are usually estimated using Computable General Equilibrium models (CGE), either static or dynamic ones.

Most analysis that were published before or immediately after the referendum forecasted a very negative outcome unless the UK remained in the EU or was able to obtain some soft Brexit conditions from the EU negotiators. Under all exit scenarios, UK-EU trade declines and the drop is sharp in the case of a hard Brexit (the so-called "WTO option"). For some representative examples, see Dhingra *et al.* (2016), HM Treasury (2016), NIESR (2016; OECD (2016) or PWC (2016). Uncertainty deters investments in the short term and the long-term effects

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are felt through reduced productivity and competitiveness. According to Dhingra *et al.* (2016), in the long run, the lower trade levels induced by Brexit will reduce productivity gains, increasing the welfare costs to 9.5% of GDP. Similar results are found by Treasury (2016).

There were only few exceptions to the economists' consensus, one of them from Minford (2016) who estimated welfare gains of 4%. Minford's assumed that leaving the EU would reduce the negative effects of trade diversion induced by this trade agreement, allowing the UK to remove trade barriers and import from more efficient sources than the EU suppliers. Many observers expressed doubts about the potential gains related to correcting trade diversion. Indeed, a few years before, Freund and Ornelas' (2010) review of the literature found that trade diversion is usually not a major concern[32]. On the other hand, while recognizing that RTAs did not lead to trade diversion as advocates of multilateralism may have feared, Baldwin (2011) declared that "unilateralism is a key driver of trade opening" (p. 25) and that the "focus on tariff preferences is not appropriate for 21st century regionalism". Yet, most Brexit analysts reject this optimistic approach to unilateralism and the profession's consensus was that Brexit would lead to a sharp reduction in trade and economic growth.

Intrigued by the apparent resilience of the UK economy after the referendum (the so-called "Brexit boom"), recent papers have reviewed the initial estimates produced by national and international organizations, spotting and correcting some issues in the parametrization of their models. The revisions corrected two sets of parameters. On purely econometric grounds, gravity equations seemed to overestimate the impact of entering a deep regional trade agreement (RTA) similar to the EU for a country like UK. Moreover, there were doubts about the symmetry of the effects: while joining a RTA creates and/or deviates trade, leaving a RTA is expected to have less trade destruction effects due to the resilience of business linkages. Another set of revisions dealt with the dynamic effect of RTA membership on investment and productivity, one of the main channels of long-term shock transmission.

These revisions lead in general to negative but smaller impacts. Gudgin *et al.* (2017), for example, estimate that the UK might lose 20% of its exports to the EU after 2019 in the case of a hard Brexit, half the impact estimated by the Treasury and lower than estimated by the OECD or IMF. The impact on trade and FDI is likely to be offset through a lower exchange rate, resulting in UK's GDP to be only slightly lower by 2025 than on the base scenario of no Brexit. Coutts et al. (2018) estimate a smaller 12% loss of EU trade, while Kee and Nicita (2017) suggest an even smaller negative impact of 2%, once price elasticity of demand for UK products is taken into consideration[33].

On the specific issue of value chains, few studies have dealt with the impact of Brexit on GVCs, even when the EU is, together with "Factory Asia" and NAFTA, one of the three main regional value chains in the world and the largest one for its economic size. Vickers and Khorana (2018) compile a series of contributions, with a specific emphasis on the implications for Commonwealth and developing countries. Curran (2017, 2018) focuses on the trade policy options and presents a review of the relevant literature. After a brief review of recent trends in the UK's destination and origin of value-added, Keane (2018) looks at Brexit implications on trade costs and GVC governance. From a more empirical side, Mulabdic *et al.* (2017) highlight the importance of deep RTAs when determining the unbundling of stages of production across borders. The existence of GVCs generates a demand for deeper forms of integration to align relevant national policies. They estimate that domestic value added in gross exports increased on average by as much as 35% in the UK case (p. 17) thanks to joining a deep RTA such as the EU. All or part of these gains are supposed to be put in jeopardy in the case of a hard Brexit. Leaving the EU would therefore severely disrupt UK GVCs.

Using a gravity model with sector-level input-output GVC linkages in production, Vandenbussche *et al.* (2017) find that both the UK and the EU27 would suffer substantial losses in the case of a hard Brexit. If the UK suffer more (4.5% of GDP and 500 thousand jobs) than the EU-27, EU-27 losses are also substantial (1.5% of GDP and 1.2 million jobs). Closer to the methodology used in our analysis, Chen *et al.* (2017) base their simulations on the inter-industry linkages measured through multi-regional input-output matrices and adopt a national and regional accounting approach. Their approach is somewhat extreme and better suited to modelling natural disasters; they set sectoral UK-EU trade linkages to zero, to reflect the complete disruption of regional GVCs[34]. They show that UK's exposure to Brexit is some 4.6 times greater than that of the rest of other EU.

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[32] "The direst predictions about RTAs - that they will generate significant trade diversion and erode the world trade system - have not come to pass", p.4

[33] The authors show that the covariance between tariff and trade elasticity is negative for the EU. Higher tariffs are usually placed on less elastic products (such as transport equipment), meaning that a price increase of UK products due to the application of tariffs will not affect much EU's imports.

[34] Extraction techniques are used in input-output analysis to estimate the importance of a sector "i" (see Miller and Lahr, 2001, for a review). The procedure consists in deleting the i-th row and column of the input-output matrix A, then, using the Leontief model, to compute the reduced outputs obtained when i = 0 and compare with total output before extraction.

In summary, there is a large divergence among experts on the outcome of Brexit and, to quote Coutts *et al.* (2018), there is a high probability that some/most in the economic profession will get it wrong on this subject. In the next sections, we will try not to add to the confusion, reducing our ambition to highlighting a series of stylized facts relevant to GVC trade that may be useful for further research on the topic.

2. United Kingdom inter-industrial insertion in global economy and its revealed comparative advantages

After revising UK's main trade indicators as provided by trade and balance of payments statistics, this section looks into UK's GVCs insertion into the inter-industrial World Trade Network.

United Kingdom trade profile

With exports estimated at $409.4 billion in 2016 by the World Trade Organization (2.6% of world total) and imports value at $635.8 billion (3.9% of world total), UK ranks 10th as exporter of goods and 4th as importer. While UK exhibits a large deficit in trade in goods, its situation in services is much better: UK ranks second as World exporter of commercial services with sales at $323.7 bn (6.7% of World trade, according to WTO) and fifth as an importer ($194.6 bn and 4.1%, respectively).

Despite its relatively low ranking as exporter of goods, products "Made in UK" enjoy a very good image with global consumers, ranking third after German and Swiss ones, Figure 1. This qualitative dimension is important for our purpose: Inter-industrial trade along GVCs are Business to Business (B2B) relationships that are based on trust as much as on cost considerations.

Figure 1. World most respected « Made in », 2017
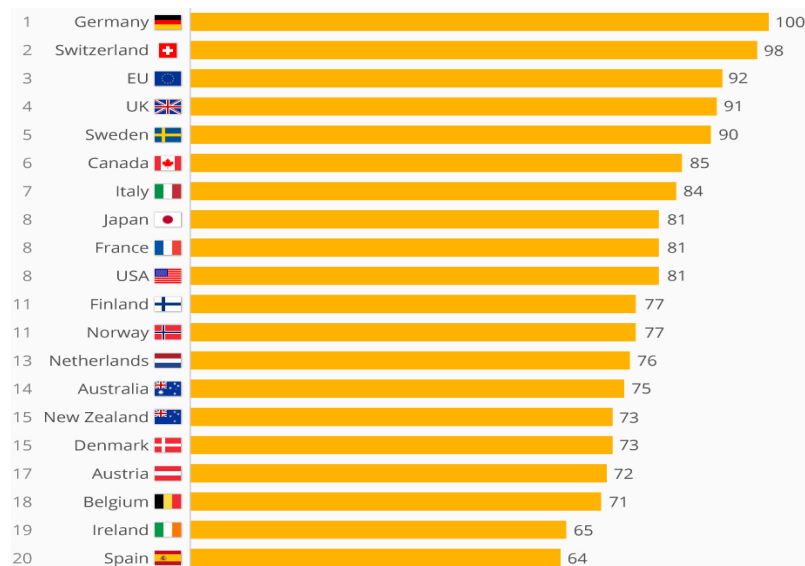
Note: Made-in-Country-Index 2017, based on a survey of 43,000 consumers in 52 countries
Source: Statista/Dalia Research

Table 1 provides a view of the main products traded by UK. In terms of geographical distribution, the EU trade partners absorbed 47% of UK's exports in 2016, followed by the USA (15%), Switzerland (5%) and China (4%). UK sources 52% of its imports from the EU, compared to 9% from China, another 9% from the USA and 4% from Switzerland (source: WTO).

Table 1 UK: Main exported and imported goods, 2016 (Millions of USD)

Agricultural Products,				Non-Agricultural Products,			
Top 5 exported products		Top 5 imported products		Top 5 exported products		Top 5 imported products	
HS2208 Alcohol of less than 80% volume	7,117	HS2204 Wine of fresh grapes	4,084	HS8703 Motor cars for transport of persons	41,288	HS7108 Gold	57,973
HS2106 Other food preparations	1,535	HS1602 Other prepared or preserved meat	2,422	HS3004 Medicaments in measured doses	21,997	HS8703 Motor cars for transport of persons	46,067
HS2309 Preparations of a kind used in animal feeding	1,282	HS1905 Bread, pastry, other bakers' wares	2,382	HS8411 Turbo-jets, turbo-propellers and ot.	18,852	HS3004 Medicaments in measured doses	18,852

Agricultural Products,				Non-Agricultural Products,			
Top 5 exported products		Top 5 imported products		Top 5 exported products		Top 5 imported products	
HS1905 Bread, pastry, other bakers' wares	1,147	HS2106 Other food preparations	2,087	HS7108 Gold	15,743	HS8411 Turbo-jets, turbo-propellers and ot.	17,439
HS1806 Chocolate and other cocoa food	879	HS1806 Chocolate and other cocoa food	1,934	HS8803 Parts of goods 8801-8802	15,003	HS8708 Parts for motor vehicles 8701-8075	15,745

Source: WTO World Trade Profiles, 2017

Trade in services is UK's strength. This specialization is a positive point from a long-term perspective, as the World trade-in-services/GDP elasticity is expected to be higher for services than for merchandises (Escaith and Miroudot, 2015)[35]. As already observed for trade in goods, EU is more important for the UK as a source of imports than as an export market. Exports of commercial services in 2016 are concentrated in "Other services" with 76% of total: 44% are business services (other than finance and ICT), financial services arrive second with 29%, far ahead of ICT services (10%). Travel services (a close proxy of tourism) represent 12% of services exports and transport 11%. EU absorbs 37% of UK exports of commercial services and the USA 25%. On the UK imports side, "Other services" weight 51%, travel 33% and transport 16%. UK sources 50% of its services imports from EU and 19% from the USA.

UK role in the World Trade Network

In this section, we use the inter-industrial trade flows in the *TiVA* nowcasts database for 2014; these flows correspond to trade in processed and unprocessed goods as well as services used as inputs in the production process. For the time being, we look only at the trade gross value (domestic plus foreign value-added contents) because we want to identify UK's role as a world trade platform, irrespective of the origin of the value-added embodied in these produtcs. Two sets of indicators are relevant here: some based on economic weight, others on connections. Weight is probably more relevant when it comes to bilateral negotiations; in a more complex negotiation framework, strong connections allow for building alliances.

In order to simplify the analysis, we use 12 aggregated sectors (goods and services) based on the 34 industries included in *TiVA*: C01T05 Agriculture, C10T14 Mining, C15T16 Agroindustry, C17T19 Textiles, C20T22 Wood and Paper, C23T26 Chemicals, C27T28 Metals, C30T33 Electronics, C34T35 Vehicles, C50T64 Transport, communication and commerce, C65T74 Business services.

Even with such an aggregation, the resulting World Trade Network based on the 62 *TiVA* countries is dense and not easily decipherable. The following Table 2 and its associated graph () provide more analytical information on UK's role in the World Trade Network, considering all inter-industrial trade flows.

Table 2. UK and the Inter-Industrial World Trade Network: selected indicators, 2014

Sector	Eigen centrality	Weight indegree	Weight outdegree	Weight degree	PageRank	Betweenness centrality
Agriculture	0.653	13,044	4,571	17,615	0.003238	0.00004
Mining	0.343	37,315	36,045	73,361	0.001582	0.000075
Agroindustry	0.878	55,634	19,250	74,885	0.004243	0.000004
Textiles	0.859	34,314	11,366	45,681	0.004446	0.000008
Wood and Paper	0.653	20,147	15,159	35,306	0.003991	0.000024
Chemicals	0.896	114,647	96,489	211,136	0.003107	0.000007
Metals	0.728	40,918	25,928	66,847	0.002792	0.000019
Electronics	0.832	72,831	38,808	111,639	0.003608	0.000013
Vehicles	0.605	96,128	69,766	165,895	0.005308	0.000034
Transport, communication and commerce	1.000	150,009	132,177	282,186	0.003074	0.000001
Business services	0.770	101,150	197,708	298,859	0.004673	0.000013
Health, education and administration	0.687	26,733	28,322	55,056	0.006401	0.000015

Note: see Annex 2 for a brief description of the network indicators.
Source: Author's calculation based on OECD-WTO *TiVA* data and Gephi software.

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[35] The expected outcome is due to a long-term evolution of demand composition across sectors favouriting services, due to non-homothetic demand effects (Engel's Law).

We can look, for example, at UK role as an exporter using the Outdegree score, obtained by weighting the arcs joining two nodes (countries) by the value of the export flows. According to this indicator, UK is strong in services exports (Business services or Transport, communication and commerce). As far as trade in goods is concened, its main strenght is in Chemicals. Typical of modern advanced economies, the sectors where UK is strong as an exporter are also where UK's role as an importer is the highest[36]. This is in particular the case for Transport, communication and commerce, for Chemicals or for Business services. Figure 2 shows the positive correlation between In-Degree (role as importer) and the Out-Degree (role as exporter). Business services stands out, breaking with this pattern: While all other industries are more or less aligned along a straight line, Business services indicates a much higher ratio Out-Degree/In-Degree than other sectors, indicating a strong export-orientation. Actually, it is the only UK sector showing such a clear export orientation. Lastly, the figure shows also that the gross amount of trade is not a predictor of the role of an industry in the World network. PageRank (indicated by the size of the bubble in Figure 2) is high for Health, education and administration, where UK plays a specific role (especially for trade in education services) while its strategic role for Chemicals is reduced, despite its strong pharma and petrochemical industry.

Figure 2. UK industries from the World Trade Network perspective: selected indicators, 2014
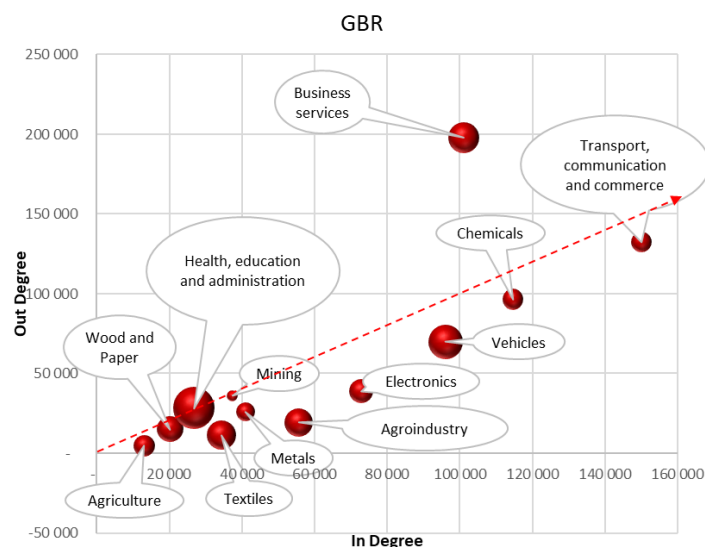
Note: The size of the bubble represents the PageRank score of the industry. Dotted line: equal import export weights
Source: Table 2

In order to put UK industries into a global perspective, the network indicators built in Table 2 were also constructed for all other *TiVA* trade partners. Selected comparators are presented in Annex 2: All EU28 members together, then Germany, France and Italy separated, all developed economies and all G20 members. In the following review, as in the previous graph, the focus is on UK's weight as exporter and importer, but also on its network centrality and influence, measured using PageRank[37].

When looking at *Agriculture* (C01T05), we see that the UK is relatively unconnected to the rest of the *TiVA* countries, as evidenced by the low weighted out-degree (through exports). If it is less connected than for the other three EU-G20 members, it remains that UK is still above the median score observed in the EU28 and the larger group of developed economies. Compared with the 19 G20 member countries, the picture is mixed: UK scores lower on its out-degree and weighted degree, but shows better PageRank centrality. The latter is perhaps due to the over-representation of EU countries in the *TiVA* sample, as close trade ties with many other countries will influence centrality scores[38].

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[36] This may not remain true if we used a more detailed disaggregation; remember that the analysis is performed at aggregated sectoral level, with only 12 categories of sectoral trade.

[37] The PageRank score for a trader is based on the probability that a trade flow, randomly chosen, will go through this country. The rank value indicates the importance and "centrality" of a particular country as a trade hub. This importance can be related to its economic size, but also to its close association with other influential trade partners.

[38] Incidentally, this may show a trade diversion effect of EU membership for agricultural goods.

For *Mining* (C10T14), UK is a key player in the EU28 but not in the *TiVA* world, where it ranks only at the 9th position. On weights, UK dominates its G20 EU partners and is much above the median of EU and developed economies, thanks to strong exports connections (weighted out-degree). UK is even above the median of G20, a group with a large representation of commodity exporters (especially in the connections based on import weights). This said, UK's PageRank is low compared to EU-G20 and slightly below the G20 median. UK ranks only 18th in the list of *TiVA* reporters. A possible explanation (but a more thorough sectoral analysis would be required) is that UK's high score is mainly based on volumes rather than on the diversity and importance of its connections.

For *Agroindusties* (C15T16), UK is an important EU player in terms of imports (higher in-degree than EU-G20) but not as an exporter. it remains relatively well connected despite a low volume of exports: UK's PageRank score is higher than France of Italy and is the 5th one among the 61 *TiVA* reporters. UK remains also a key player when compared to the median score in the EU, the group of developed countries or the G20.

Textile (C17T19) shows similar features than Agroindustry: here too, UK is more important as an importer than as an exporter. Here too, the situation is opposite to what we found for Mining: While UK is less connected in terms of volumes than other EU-G20, its PageRank score compares positively with France, despite the higher French score on weighted connections (UK ranks 5th in the list of *TiVA* reporters on this indicator).

In *Wood and paper products* (C20T22), UK has no particular position in the trade network, arriving after Germany and France on most indicators (except weight out, where it is second). UK is 5th on both weighted connections and PageRank among all *TiVA* reporters.

Chemicals (C23T26) is the biggest sectoral GVC as far as its weight is concerned. UK ranks third amongst the EU-G20 members, lower than Germany but close to France. Among all *TiVA* reporters, UK ranks 5th on PageRank with a score of 0.0031, after the USA (0.0109), China (0.0059), Germany (0.0055) and France (0.0037).

Metal and metal products (C27T28) is another large GVC for its weight. UK isn't a large player here, ranking fourth in the EU-G20 group after Germany (which is dominating the sector in EU), Italy and France. UK is particularly weak as an exporter (weight-out), being below the G20 median score. Yet, on a PageRank basis, it remains well connected (better than France and Italy and above the G20 average). This shows that UK is relatively well connected with big players (in particular the USA) and will be inheriting some of their networking influence[39].

Electronics (C30T33) is a sector where UK ranks third after Germany and France in the EU-G20 group, due to the weakness in its export links (weighting only the imports, UK is second and close to Germany while its export weight is less than a third of Germany's one). Yet, UK stands relatively well on the PageRank score, close to Germany. With a PageRank score of 0.00361, UK classifies fourth among the *TiVA* reporters, between Germany (0.0042) and Japan (0.00315) and much behind the USA (0.01263) and China (0.01251).

Vehicles and transport equipment (C34T35) present a situation similar to Electronics: UK ranks third after Germany and France in the EU-G20 group, due to the weakness in its export links. Weighting only the imports, UK would be second after Germany, but its export weight is less than a third of Germany's. Here also, UK ranks better on its PageRank score and is second to Germany: With a score of 0.00531, it ranks fourth among *TiVA* reporters, after USA (0.01363), Germany (0.00667), Canada (0.00532), and before China (0.00464) and France (0.00458). One hypothesis, which remains to be checked, is that, like Canada, UK benefits here from its closer trade relationship with the USA. Quite surprisingly, the UK, while being a large exporter of services, is not a dominant player for services of *transportation, communication and trade* (C50T64). It is in particular the case when looking at export connections, which are lower than its import-connection, at the difference of France and Italy. At the contrary, UK shows its strength in *Business services* (C65T74), especially on export-weighted connections where it dominates all other EU-G20 partners. On the import side, UK ranks second to Germany, which may explain why it is also second on the PageRank score. Indeed, while UK ranks second only to the USA on the basis of weighted connections, it classifies third after Germany when network centrality (i.e., PageRank) is concerned.

Health, education and other social services (C75T95) is the other strong UK services export sector. The high score is due, among other things, to the exports of Education services. Nevertheless, the import weights are also the highest in the EU-G20 subgroup, indicating an intense exchange in both directions. UK is second after the USA in terms of weight (and almost second at par with Germany on PageRank).

3. Synthetizing United Kingdom global value chains (GVC) trade through exploratory data analysis

The section applies Exploratory Data Analysis (EDA) on network indicators to isolate and identify most relevant patterns emerging from the World Trade Network, with a special emphasis on the role of the UK in this Network.

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[39] The USA is by far the main player in Metal and metal products with a score of 0.00975, while China, the second one, has a PageRank score of only 0.00705.

We look at "the big picture" using gross trade flow to analyse three categories of goods closely related to industrial production and global value chains: Investment and intermediate goods, that are closely related to the supply side, and final consumers' goods, which are the end-result of the value chain. We analyse separately a fourth category of goods, transport equipment (final goods and parts). This category includes goods that are both final consumers' goods (e.g., cars and motorcycle) or investment goods (lorries, trains, aeroplanes…). An important caveat is that the UN COMTRADE database used here covers only goods and excludes trade in services, where UK has shown comparative advantages.

Exploratory data analysis on network indicators

Network analysis produces a number of indicators that are often closely correlated. Analysing the World Trade Network defined by the UN COMTRADE database produces a 217 x 44 table (217 trade partners and 36 indicators per country): Understanding the "big picture" out of almost ten thousand indicators is almost impossible. Multidimensional EDA is particularly well suited to identify patterns in the data, reducing the size of the problem to a few significative "illustrative" factors.

After reviewing the data and their correlations, we applied Principal Component Analysis (PCA) to a series of quantitative network indicators computed on four categories of goods selected using the UN classification by Broad Economic Categories (BEC): Final goods for consumption, Transport equipment and parts, final goods for investment (capital goods excluding transport equipment) and Processed Intermediate Goods (goods used as inputs by industry, excluding unprocessed commodities). As mentioned, these four categories of goods are particularly relevant for analysing global value chains.

The eleven network indicators retained were the following: two Indegree and two Outdegree indicators (weighted or not by trade flows); Eccentricity; Closeness; Harmonic Closeness Centrality; Betweenness Centrality; Pagerank; Clustering and Eigen Centrality[40]. It should be kept in mind that the role of a country in the World Trade Network is based on its activity as exporter but also as importer. If the economic weight of a country is definitely important, the geographical distribution of its trade partners (clustered into a few ones or, at the contrary, diversified) is also determining its role in the network.

Network score and ranking according to the whole World Trade Network

When applying PCA to the whole network database (including results for the four groups of goods), the first two principal components presented in capture 80% of the total variance (F1: 69% and F2: 11%). This is encouraging as 80% of the "information" (variance) can be reproduced using only two dimensions. Nevertheless, some other interesting features can be identified when looking beyond these two principal components.

The first component (F1, horizontal axis) captures by itself 69% of the "information" contained in the data. *Prima facie*, F1 appears to rank countries according to the value of their total trade, the largest economies being on the right side of the graph. A closer look show that it is not exactly the case: F1 privileges more the number of connections than the sum of their value in monetary term. In particular, weighted degrees (connections weighted by the value of the trade flows) are less correlated than unweighted degrees. Similarly, we find a negative correlation of F1 with the clustering indicator: on the left side of the graph, we can expect to find local or regional players, while on the right side will appear the global players.

The second component F2 (vertical axis) weights 11% of the total variance and is positively correlated with weights and betweenness. Large players are therefore expected to be on the positive side of the vertical axis. But this is not the only criteria. Actually, the axis is also positively correlated with trade in capital goods. So, large player but specialising in consumer or intermediate goods will remain closer to the lower positive part of the axis.
Most countries are arranged in a U, with three countries standing out: Germany, China and the USA as frontrunner. According to this combination of variables, UK is part of the pack of followers, but is positioned on its front position, just after France[41]. A first conclusion would be that while not a "special case" (there is no an English exception as far as trade in goods is concerned), the UK is in the Top5 of most relevant players in the trade in goods network.

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[40] See Annex 2 for a brief description of these network indicators.

[41] Further transformation (Varimax rotation) would show that Japan is not part of the "pack" and stands-out - albeit less than the three leaders - due to its role in the capital goods sub-network. When taking into consideration the third principal component (6% of total variance), the leading role of China is reduced due to its relatively lower profile as exporter of transport equipment and the lower geographical distribution of its exports of capital goods.

Figure 2. Principal component analysis on four groups of goods, 2015
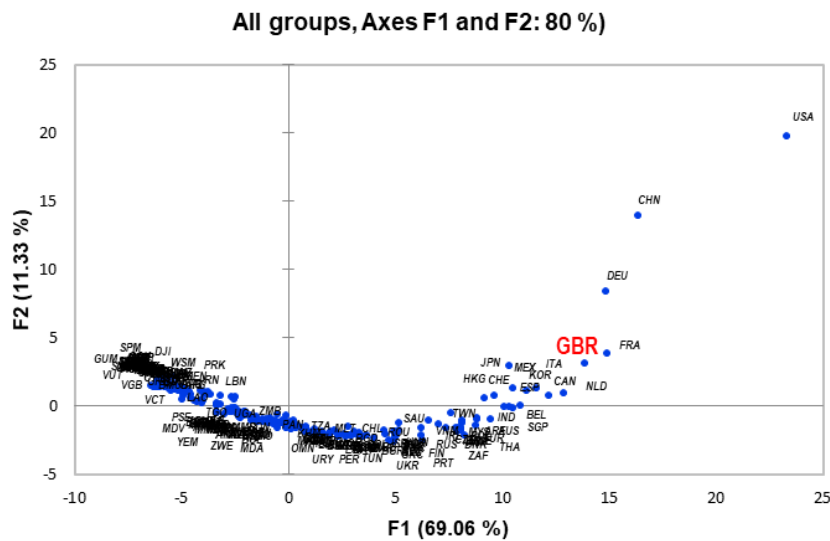
Source: Author's elaboration on the basis of Comtrade data.

PCA can be used to construct a synthetic index using the "scores" of each country on the most relevant principal components. Here, we use the first three components, representing 87% of the total information contained in the sample. Each score on a component is weighted by the percentage of total variance explained by the component. An index, ranging from 0 to 100, is derived from those scores (see summary Tabl in the end of this section).

Rankings should be taken with due care when scores are adjacent: a small change in the analysis (dropping or adding variables or countries) may change the results. For example, a ranking based on total trade aggregating all categories of goods except fuels (Figure 3) puts the UK in a 5th position. But the distance between the USA, China and Germany is large from the other group of front runners (France, UK, Japan, *etc*.) which are neck and neck and should be considered as part of the same cluster. The following sections look at UK's situation according to each individual group of goods.

Score and ranking for capital goods: The PCA on network indicators for trade in capital goods results in two principal factors explaining more than 80% of total variance (Figure 4). The main (horizontal) axis (68% of variance) is driven by connectedness and the geographical distribution of trade, while the second factor (13% of variance) is more correlated with the economic weight of the traders. China and the USA stand-out in this context, Germany being only distant third player. The UK is not part of the front-runners, even if it remains close to them. On the basis of its score, it ranks only 8th (see summary Table 3). Actually, the largest European economies are confronted with the competition of Asian traders.

Figure 3. Principal component analysis on capital goods, 2015
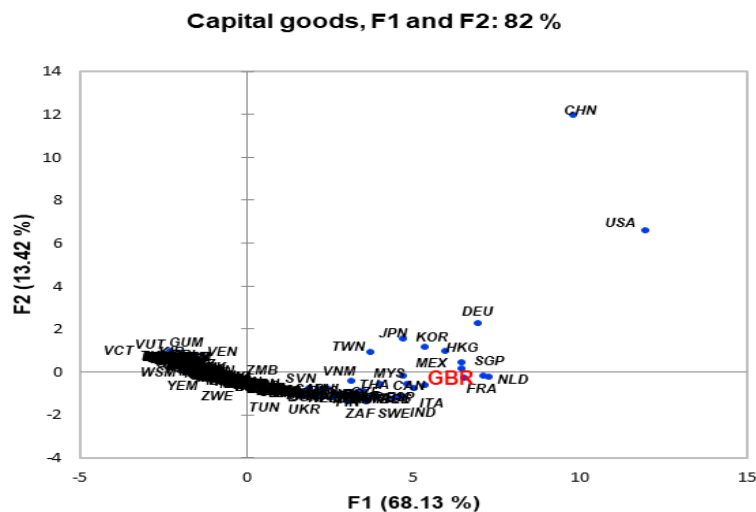
Source: see Figure 3

Score and ranking for consumers' goods: Again, we find that the first two principal components explain about 80% of the total variance of the indicators related to the World Trade Network in consumer goods. The first factor on the horizontal axis of Figure 5 captures 67% of the information and is closely associated with the geographical connectiveness of the country and its economic weight as an importer. At the contrary, F2 (13% of the variance) is almost entirely driven by the weight of the countries as importer and exporter. On these criteria, the USA stand-out as an outlier, with China, Germany France and the UK clustered in a small group of front-runners, followed by the rest of the countries. When computing a score based on the first three principal components, UK ranks 3rd (see Table 3).

Figure 4. Principal component analysis on consumers' goods, 2015
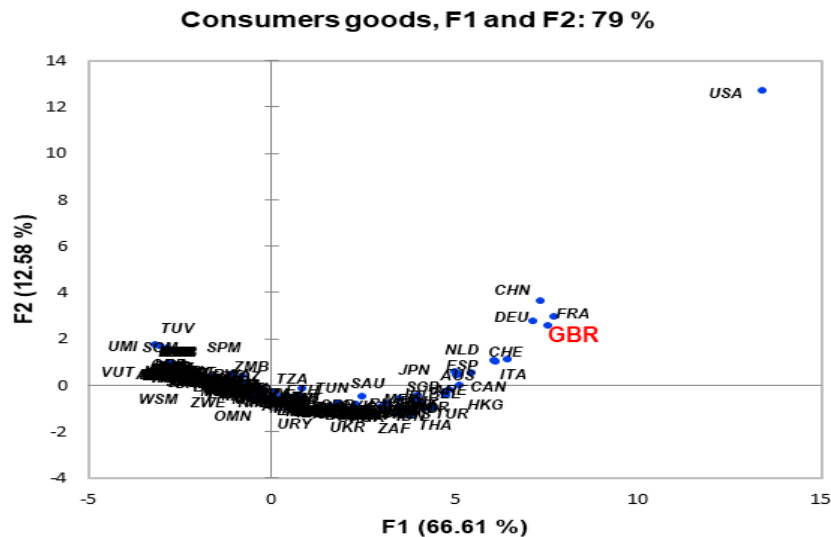
Source: see Figure 3

Score and ranking on processed intermediate goods: The patterns observed with processed intermediate goods for industry (Figure 6) is similar to what was obtained when considering all groups of goods.

Figure 5. Principal component analysis on processed intermediate goods, 2015
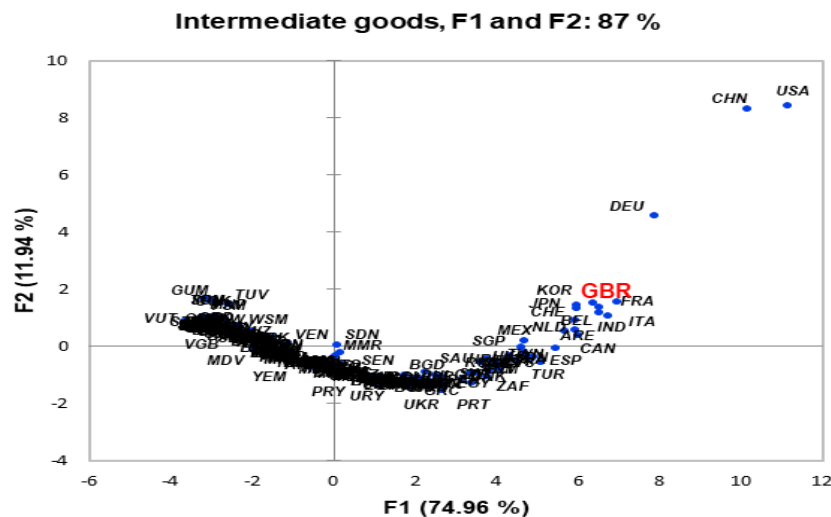
Source: see Figure 3.

The two first principal components explain a large proportion of the total variance (87%). F1 (75% of variance) organises the countries according to their central role in the network and the geographical diversification of their trade partners. F2 gives more weight on the economic size of the nodes (the value of their imports and exports). On these criteria, China and the USA are two outstanding traders, followed by Germany. The UK ranks 6th when computing its score on the basis of the first three principal components and is among the front runners of the group of other countries (see Table 3).

Score and ranking according to transport equipment: The last Figure 7 is organised according to the same logic: two first principal components explain a large proportion of the total (86%) variance, with F1 (73%) ranking

countries according to their central role in the network and the geographical diversification of their trade partners while F2 privileges the economic size of the countries as measured by the value of their trade flows. But, at the difference of intermediate goods, China is not singled out as a leader: The USA remains alone in pole position, followed by Germany. Based on its score on the composite index, the UK is well placed in the Top-5 of the rest of countries (Table 3) and belongs to the sub-group of 11 countries that emerge from the rest of the pack (Figure 7). Indeed, this sector, together with capital goods is probably the most demanding in terms of technology, thus only a few countries can belong to the group of leaders. This explains the existence of a sub-group of second-rank leaders between the front-runners and the rest of the pack.

Figure 6. Principal Component Analysis on transport equipment and parts, 2015
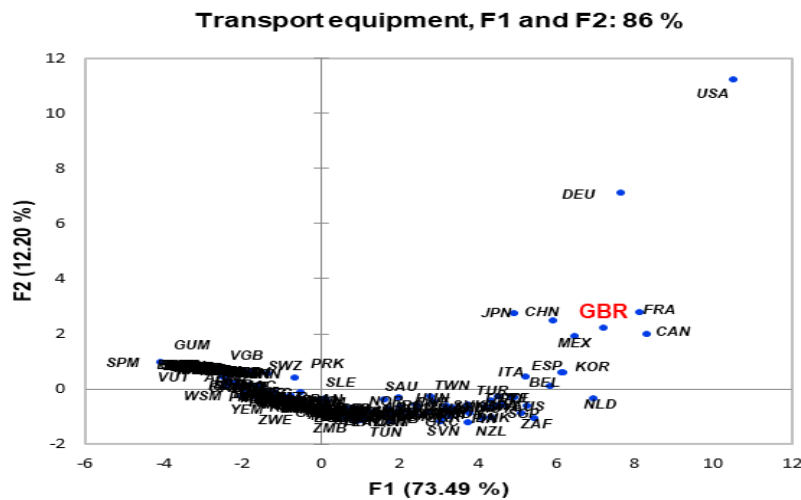
Source: see Figure 3

Table 3 summarizes the results obtained when computing the score of each country for each one of the four categories of goods. When considering transport equipment, UK ranked 5th. UK does better (3rd) for consumers' goods and worse for processed intermediate goods (6th) and capital goods, other than transport equipment (8th). Overall, UK ranked 5th when considering all categories. Note that these rankings are contingent to the variables included in the analysis and the size of the sample. Therefore, small differences in scores are not statistically significant. For example, it is safe to consider that Mexico, Singapore, UK and Hong Kong share the same rank for capital goods and India, UK, Italy and Korea for intermediate goods.

Table 3. Summary Top 10 network scores on each groups of goods, 2015

Capital goods			Intermediate goods[a]			Consumers' goods[a]			Transport goods			All goods[a]		
ISO3	Score	Index	ISO3	Score	Index	ISO3	Score	Index	ISO3	Score	Index	ISO3	Score	Index
USA	10.4	100.0	USA	10.2	100.0	USA	12.4	100.0	USA	9.3	100.0	USA	21.6	100.0
CHN	9.3	91.6	CHN	9.4	93.8	FRA	6.4	58.9	DEU	6.8	79.2	CHN	14.8	74.4
DEU	5.7	61.9	DEU	7.0	75.5	GBR	6.2	57.8	CAN	6.6	77.9	DEU	13.0	67.5
NLD	5.6	61.5	FRA	5.8	66.2	DEU	5.8	55.1	FRA	6.6	77.7	FRA	12.5	65.8
FRA	5.5	60.4	IND	5.6	64.5	CHN	5.6	54.2	GBR	5.8	71.7	GBR	11.6	62.1
MEX	5.1	57.1	GBR	5.4	63.3	CHE	5.0	50.0	NLD	5.3	67.6	NLD	10.5	58.0
SGP	5.0	56.5	ITA	5.4	63.3	NLD	4.8	48.2	MEX	5.2	66.6	CAN	9.9	55.7
GBR	5.0	56.4	KOR	5.3	62.6	ITA	4.7	47.8	CHN	4.9	64.5	ITA	9.4	54.0
HKG	4.8	54.6	JPN	5.0	60.2	ESP	4.2	44.2	KOR	4.9	64.2	KOR	8.9	52.3
KOR	4.2	50.2	CHE	5.0	60.1	HKG	4.0	42.8	ESP	4.8	63.6	ESP	8.6	51.0

Note: Score based on the countries position according to the first three principal components calculated for each group of goods and the related index ranging from 0 to 100. [a]Except oil and fuels.
Source: Author's elaboration on the basis of Comtrade data.

4. United Kingdom's revealed comparative advantages from a global value chains (GVC) perspective

After characterising UK trade from the aggregated perspective of the basic economic classification, this section looks at more detailed product group. Over the past 10 years, the composition of UK's exports of merchandises didn't change much, except for a lower share of fuels, largely due to the decline in oil prices after 2011 (Figure 8).

Figure 7. UK Export composition, 2006-2016
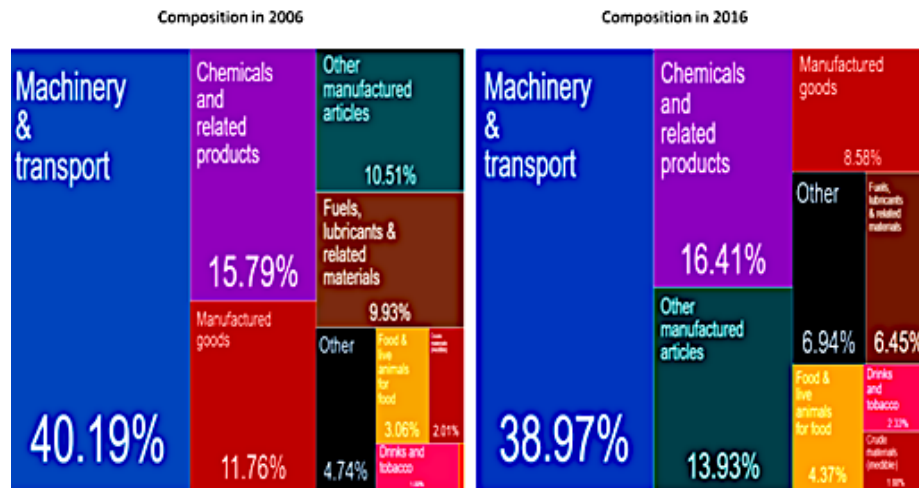
Notes: Based on SITC4 trade data
Source: Atlas of Economic Complexity interactive website, Harvard Centre for International Development. Available from: https://atlas.media.mit.edu/publications/

A closer look (Figure 9) indicates that the aggregate Machinery and Transport is composed of two sub-sectors that followed different paths. Transport equipment did well, thanks to a mix of increased volume in terms of market share and relative price. The good orientation of Transport equipment is largely due to road vehicles: they represented 8.6% of exports in 2006 and 12.1% in 2016. Machinery, which excludes electrical and electronics and was not included as such in our *TiVA* review, is also a heavily traded group of products. It gained in prices but lost in terms of market share (we saw in the previous section that UK ranks only 8th on capital goods). The most dynamic group of products from 2006 to mid-2016 was Chemicals, one of the strongest UK good-producing sectors.

Figure 9. Product mix and sector specialization, 2006-2016
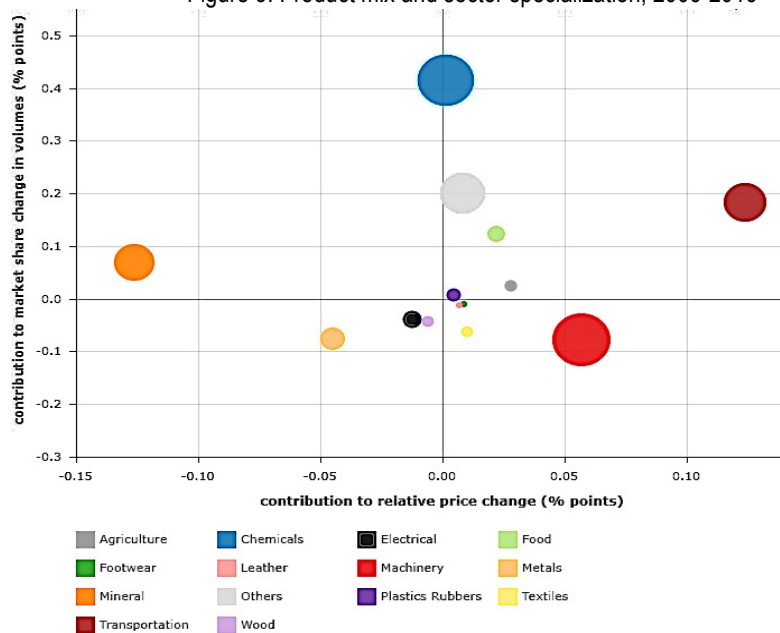
Notes: The products are classified according to the Harmonized Systmem 1996 and do not correspond to the industrial sectors used in *TiVA*. The size of the bubbles (weight) is equal to a country's sector specialization.
Source: World Bank "Measuring Export Competitiveness".

Product-space and comparative advantages from the value chain perspective

A product space diagram depicts the connectedness between products, based on the similarities of endowments required to produce them. Strengths and weaknesses in exporting these products are measured through the Revealed Comparative Advantage (RCA) indicator, which compares the share of a product in the country's exports with the weight of this product in world trade. The diagram shows the connectedness between products, based on the similarities of revealed comparative advantages (RCA) required to produce them, itself calculated as a correlation between these exports across all countries[42].

We use for our analysis here the Atlas of Economic Complexity, Harvard Centre for International Development based on 2016 data, in Figure 10. For example, car production (which has a RCA of 2, meaning that UK has a strong comparative advantage in this product) is closely associated with the following products: Springs and leaves for springs; Other lifting, handling, loading or unloading machinery; Other articles of vulcanized rubber other than hard rubber; Parts and accessories of the motor vehicles: Safety glass, consisting of toughened (tempered) or laminated glass. When an exporter has a comparative advantage in one of these products, this competitiveness can (relatively) easily be transferred to the other related products[43].

Figure 10. UK product space, 2016
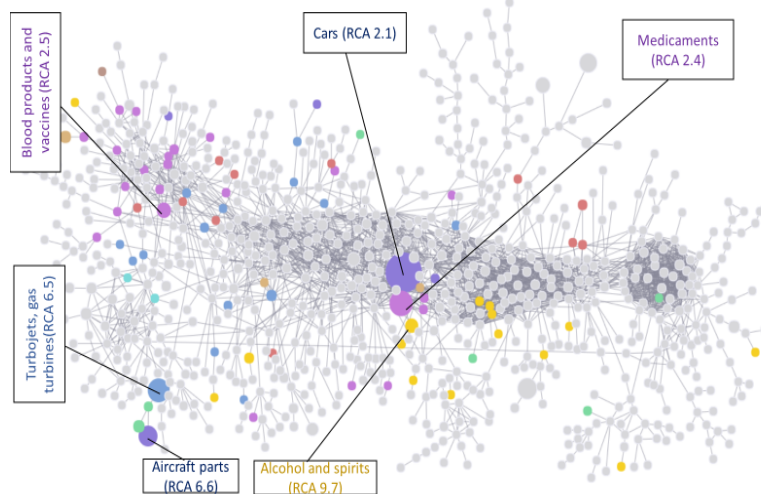
Notes: The product space (here at HS4 classification) depicts the connectedness between products, based on the similarities of endowments required to produce them. Revealed Comparative Advantage (RCA) compares the share of a product in the country's exports with the weight of this product in world trade. Coloured nodes are products for which UK's RCA is higher than 2.
Source: Atlas of Economic Complexity, Harvard Centre for International Development.

Besides the particular strength of UK in exporting alcohol and spirits (with an RCA close to 10), the product-space analysis identifies two strong clusters: one belongs to transport and related machinery and is articulated on car (RCA 2), aircrafts and turbines (both with an RCA close to 7); the other one is articulated on medicaments and chemical products (RCA 2).

In a world where industrial production is geographically fragmented, the product-space based on gross trade statistics may be strongly biased. An exporter specialising in the final stages of production (*e.g.,* assembly) will appear as exporting a set of very sophisticated products, even if most of the value-added comes from upstream industries located outside the country. When analysing trade from a GVC perspective, it is therefore necessary to look at "trade in tasks" rather than "trade in goods". The OECD-WTO *TiVA* database is particularly suited for this

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[42] RCA is called 'revealed' because the calculation of comparative advantages is based on trade statistics: if a country has a comparative advantage in a given product, it will specialize in exporting it. RCA = 1 indicates a neutral position (the country's export specialization corresponds to the weight of this product in world trade); scores higher/lower than 1 indicate an advantage/disadvantage in exporting the product.

[43] Product-space is based on a statistical association (correlation) often based on similar know-how and resources endowments (in the UK case, cars and aircraft exports). It should not be confounded with the notion of value chains, where intermediate products are linked through a production function (for example, the barley required to produce whisky and the glass bottles used to package it).

purpose as it allows to trace the origin (sectoral and geographic) of the value added embodied into the trade goods and services[44].

The picture provided by trade in value-added as estimated in differs in several ways from the patterns observed in Figure 10. We look now at the sectoral (good but also services) domestic value-added directly or indirectly embodied in trade, instead of looking at the gross value of merchandises as recorded by customs administrations and official trade statistics. Moreover, the RCA is not calculated in reference to all World trade partners, but only against the other developed G20 members (Australia, Canada, France, Germany, Italy, Japan, United Kingdom and United States). It is principally within this group that UK has to compete, even if some "emerging economies" have indeed attained a high level of industrial development[45].

Table 4. Revealed comparative advantages in tasks, developed G20 countries (2012-2014 average)

	United Kingdom	Australia	Canada	France	Germany	Italy	Japan	United States
C01T05: Agriculture, hunting, forestry and fishing	0.31	2.43	2.21	1.49	0.44	1.03	0.24	1.22
C10T41: Industry (Mining, Manufactures and Utilities)	0.77	1.13	1.22	0.72	1.20	0.98	1.14	0.92
C15T37: Total Manufactures	0.73	0.36	0.76	0.81	1.33	1.10	1.32	0.95
C20T22: Wood, paper, paper products, printing and publishing	0.84	0.52	1.73	0.67	0.99	0.77	0.79	1.21
C23T26: Chemicals and non-metallic mineral products	0.86	0.36	0.66	0.88	1.16	0.86	1.19	1.13
C27T28: Basic metals and fabricated metal products	0.53	0.62	0.98	0.96	1.29	1.57	1.57	0.67
C30T33: Electrical and optical equipment	0.67	0.14	0.29	0.53	1.31	0.79	1.93	1.06
C34T35: Transport Equipment	0.73	0.15	0.81	0.82	1.79	0.48	1.54	0.76
C45T95: Total Services including Construction activities	1.19	0.86	0.80	1.19	0.88	1.02	0.93	1.05
C50T95: Total Services	1.18	0.84	0.80	1.18	0.87	1.02	0.93	1.06
C50T74: Total Business Sector Services	1.15	0.83	0.80	1.16	0.87	1.04	0.98	1.05
C50T64: Wholesale, retail, hotels, restaurants, transport	0.89	0.97	0.95	1.18	0.75	1.09	1.39	0.97
C50T55: Wholesale and retail trade, Hotels and restaurants	0.86	0.90	0.94	1.16	0.74	1.09	1.52	0.95
C60T64: Transport and storage, post and telecommunication	0.94	1.10	0.97	1.23	0.78	1.10	1.14	0.99
C65T74: Finance, Real Estate and business services	1.43	0.68	0.64	1.14	0.99	0.98	0.54	1.14
C70T74: Real estate, renting and business activities	1.26	0.68	0.55	1.23	1.12	0.99	0.57	1.09
C75T95: Community, social and personal services	1.52	1.00	0.83	1.37	0.91	0.71	0.29	1.17

Notes: The RCA is calculated "relative" to all G20 developed economies, over the 2012-2014 period. For any particular sector, the RCA is greater than 1 if the share of domestic value added in World Final Demand is larger than the DVD-G20 weighted average.

Source: Author's elaboration based on OECD *TiVA* Nowcasts.

On this basis, UK's comparative advantages are mainly to be found in services, particularly in Finance and Business services (sector C65T74). Figure 11 synthetises the information by comparing the UK with the DVD-G20 (unweighted) average. The highest UK's RCAs (on the left part of the graph) are all in services, headed by Finance intermediation. The first good-producing sector is Chemicals, where the UK is almost at par with other developed G20 countries. Transport equipment, which appeared as a strong sector when looking at the exports of final products (including parts and components), is now below par, at 0.73 compared with 0.91 in DVD-G20 average where Germany and Japan lead the group.

However, a word of caution is in order. It would be a mistake to conclude that UK has no comparative advantages in the production of cars or aircrafts. What trade in tasks tells us is that a large share of the value embodied in these products comes has been imported? The result may have been influenced by differences in business models: UK car industry may be less incorporated than in Germany and Japan or more dependent of a foreign lead-firm. A UK firm may, in this case, outsource more of its tasks compared to older-style incorporated firms that amalgamated all core and non-core activities under the same corporate roof. Additionally, UKs automotive firm may be very good at assembling the various pieces of value-added embodied into a car, producing a final product that proves competitive on international markets (remember the very good ranking of the "Made in UK"

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[44] There are other databases that provide similar information; in particular, WIOD, an EU-funded project, or Eora, initially funded by the Australian Research Council. The Beijing-based UIBE GVC Index project compiles most of these data and derives a series of ready-made indicators.

[45] Korea, for example, informed during the WTO Doha Round discussion its intention of being treated as a "developed economy" and the Russian Federation joined the WTO under this status.

brand, Figure 1). Therefore, the *TiVA* approach does not substitute the traditional product-space approach but complements it by identifying more closely the sources of competitiveness.

Figure 11. UK revealed comparative advantages in tasks relative to developed G20 countries, 2012-2014
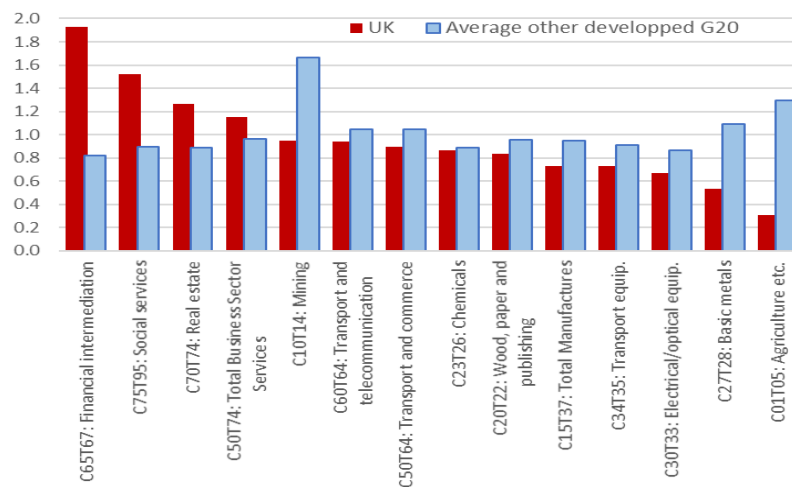
Note: The G20 statistics is based on a simple average of the 8 developed G20 members over 2012-2014.
Source: Table 4

Exports, value-added and employment

Trade in value-added provides a basis for estimating the employment content of exports. The estimate requires data on the amount of sectoral value-added absorbed by wages (compensation of employees) and additional labour statistics. Using OECD estimates for 2011, Annex 1 presents the results by sector and aggregates, distinguishing the destination of exports supporting the jobs. Again, a word of caution is in order: *TiVA* data are based on national industry averages, mixing small and large firms. Exporters are known to be mainly large firms that are more efficient than the industrial average. As a result, the number of jobs that are reported here as embodied in exports is probably an upper estimate.

In 2011, export activities supported, directly or indirectly 6.6 million UK jobs according to OECD (see Annex 1). The business services sector represents 4.4 million (67%) of these posts. By comparison, UK exports of manufacture support 1.3 million of jobs (20% of total export-related employment) and the primary sectors (agriculture plus mining) only 2%[46]. Looking at individual sectors, Financial intermediation alone weights 6% of total jobs, twice as much than Chemicals or Transport equipment (3% each).

Table 5. Sectoral distribution of UK employment supported by foreign final demand in 2011, by main region

World	EU	NAFTA	East & South Asia	Central & South America	Other
CTOTAL: TOTAL	43%	19%	11%	2%	25%
of which	100%	100%	100%	100%	100%
C01T05: Agriculture, hunting, forestry and fishing	**58%**	11%	7%	1%	23%
C10T14: Mining and quarrying	52%	18%	7%	**3%**	21%
C17T19: Textiles, textile products, leather and footwear	**60%**	11%	9%	1%	19%
C23: Coke, refined petroleum products and nuclear fuel	**53%**	**25%**	5%	2%	15%
C24: Chemicals and chemical products	42%	21%	11%	**3%**	23%
C27T28: Basic metals and fabricated metal products	35%	17%	12%	2%	**34%**
C27: Basic metals	30%	16%	**14%**	2%	**38%**
C29: Machinery and equipment, nec	28%	22%	14%	**3%**	34%
C30T33: Electrical and optical equipment	37%	21%	**15%**	2%	26%
C30T33X: Computer, Electronic and optical equipment	37%	22%	**15%**	2%	24%
C31: Electrical machinery and apparatus, nec	35%	18%	**14%**	**3%**	30%
C34T35: Transport equipment	30%	16%	10%	2%	**41%**
C35: Other transport equipment	23%	17%	9%	1%	**50%**
C36T37: Manufacturing nec; recycling	**53%**	13%	7%	1%	26%

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[46] The remaining jobs are distributed among other sectors, in particular administration and other services.

World	EU	NAFTA	East & South Asia	Central & South America	Other
C60T63: Transport and storage	34%	15%	13%	2%	**36%**
C65T67: Financial intermediation	20%	**36%**	**17%**	2%	25%
C72: Computer and related activities	43%	**24%**	11%	1%	20%
C80: Education	36%	21%	12%	**3%**	28%
C85: Health and social work	39%	**22%**	10%	2%	26%
C90T95: Other social services	**54%**	14%	6%	1%	26%
C65T74: Finance, Real Estate and business services	45%	**23%**	11%	2%	20%

Note: Highlighted sectors show the 5 largest sources of UK employment driven by export to this region.
Source: Annex 1 based on OECD data

In terms of geographic distribution, 43% of the total export-related jobs are linked to EU final demand, 19% to NAFTA (Canada, Mexico and the USA) and 11% to East and South Asia (please note that the results are constrained by the geographic *TiVA* coverage). The distribution of employment supported by the demand emanating from these regions varies from sector to sector. If we compare EU and NAFTA regions, the main difference is on the relative weigh of goods vs services sectoral value-added. With the exception of fuels (C23), all Top5 UK sectors of origin for the NAFTA region are in services. Comparatively, EU demand for UK labour-related value-added is concentrated in low-wages sectors (primary sector, other manufacture and recycling, social services) or in fuels[47]. Asia absorbs principally manufacture value-added and financial services. The distribution of demand from South and Central America is relatively flat, while the Rest of the World concentrates its imports mainly on metals and transport equipment (and the transport and storage services that are associated with trade in goods).

Conclusions

The analysis confirms that UK's main comparative advantage is in services, when looking at both traditional and value-added trade statistics. Finance intermediation presents the highest revealed comparative advantage, followed by other business services. UK dominance in this sector of trade (UK ranks second after the USA, with about 7% of World exports) reflects a comparative advantage that is without common measure to its economic size as measured by total trade or GDP.

Conversely, the UK is not a "special case" when looking at trade in goods. UK's position in the Top5 group of most relevant players in the worldwide network of trade in merchandises is owed more to its economic size than to a particular comparative advantage. Indeed, at the difference of trade in services, UK's trade balance in merchandises is negative. Differentiating by categories of goods, UK ranks better on consumers' good than on capital good (excluding transport equipment). Consumers' good being easier to target in trade wars, UK's strength in consumer goods can also be seen as a vulnerability in case of hard Brexit. UK's role in transport equipment is more prominent than for capital good. This sector is one of the strengths of the UK economy, representing little less than 40% of its merchandises exports. When looking at comparative advantages from a trade in value-added perspective (*id est*, including direct and indirect exports), the sector of Chemicals stands out as one of the most competitive. Network analysis provided additional information on a few sectors (Agroindustry, Metal products) where UK has an influential role that surpasses the economic weigh of its sectoral trade.

Estimates of the jobs embodied in the domestic value-added exported to third countries show that about 6 million UK jobs have been generated directly or indirectly by exports. 67% of them are generated by the business services sector, much more than manufacture (20%) or primary activities (2%). North America generates the highest demand for UK business services skills, EU is the main driver for low-skill industrial jobs while exports to Asia embody medium to highly skilled jobs.

A forthcoming second part will benchmark UK within "*Factory EU*" and against other key G-20 countries for three industries that the present article identified for their relevance from a GVC perspective: Transport equipment, Chemicals and Electronics. It will evaluate also how Brexit and the expected increase in UK trade costs to and from the EU affect UK's export competitiveness.

Aknowledgement

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[47] Irrespective of the important fact that EU demand is also large, relative to other region, for other products.

(9 November 2017) and "Navigating Uncertainty: Towards A Post-Brexit Trade and Business Agenda (18 June 2018) for their comments and suggestions on previous drafts. All remaining errors and shortcomings remain my own responsibility.

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ANNEXES

ANNEX 1: UK jobs embodied in exports of sectoral value-added

Table 3. UK jobs embodied in exports to World and to selected regions, 2011[a]

	To World		EU	NAFTA	East & South Asia	Central & South America	Other regions
	Thousands	%					
CTOTAL: TOTAL	6,588.2	100.0%	43.0%	19.2%	11.1%	1.9%	24.8%
C01T05: Agriculture, hunting, forestry and fishing	87.3	1.3%	0.8%	0.1%	0.1%	0.0%	0.3%
C10T14: Mining and quarrying	39.0	0.6%	0.3%	0.1%	0.0%	0.0%	0.1%
C15T37: Total Manufactures	1,296.0	19.7%	7.9%	3.4%	2.3%	0.4%	5.7%
C15T16: Food products, beverages and tobacco	88.8	1.3%	0.7%	0.2%	0.1%	0.0%	0.3%
C17T19: Textiles, textile products, leather and footwear	65.4	1.0%	0.6%	0.1%	0.1%	0.0%	0.2%
C20T22: Wood, paper, paper products, printing, publishing	136.4	2.1%	1.0%	0.3%	0.2%	0.0%	0.5%
C20: Wood and products of wood and cork	17.4	0.3%	0.1%	0.0%	0.0%	0.0%	0.1%
C21T22: Pulp, paper, paper products, printing &publishing	119.0	1.8%	0.8%	0.3%	0.2%	0.0%	0.4%
C23T26: Chemicals and non-metallic mineral products	202.5	3.1%	1.4%	0.6%	0.3%	0.1%	0.7%
C23: Coke, refined petroleum products and nuclear fuel	13.3	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%
C24: Chemicals and chemical products	101.9	1.5%	0.6%	0.3%	0.2%	0.0%	0.4%
C25: Rubber and plastics products	64.3	1.0%	0.4%	0.2%	0.1%	0.0%	0.2%
C26: Other non-metallic mineral products	22.9	0.3%	0.2%	0.1%	0.0%	0.0%	0.1%
C27T28: Basic metals and fabricated metal products	167.8	2.5%	0.9%	0.4%	0.3%	0.1%	0.9%
C27: Basic metals	46.5	0.7%	0.2%	0.1%	0.1%	0.0%	0.3%
C28: Fabricated metal products	121.3	1.8%	0.7%	0.3%	0.2%	0.0%	0.6%
C29: Machinery and equipment, nec	170.6	2.6%	0.7%	0.6%	0.4%	0.1%	0.9%
C30T33: Electrical and optical equipment	198.5	3.0%	1.1%	0.6%	0.4%	0.1%	0.8%
C30T33X: Computer, Electronic and optical equipment	136.0	2.1%	0.8%	0.5%	0.3%	0.0%	0.5%
C31: Electrical machinery and apparatus, nec	62.5	0.9%	0.3%	0.2%	0.1%	0.0%	0.3%
C34T35: Transport equipment	181.9	2.8%	0.8%	0.4%	0.3%	0.0%	1.1%
C34: Motor vehicles, trailers and semi-trailers	67.6	1.0%	0.4%	0.2%	0.1%	0.0%	0.3%
C35: Other transport equipment	114.2	1.7%	0.4%	0.3%	0.1%	0.0%	0.9%
C36T37: Manufacturing nec; recycling	84.2	1.3%	0.7%	0.2%	0.1%	0.0%	0.3%
C40T41: Electricity, gas and water supply	29.1	0.4%	0.2%	0.1%	0.0%	0.0%	0.1%
C45: Construction	134.7	2.0%	0.9%	0.4%	0.2%	0.0%	0.5%
C50T74: Total Business Sector Services	4,434.0	67.3%	28.9%	13.7%	7.8%	1.3%	15.7%
C50T55: Wholesale and retail trade; Hotels, restaurants	1,492.5	22.7%	9.6%	4.1%	2.7%	0.5%	5.8%
C50T52: Wholesale and retail trade; repairs	1,300.5	19.7%	8.3%	3.6%	2.4%	0.4%	5.0%
C55: Hotels and restaurants	191.9	2.9%	1.3%	0.5%	0.3%	0.1%	0.7%
C60T64: Transport, storage, post and telecommunication	514.6	7.8%	2.9%	1.3%	1.0%	0.1%	2.5%
C60T63: Transport and storage	380.3	5.8%	2.0%	0.9%	0.7%	0.1%	2.1%
C64: Post and telecommunications	134.2	2.0%	0.9%	0.4%	0.2%	0.0%	0.5%
C65T67: Financial intermediation	379.2	5.8%	1.2%	2.1%	1.0%	0.1%	1.4%
C70T74: Real estate, renting and business activities	2,047.8	31.1%	15.2%	6.2%	3.2%	0.5%	5.9%
C70: Real estate activities	17.7	0.3%	0.1%	0.1%	0.0%	0.0%	0.1%
C71: Renting of machinery and equipment	27.0	0.4%	0.2%	0.1%	0.0%	0.0%	0.1%
C72: Computer and related activities	189.5	2.9%	1.2%	0.7%	0.3%	0.0%	0.6%
C73T74: R&D and other business activities	1,813.6	27.5%	13.7%	5.4%	2.8%	0.5%	5.2%
C75T95: Community, social and personal services	568.1	8.6%	4.2%	1.4%	0.7%	0.1%	2.3%

	To World		EU	NAFTA	East & South Asia	Central & South America	Other regions
	Thousands	%					
C75: Public administration and defence; compulsory social security	42.5	0.6%	0.3%	0.1%	0.1%	0.0%	0.2%
C80: Education	134.1	2.0%	0.7%	0.4%	0.2%	0.1%	0.6%
C85: Health and social work	19.0	0.3%	0.1%	0.1%	0.0%	0.0%	0.1%
C90T95: Other social services	372.5	5.7%	3.0%	0.8%	0.3%	0.1%	1.5%
C10T41: Industry (Mining, Manufactures and Utilities)	1,364.2	20.7%	8.4%	3.6%	2.3%	0.4%	6.0%
C45T95: Total Services including Construction activities	5,136.8	78.0%	33.9%	15.5%	8.7%	1.4%	18.5%
C50T95: Total Services	5,002.1	75.9%	33.0%	15.1%	8.4%	1.4%	17.9%
C50T64: Wholesale, retail, hotels, restaurants, transport	2,007.0	30.5%	12.5%	5.4%	3.6%	0.6%	8.3%
C65T74: Finance, Real Estate and business services	2,427.0	36.8%	16.4%	8.3%	4.1%	0.6%	7.4%

Note: [a]The estimates, based on national industrial averages, are probably over-estimating the actual number of jobs: Export-oriented firms and their suppliers are usually larger and more efficient in the use of labour than purely domestic firms.

Source: OECD Trade in employment Data Set: Core Indicators

ANNEX 2: Sectoral Network Indicators for Selected TiVA countries and groups

Social network analysis is "social" in the sense that it looks at the strength of ties or relations between individuals (called "nodes" or "vertices"). It is particularly well adapted for analysing trade along supply chains, where GVCs may be of the "spider type", hubs and spokes where traders are connected at short lengths, or "snakes" were distances may be larger from beginning to end, but the connections are strong and stable. The network indicators retained in this study are: Indegree and Outdegree, which can be unweighted (the number of trade partners pointing to or from a given node) or weighted by trade flows (value of imports and exports). The weighted degree is the sum of imports plus exports.

Other indicators belong to the family of centrality scores. This area is one of the most studied concepts in social network analysis and numerous measures have been developed (Borgatti 2005). We use several ones, described as follows. Closeness: nodes with low score have relatively short distance to travel to link with other nodes. Betweenness centrality and eigen centrality includes some idea of dominance: going through these nodes is the best way of getting to all others because of their influence (centrality). A trader with higher betweenness centrality would have more control over the trade network, because more trade flows pass through it. To quote Borgatti (2005, 61), "the idea is that even if a node influences just one other node, who subsequently influences many other nodes (who themselves influence still more others), then the first node in that chain is highly influential." Closely associated with eigen centrality, PageRank is a probabilistic score based on a hierarchy of node by "link popularity": A node is ranked higher as there are more links pointing to it. It is our best choice in this case of acyclic directed graph as it avoids issues found in other indicators such as eigenvector centrality (Newman 2010, 171).

Clustering measures, the tendency of a country to trade into a tightly knit group of trade partners. Eccentricity measure captures the distance between a country and the trade partner that is furthest from it; a low eccentricity means that the furthest away node is actually quite close. Here, a word of caution is called for. When working with the World Trade Network at aggregated level, only few bilateral trade flows are nil, so an indicator like eccentricity would have little sense. In order to focus only on significant bilateral trade relationship, in most of the analysis, bilateral flows smaller than 1% of reporter's exports were not considered in the calculation of network indicators

Table 4. World Trade Network indicators, selected countries (2014)

Sector	Label	Reporter	Eigen centrality	Weigh in-degree	Weight out-degree	Weight degree	Page Rank	Between. centrality
C01T05	Agriculture	GBR	0.653	13044	4571	17616	0.0032	4.0E-05
C01T05	Agriculture	DEU	0.654	26109	11488	37597	0.0068	2.1E-05
C01T05	Agriculture	FRA	0.660	16621	15738	32359	0.0046	4.2E-05
C01T05	Agriculture	ITA	0.644	16333	5952	22285	0.0046	1.8E-05
C01T05	Agriculture	G20	0.637	11524	8431	19950	0.0023	1.5E-05
C01T05	Agriculture	EU	0.623	1848	2355	4377	0.0008	1.2E-05
C01T05	Agriculture	DVD	0.635	1848	2533	4720	0.0008	1.3E-05
C10T14	Mining	GBR	0.343	37316	36045	73361	0.0016	7.5E-05
C10T14	Mining	DEU	0.353	40716	5339	46055	0.0030	9.8E-05
C10T14	Mining	FRA	0.340	21849	3164	25013	0.0031	7.7E-05
C10T14	Mining	ITA	0.328	30371	1515	31886	0.0022	5.2E-05
C10T14	Mining	G20	0.328	26110	31789	64507	0.0019	5.1E-05
C10T14	Mining	EU	0.274	5023	713	5718	0.0006	2.2E-05
C10T14	Mining	DVD	0.277	5023	876	5920	0.0007	2.5E-05
C15T16	Agroindustry	GBR	0.878	55635	19250	74885	0.0042	4.0E-06
C15T16	Agroindustry	DEU	0.889	49377	50380	99757	0.0045	8.0E-06
C15T16	Agroindustry	FRA	0.878	41858	40595	82452	0.0038	4.0E-06
C15T16	Agroindustry	ITA	0.878	29678	31364	61041	0.0028	4.0E-06
C15T16	Agroindustry	G20	0.878	18709	16888	30433	0.0022	7.0E-06
C15T16	Agroindustry	EU	0.867	5501	4709	9856	0.0007	3.0E-06
C15T16	Agroindustry	DVD	0.873	6475	5471	13991	0.0008	3.5E-06
C17T19	Textiles	GBR	0.859	34315	11367	45681	0.0044	8.0E-06
C17T19	Textiles	DEU	0.859	32791	17020	49811	0.0052	8.0E-06
C17T19	Textiles	FRA	0.859	33226	16095	49322	0.0037	8.0E-06

Sector	Label	Reporter	Eigen centrality	Weigh in-degree	Weight out-degree	Weight degree	Page Rank	Between. centrality
C17T19	Textiles	ITA	0.850	26510	46456	72966	0.0047	6.0E-06
C17T19	Textiles	G20	0.854	13250	8288	23544	0.0023	6.5E-06
C17T19	Textiles	EU	0.842	2528	1561	3641	0.0007	5.0E-06
C17T19	Textiles	DVD	0.850	2942	1561	4742	0.0008	6.0E-06
C20T22	Wood and Paper	GBR	0.653	20147	15160	35307	0.0040	2.4E-05
C20T22	Wood and Paper	DEU	0.653	29947	37039	66986	0.0060	2.4E-05
C20T22	Wood and Paper	FRA	0.659	23499	13128	36627	0.0050	3.9E-05
C20T22	Wood and Paper	ITA	0.653	17244	10042	27286	0.0034	2.4E-05
C20T22	Wood and Paper	G20	0.635	9243	5924	12330	0.0018	2.1E-05
C20T22	Wood and Paper	EU	0.606	2185	2258	4946	0.0006	1.1E-05
C20T22	Wood and Paper	DVD	0.619	2768	2369	6251	0.0007	1.3E-05
C23T26	Chemicals	GBR	0.896	114647	96489	211137	0.0031	7.0E-06
C23T26	Chemicals	DEU	0.896	199384	219778	419162	0.0055	7.0E-06
C23T26	Chemicals	FRA	0.886	134557	110535	245092	0.0037	4.0E-06
C23T26	Chemicals	ITA	0.886	78247	82029	160276	0.0024	4.0E-06
C23T26	Chemicals	G20	0.896	66861	76037	128738	0.0024	7.0E-06
C23T26	Chemicals	EU	0.867	14821	15698	30653	0.0006	3.0E-06
C23T26	Chemicals	DVD	0.874	15683	15698	32518	0.0006	3.0E-06
C27T28	Metals	GBR	0.728	40919	25928	66847	0.0028	1.9E-05
C27T28	Metals	DEU	0.730	82521	101506	184028	0.0050	1.4E-05
C27T28	Metals	FRA	0.730	43068	36280	79348	0.0026	1.4E-05
C27T28	Metals	ITA	0.739	40505	52357	92863	0.0026	2.0E-05
C27T28	Metals	G20	0.729	40231	31104	73098	0.0027	1.4E-05
C27T28	Metals	EU	0.699	5740	4442	11889	0.0005	9.0E-06
C27T28	Metals	DVD	0.705	8082	7931	16163	0.0006	1.0E-05
C30T33	Electronics	GBR	0.832	72832	38808	111640	0.0036	1.3E-05
C30T33	Electronics	DEU	0.832	85612	127086	212697	0.0042	1.3E-05
C30T33	Electronics	FRA	0.822	61465	40621	102086	0.0028	7.0E-06
C30T33	Electronics	ITA	0.832	31984	32980	64964	0.0017	1.3E-05
C30T33	Electronics	G20	0.822	40131	22162	58724	0.0019	9.5E-06
C30T33	Electronics	EU	0.804	6926	5783	12524	0.0005	5.5E-06
C30T33	Electronics	DVD	0.811	8087	5783	15123	0.0006	6.0E-06
C34T35	Vehicles	GBR	0.605	96129	69767	165896	0.0053	3.4E-05
C34T35	Vehicles	DEU	0.606	121365	241680	363045	0.0067	3.1E-05
C34T35	Vehicles	FRA	0.614	78403	93855	172258	0.0046	3.7E-05
C34T35	Vehicles	ITA	0.597	38163	42935	81098	0.0018	2.8E-05
C34T35	Vehicles	G20	0.575	34241	53221	85739	0.0017	2.1E-05
C34T35	Vehicles	EU	0.555	5742	7351	12464	0.0004	1.2E-05
C34T35	Vehicles	DVD	0.560	7111	4795	15236	0.0005	1.5E-05
C50T64	Transport, etc.	GBR	1.000	150009	132177	282187	0.0031	1.0E-06
C50T64	Transport, etc.	DEU	1.000	240839	233691	474529	0.0048	1.0E-06
C50T64	Transport, etc.	FRA	1.000	154358	179782	334141	0.0032	1.0E-06
C50T64	Transport, etc.	ITA	1.000	102767	125590	228357	0.0023	1.0E-06
C50T64	Transport, etc.	G20	1.000	100382	90176	195155	0.0023	1.0E-06
C50T64	Transport, etc.	EU	1.000	16930	20700	40130	0.0005	1.0E-06
C50T64	Transport, etc.	DVD	1.000	24359	30113	50755	0.0007	1.0E-06
C65T74	Business services	GBR	0.770	101151	197709	298860	0.0047	1.3E-05
C65T74	Business services	DEU	0.770	148265	110426	258691	0.0066	1.3E-05
C65T74	Business services	FRA	0.758	69887	49973	119860	0.0029	1.1E-05
C65T74	Business services	ITA	0.758	56323	33794	90117	0.0025	1.1E-05
C65T74	Business services	G20	0.764	37497	27892	67744	0.0016	1.1E-05
C65T74	Business services	EU	0.734	13420	8468	21922	0.0008	9.0E-06
C65T74	Business services	DVD	0.741	15240	10660	28888	0.0009	9.0E-06

Sector	Label	Reporter	Eigen centrality	Weigh in-degree	Weight out-degree	Weight degree	Page Rank	Between. centrality
C75T95	Health, edu., etc.	GBR	0.687	26734	28323	55056	0.0064	1.5E-05
C75T95	Health, edu., etc.	DEU	0.697	24747	10876	35623	0.0065	1.9E-05
C75T95	Health, edu., etc.	FRA	0.687	15046	16528	31573	0.0040	1.5E-05
C75T95	Health, edu., etc.	ITA	0.687	9325	5489	14814	0.0024	1.5E-05
C75T95	Health, edu., etc.	G20	0.687	6565	5460	12879	0.0015	1.5E-05
C75T95	Health, edu., etc.	EU	0.636	1943	2143	3832	0.0007	1.3E-05
C75T95	Health, edu., etc.	DVD	0.661	2429	2143	4264	0.0009	1.3E-05

Notes: DVD: developed countries; DVD, EU28 and G20: simple average of countries' scores.
Source: Author's calculation based on *TiVA* data and Gephi software (Bastian *et al.* 2009).

Credit Risk Estimation through Eventological Scoring

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Abstract:

After IFRS 9 "Financial Instruments" entered into force and due to the fact that Russian companies are updating their accounting to comply with international financial reporting standards, a number of problems arise, and one of them is the issue of objectivity and accuracy of credit risk estimation. One of the challenges in the methodology what regulates the provisions of this standard deals with assessing the credit risk of a financial asset so that one can an approach to estimate its impairment allowance. In accordance with the requirements of the standard, the credit risk estimation should be based on a comprehensive analysis and use available and relevant information. At present moment, most methods for assessing credit risk are based on statistical data and are neither flexible nor imply the opportunity to change the assessed parameters. The article explores how the method of eventological scoring can be adapted to use within the credit field, as its application enables to calculate the conditional probability of the occurrence of the target event in the context of numerous random events and take into account all relevant factors that influence the credit risk for a particular financial instrument. Application of the proposed method will help to choose an approach to estimating the expected credit losses without using statistical data and quantitative scores of experts. Using the proposed method will make it possible to simplify the procedures for data collection and formalizing the results of the survey that considers various factors and aims to assess the dynamics of credit risk.

Keywords: credit risk; eventological scoring; consolidated financial statement; international financial reporting standards; financial instruments

JEL Classification: G23; G21; H12; D81; G32

Introduction

Despite certain complications in Russia's relations with the West, many Russian companies successfully operate abroad, which includes some specific markets (Petrova and Shovkhalov 2016). Companies are obliged to provide reporting in line with the International Financial Reporting Standard (IFRS) principles. Whereas in the past the lack of qualified specialists was the main challenge, today it is associated with the constant changes of standards that are adapted to the requirements of modern management. Estimation of credit risk that is carried out when preparing financial statements is one of the issues requiring a methodological solution. This issue was even more relevant in 2018, when it became mandatory to apply IFRS 9 "Financial Instruments" on the territory of Russia (2014). International and Russian scientists propose methods for assessing credit risks, but the scoring systems they use are based on statistical tools, while the proposed methodology uses probability theory, which distinguishes it from other ones considered in scientific papers. The purpose of this article is to improve and adapt the method of eventological scoring for credit risk estimation.

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1. Literature review

Having studied scientific works (Lundqvist and Vilhelmsson 2018, Bae and Damnjanovic 2018, Anginer *et al.* 2014, Wilhelm 2000, Bessis 2002, Schonbucher 2003, Embrechts and Hofert 2014), we may conclude that in international banking sector the term "credit risk" is more thoroughly examined and can be interpreted from different perspectives. For instance, J. Kuot and E. Altman believe that it implies the possibility of losses due to the inability of the counterparty to fulfill its contractual obligations (Cauoette *et al.* 1998, Altman 2008). Credit risk is defined as the inability of the debtor to make interest payments or pay the principal amount of a loan in accordance with the terms of the loan agreement. The works of Russian scientists Lavrushin and Valenzova (2016), Mitrofanova (2015), Zinkevich (2011), Semenikhin (2012) also reflect the diversity of approaches both regarding the theory and the analytical support for risk estimation.

The Bank of Russia, as a mega-regulator of Russia's financial market, is updating the legal and methodological framework. Since 2016, significant amendments have been made to the regulatory acts of the Central Bank of the Russian Federation regulating the types of risks; this was done to improve the credit risk management system (ConsultantPlus 2017).

Determining and measurement of the "significant increase in credit risk" is a complex methodological problem that is relevant not only to all entities that produce IFRS reporting, but also to those companies where management accounting is created according to the IFRS principles (Polyakova and Ignatova 2017). In accordance with paragraphs 9.5.5.9 of IFRS 9, for each reporting date a company must measure whether the credit risk of a financial instrument has increased significantly since its initial recognition. To develop the estimation, a company must compare the default risk of a financial instrument at the reporting date with the risk of default on a financial instrument on the date of initial recognition (International Financial Reporting Standard 9 - Financial Instruments 2014). This topic has been investigated in scientific publications, but authors did not consider its connection with eventology (Novotny-Farkas 2016, Adrian and Shin 2014, Altman *et al.* 2016, Kou *et al.* 2014).

2. Materials and methods

By present moment, there have been significant changes in the accounting of financial assets, if compared with the provisions of International Accounting Standard (IAS) 39 - Financial Instruments: Recognition and Measurement (2003). The essence of this is presented in Table 1.

Table 1. Comparison of the main provisions regarding the accounting of financial assets

Comparison criteria	Main provisions	
	IAS 39	IFRS 9
Classification of financial assets	– Financial assets are measured at fair value through profit or loss; – Held-to-maturity investments; – Loans and receivables; – Held for trading financial assets.	– Assets measured at amortized cost (AC); – Assets measured at fair value through profit or loss of the reporting period (FVPL); – Assets are measured at fair value through other comprehensive income (FVOCI).
Model of impairment of financial assets	A financial asset is impaired and impairment losses are incurred if, and only if, there is objective evidence of impairment as a result of one or more events. Losses expected as a result of future events are not recognized, regardless of the degree of probability of their occurrence.	An entity should recognize the allowance reserve for expected credit losses on financial assets that are not measured using the profit or loss of the reporting period, loans granted, lease receivables, and certain financial guarantees.
Approaches to determining the loss when calculating the allowance	The amount of the loss is estimated as the difference between the asset's carrying value and the present value of estimated future cash flows (excluding future credit losses that have not been incurred) discounted at the original effective interest rate on the financial asset.	A simplified approach for trade receivables and lease receivables provides for an allowance equal to the amount of expected credit losses. For other assets the approach implies: - calculation of expected credit losses for 12 months; - calculation of expected credit losses throughout the life time of the financial asset.

Source: International Accounting Standard 39 - Financial Instruments: Recognition and Measurement 2003; International Financial Reporting Standard 9 - Financial Instruments 2014.

The main provisions for recognizing and derecognizing financial assets have not changed, and the principles of valuation during the initial recognition have remained the same. However, a new model is currently applied for

classification and valuation of financial assets. IFRS 9 classifies assets into three groups, depending on the business management model and characteristics of the financial asset related to cash flows.

The model of the depreciation of financial assets has also been changed. This reflects the transition from the model of incurred losses to the model of expected losses. Thus, when creating an allowance, it is necessary to focus not on the objectively confirmed event, but take into account future credit losses. The model provides for several approaches. A simplified approach involves creating a provision for each reporting date, without tracking changes in credit risk. Within this universal approach, the accounting of financial assets depreciation aims to show the incorporators the expected credit losses that arise as a result of a significant increase in credit risk. For instance, in accordance with paragraph 5.5.3 of IFRS 9, "at each reporting date, an entity must measure the estimated provision for losses on the financial instrument at an amount equal to *lifetime expected credit losses* if the credit risk for this financial instrument significantly increased from the moment of its initial recognition".

IFRS 9 Application Guidance notes that the analysis of credit risk is multifactorial and comprehensive, while the relevance of a particular factor and its importance regarding other factors depends on many criteria. The entity must take into account reasonable and verifiable information that is available and relevant to the particular financial instrument that is analyzed.

The method of eventological scoring implies estimation the probability of the occurrence of target event s (timely and full accounting for a financial asset) and is based on the results of the expert's questionnaire.

3. Results

The problem may be solved by using eventological scoring, the method that enables to make managerial decisions in conditions of multi-event risks and uncertainty.

The theoretical basis of this method is represented by a new direction in probability theory – eventology which is the theory of random events that studies motion laws of sets of random events and their interaction (Lukyanova *et al.* 2017).

The method of eventological scoring allows calculating the conditional probability of the occurrence of a target event in case of the occurrence of numerous interpretive random events (Goldenok 2010). This method makes it possible to obtain an integral probabilistic estimate of a certain phenomenon on the basis of a set of parameters under conditions of uncertainty.

Let us consider the possibility of using eventological scoring method to estimate credit risk. At the preparatory stage, it is necessary to devise an internal questionnaire for the company the content of which is specific and depends on the type of financial instruments used and factors that affect credit risk. When developing the internal content of the questionnaire, one should consider the requirements of B5.5.17 of IFRS 9 which provide information that may be relevant in the analysis of changes in credit risk. According to this standard, the estimation process should take into account not only the internal credit rating of the borrower, but also external factors, that is, events, transactions or conditions occurring in the environment external to the counterparty.

As a rule, when bank credit scoring is applied, the questionnaire is filled in by a client, while if eventological scoring is used to estimate credit risk, the questionnaire is filled in by an expert who, on the basis of available and relevant information, provides a professional opinion on certain circumstances concerning the financial instrument. A provisional list of questions to be included in the questionnaire in order to measure the credit risk of a financial instrument is presented in Table 3.

Basically, eventology implies that there is some probability space (Ω, F, P) with algebra of measurable events F, probability P and a finite set of random events $(X \subseteq F)$ (Zhivaeva and Ignatova 2016). Within the framework of eventology, all the events that arise while filling in the questionnaire can be divided into two categories:
- basic events which are the events considered in the questionnaire and the occurrence of which may later influence the main event, called the target event;
- questionnaire events representing answers that are "created" by the expert while they are answering the questions of the questionnaire.

When estimating credit risk, the target event can be determined by carrying out all calculations on the estimated financial asset according to the terms established by the contract. Therefore, using the method of eventological scoring, let us denote a target event as $s \subseteq \Omega$ which implies that the counterparty conducts payments under the contract in full and in a timely manner. Each question of the questionnaire will correspond to the basic event $x \subseteq \Omega$ (the aspect on which the expert is asked to express their opinion) and the questionnaire response-event $x^c \subseteq \Omega$ (the answer to this question is based on the professional judgment of the expert). If we

assume that the possible outcomes are binary, then each basic event $(x \in \chi)$ is made up of two alternative events:

$$x = x \cap s + x \cap s^c, \tag{1}$$

where: $x \cap s$ is the basic event favorable to target event *s*, while $x \cap s^c = x - x \cap s$ is the basic event adverse to target event *s*.

For example, the stability of the borrower's financial flows will favor timely and full payment on the financial asset, that is, the occurrence of target event s, while the absence of this stability, on the contrary, will hinder it.

The method of eventological scoring implies that a set of questionnaire events χ^c performs an auxiliary function, allowing to define "eventological coordinates". This is due to the fact that each subset of questionnaire events $X^c \subseteq \chi^c$ corresponds to a single result of the questionnaire with binary answers ("yes" or "no"). In this case questionnaire events $x^c \in X^c$ favor the occurrence of target event s as $x^c \cap s$, while questionnaire events $x^c \in X^c$ do not favor the occurrence of s in the form $x^c \in X^c$. In view of this, and right in this sense, subsets of questionnaire events $X^c \subseteq \chi^c$, and also the one-to-one subsets corresponding to basic events $X \in \chi$ are called the results of the questionnaire (Zhivaeva and Ignatova 2016).

Eventology implies that the result of the questionnaire can be determined by conducting a set-theoretic operation on the set of all basis events χ that is uniquely determined by subset $X \subseteq \chi$. In the general case, this operation can be described by an arbitrary eventological set function $t : 2^\chi \to F$. In this case, the results of the questionnaire (arbitrary subsets $X \subseteq \chi$) are arguments of the given function, and events measured regarding algebra F are its values. In the particular case, the eventological set-function can be represented by the terraced interpretation of the basic events $t(X) \subseteq \Omega$, defined as a special set-theoretic operation on basic events (Lukyanova *et al.* 2017).

Eventological scoring-questionnaire aims to assess the probability of the occurrence of target event $s \subseteq \Omega$ (in this case, timely and comprehensive calculation for the financial asset) considering the result of the $X \subseteq \chi$ questionnaire, provided that basic events $x \subseteq \chi$ affecting the target event occurred in the combination (favorable $x \cap s$ and unfavorable $x \cap s^c$ for the occurrence of the target event) which is fully described by the given result of the questionnaire $X \subseteq \chi$.

Provided that the result of the scoring questionnaire is interpreted as the occurrence of target event $t(X) \subseteq \Omega$, the general formula of eventological scoring for the conditional probability of target event s takes the following form (Zhivaeva and Ignatova 2016):

$$P(s \big| t(X)) = \frac{P(s \cap t(X))}{P(t(X))} = \frac{P(s \cap t(X))}{P(s \cap t(X)) + P(s^c \cap t(X))} \tag{2}$$

Application of the method of eventological scoring is based on expert evaluation of the positive weights for each basic event x (the event considered in the questionnaire) that is favorable or unfavorable for the occurrence of target event *s*:

$$\omega(s \cap x) \geq 0, \; \omega(s^c \cap x) \geq 0, \; x \subseteq \chi. \tag{3}$$

Positive expert weights (1) have a probabilistic interpretation:

$$\omega(s \cap x) \approx P(s \cap x) = P(s \big| x)P(x), \tag{4}$$

$$\omega(s^c \cap x) \approx P(s^c \cap x) = P(s^c \big| x)P(x). \tag{5}$$

To calculate the above-mentioned positive expert weights, it is necessary to carry out the following expert procedures:
- at the first stage, the expert weighs all basic events regarding the occurrence or non-occurrence of target event s, which corresponds to the expert probabilities assessment:

$$\omega(x) \approx P(x) \tag{6}$$

of basic events $x \subseteq \chi$;

- at the second stage, for each basic event the expert weighs two options – favorable and adverse for target event s, which corresponds to expert estimates for each basic event $x \subseteq \chi$ in the pairs of conditional probabilities:

$$\omega(s,x) \approx P(s|x), \; \omega(s^c,x) \approx P(s^c|x) \tag{7}$$

the sum of which should equal one: $\omega(s,x) + \omega(s^c,x) = 1$, since $P(s|x) + P(s^c|x) = 1$;

- having conducted auxiliary expert procedures described above, it is possible to determine the resulting expert weights (2) using the following formulas:

$$\omega(s \cap x) = \omega(s,x)\omega(x), \; \omega(s^c \cap x) = \omega(s^c,x)\omega(x) \tag{8}$$

which correspond to the probabilistic formulas (4) and (5).

Thus, if the answer "yes" to the question in the eventological scoring questionnaire corresponds to questionnaire event $x^c \in X^c$ which favors the occurrence of the target event s in the form $x^c \cap s$, then it is given the positive expert weight $\omega(s \cap x)$. If the answer "yes" to the question in the eventological scoring questionnaire corresponds to questionnaire event $x^c \in X^c$, which does not favor the occurrence of s in the form $x^c \cap s^c$, then it is given the positive expert weight $\omega(s^c \cap x)$. Let's consider the distribution of positive expert weights on an example (Table 2).

Table 2. An example of an eventological scoring questionnaire for estimating credit risk of a financial instrument

Question	Answer YES	Answer NO
1 Does the borrower have stable financial flows? (x_1)	$\omega(s \cap x)$	$\omega(s^c \cap x)$
2 Can the borrower provide sufficient working capital? (x_2)	$\omega(s \cap x)$	$\omega(s^c \cap x)$
3 Is the collateral for the financial instrument liquid? (x_3)	$\omega(s \cap x)$	$\omega(s^c \cap x)$
4 Is the collateral for the financial instrument sufficient to cover the principal amount? (x_4)	$\omega(s \cap x)$	$\omega(s^c \cap x)$
5 Does the estimation of the borrower's credit rating according to financial ratios confirm high credit worthiness? (x_5)	$\omega(s \cap x)$	$\omega(s^c \cap x)$
6 Does the ratio of the total cash flow and the size of the borrower's debt confirm high credit worthiness? (x_6)	$\omega(s \cap x)$	$\omega(s^c \cap x)$
7 Are there (expected) significant changes in external market credit risk indicators for this financial instrument? (x_7)	$\omega(s^c \cap x)$	$\omega(s \cap x)$
8 Are there (expected) adverse changes in commercial, financial or economic conditions that may lead to a significant change in the ability of the borrower to meet debt obligations? (x_8)	$\omega(s^c \cap x)$	$\omega(s \cap x)$
9 Are there (expected) objective indicators pointing to actual or forecasted significant changes in the operating results of the borrower? (x_9)	$\omega(s^c \cap x)$	$\omega(s \cap x)$

In Table 3, $X \subseteq \chi$ represents the result of the questionnaire: a set of basic events with answers "YES" to questions 1-6 and "NO" to questions 7-9, and $X^c = \chi - X$ with answers "NO" to questions 1-6 and "YES" to questions 7-9.

When calculating the conditional probability of the target event by the method of eventological scoring, one should focus on the interpretation of the eventological distribution of basic events determined by their structure. There are several types of structures of basic events, and the main ones are the least overlapping, nested and s-independent basic events (Goldenok 2010).

Classical banking scoring implies using two main methods: linear multifactor model and logistic regression. In the eventological scoring, these methods are applied for two structures of basic events: the least intersecting and s-independent. The general formula of eventological scoring is used to consider the eventological structure of nested events.

4. Discussion

Let us consider the procedure for calculating the conditional probability of target event s for each type of the eventological structure of the basic events.

4.1. Linear multifactor regression

$$p = \omega_0 + \omega_1 x_1 + \omega_2 x_2 + ... + \omega_n x_n \tag{9}$$

corresponds to eventological scoring with an interpreting event $t_s^{\cup}(X) = s \cap Ter_X + s^c \cap Ter_{X^c}$ in the situation of the least intersecting basic events (Figure 1).

Figure 1. Venn diagram of the set of basic events $\chi = \{x, y\}$ with the least intersecting eventological structure
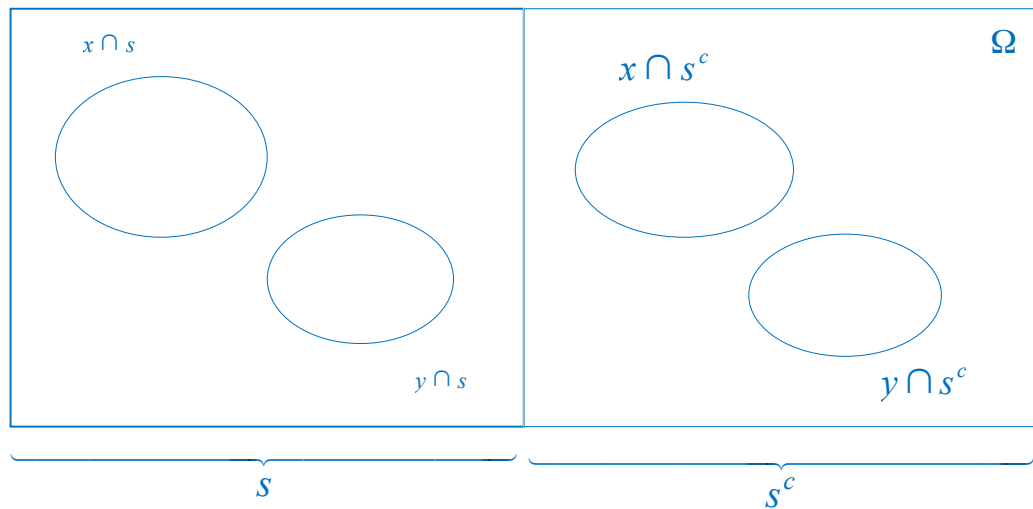
The formula for calculating the conditional probability (Zhivaeva, Ignatova 2016) of the target event s, provided that the result of the questionnaire is determined by an interpretive terrace-event $t_s^{\cup}(X)$, has the form:

$$P(s \mid t_s^{\cup}(X)) = \frac{\sum_{x \in X} \omega(s \cap x)}{\sum_{x \in X} \omega(s \cap x) + \sum_{x \in X^c} \omega(s^c \cap x)} \tag{10}$$

4.2. Logistic regression

$$\log(p / 1 - p) = \omega_0 + \omega_1 x_1 + \omega_2 x_2 + ... + \omega_n x_n, \tag{11}$$

where: p is the probability of the occurrence of event s^c, ω stands for weighing coefficient, x denotes characteristics of the client, which also:

$$p = \frac{\exp\{\omega_i x_i\} \prod_i \exp\{\omega_i x_i\}}{\exp\{\omega_i x_i\} \prod_i \exp\{\omega_i x_i\} + 1} \tag{12}$$

corresponds to eventological scoring with an interpreting event $t_s^{\cup}(X) = s \cap ter_X + s^c \cap ter_{X^c}$ in the situation of s-independent basic events (Figure 2).

Figure 2. Venn Diagram of set of basic events $\chi = \{x, y, z\}$ with eventological structure of S-independent basic events
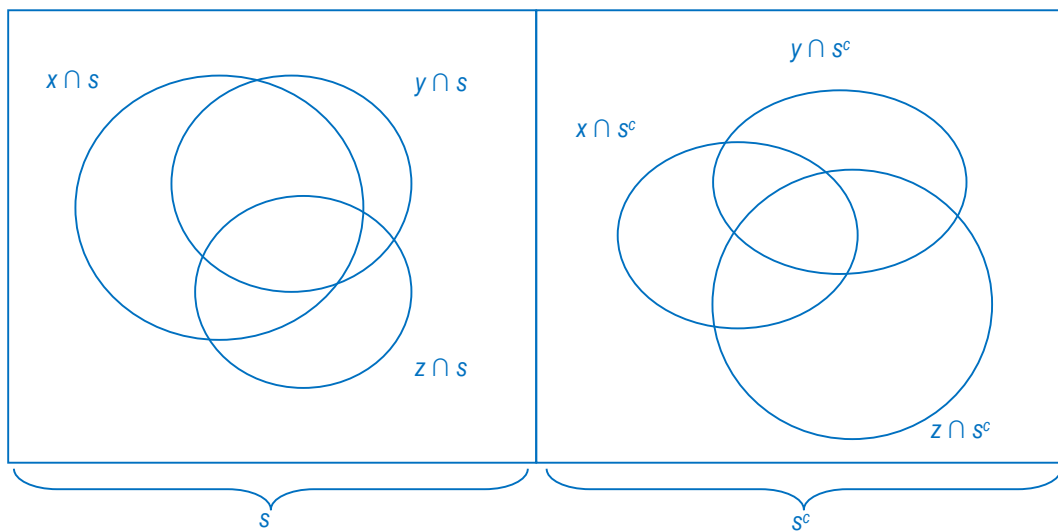
In this case the formula for calculating the conditional probability of target event s (Zhivaeva and Ignatova 2016), provided that the result of the questionnaire is determined by an interpretive terrace-event $t_s^\cup(X)$ takes the form:

$$P\left(s \big| t_s^\cap(X)\right) = \frac{1 - \prod_{x \in X}\left(1 - \omega(s \cap x)\right)}{1 - \prod_{x \in X}\left(1 - \omega(s \cap x)\right) + 1 - \prod_{x \in X^c}\left(1 - \omega(s^c \cap x)\right)} \tag{13}$$

In a situation when the basic events have a nested eventological structure (Figure 3).

Figure 3. Venn Diagram of the set of basic events $\chi = \{x, y\}$ with Nested eventological structure
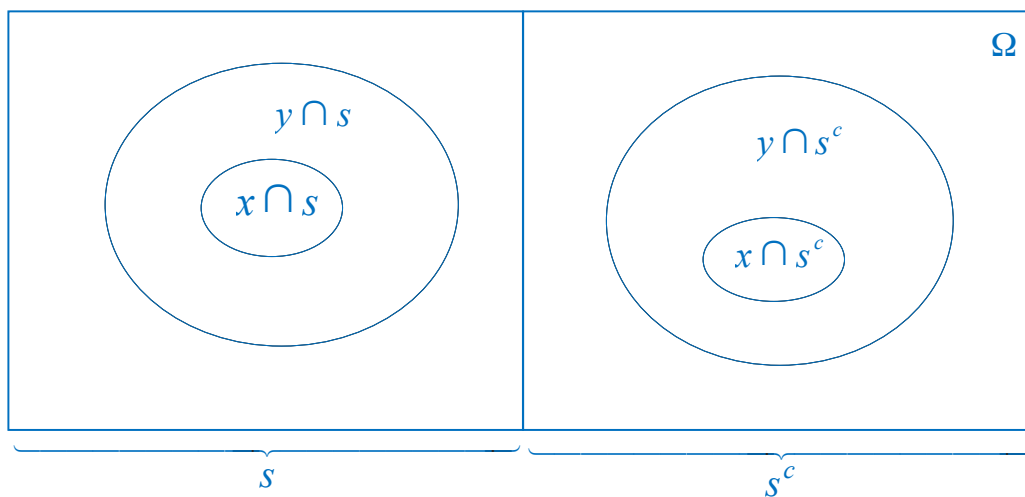
Conditional probability of the target event s may be determined (Zhivaeva and Ignatova 2016) as follows:

$$P\left(s \big| t_s^\cap(X)\right) = \frac{\max_{x \in X}\left(1 - \omega(x \cap s)\right)}{\max_{x \in X}\left(1 - \omega(x \cap s)\right) + \max_{x \in X}\left(1 - \omega(x \cap s^c)\right)} \tag{14}$$

Thus, we have considered various contacting possibilities of sets of basic events corresponding to eventological scoring in situations:
- with the least overlapping basic events (Figure 1);
- with s-independent basic events (Figure 2);
- with a nested eventological structure (Figure 3).

We also presented formulas for calculating the conditional probability of the occurrence of target event s (formulas 10, 13, 14, respectively). Next, let us test the method by carrying our calculations for a financial asset such as a loan to a legal entity.

In the considered example, in order to calculate the probability of target event s, "the counterparty settles the contract in full within the established time limit". The expert weights $\omega\left(s^c \cap x\right) \geq 0$ were obtained as a result of the questionnaire and they were presented in Table 3 (the content of the parameter xi in column "A" corresponds to the i question in Table 2).

Table 3. Eventological scoring – a questionnaire for determining conditional probability of target event s

Questions	Expert weights				
	$\omega(x) \approx P(x)$	$\omega(s,x) \approx P(s\|x)$	$\omega\left(s^c,x\right) \approx P\left(s^c\|x\right)$	$\omega(s \cap x)$	$\omega\left(s^c \cap x\right)$
A	1	2	3	4 (1*2)	5 (1*3)
x_1	0.1000	0.6000	0.4000	0.0600	0.0400
x_2	0.0500	0.5500	0.4500	0.0275	0.0225
x_3	0.1500	0.4000	0.6000	0.0600	0.0900
x_4	0.2000	0.4000	0.6000	0.0800	0.1200
x_5	0.2000	0.7000	0.3000	0.1400	0.0600
x_6	0.1000	0.7000	0.3000	0.0700	0.0300
x_7	0.0500	0.3000	0.7000	0.0150	0.0350
x_8	0.1000	0.2000	0.8000	0.0200	0.0800
x_9	0.0500	0.8000	0.2000	0.0400	0.0100

Despite the fact that true eventological distribution of basic events is unknown, the authors consider it most logical to suggest the structure of s-independent basic events, since the questions of the questionnaire reflect various interrelated aspects of the borrower's work and the dynamics of the external environment of the organization.

The formula for calculating the conditional probability of the occurrence of a target event (13) in the situation of s-independent basic events was given above. Auxiliary calculations are performed in Table 4.

Table 4. Calculation of conditional probability of target event s in the situation of s-independent basic events

Questions	Questionnaire result		Calculation	
	$\omega(s \cap x)$	$\omega\left(s^c \cap x\right)$	$1 - \omega(s \cap x)$	$1 - \omega\left(s^c \cap x\right)$
x_1	0.06000	–	0.94000	–
x_2	0.02750	–	0.97250	–
x_3	–	0.09000	–	0.91000
x_4	–	0.12000	–	0.88000
x_5	0.14000	–	0.86000	–
x_6	0.07000	–	0.93000	–
x_7	0.01500	–	0.98500	–
x_8	0.02000	–	0.98000	–
x_9	–	0.01000	–	0.99000
P_x	–	–	0.70577	0.79279

Let us calculate conditional probability of the target event for the eventological structure of s-independent basic events:

$$P\left(s\big|t_s^{\cap}(X)\right) = \frac{1 - 0.70577}{1 - 0.70577 + 1 - 0.79279} = 0.587 \tag{15}$$

Thus, we determined conditional probability of target event s for the eventological structure of s-independent basic events using the data obtained during the experts' questionnaire. This allows us to estimate the credit risk as 0.587 which, according to the results of the questionnaire, can be interpreted as the conditional probability of the occurrence of target event s as "the counterparty settles the contract in full and in a timely manner". In other words, based on the answers given by experts to the questions of the questionnaire and regarding various factors of credit risk, it can be claimed that the counterparty settles the contract in full within the established time limit, with a probability of 0.587.

Conclusion

Summing up, we would like to note that in the article we developed an algorithm for estimation of the credit risk of a financial asset in order to determine the approach to estimating its impairment allowance in line with IFRS 9.

The scientific result is represented by the methodology of eventological scoring that allows estimating conditional probability of the event occurrence which enables to determine how timely and full the calculation on the financial asset is, taking into account various aspects of the occurrence of basic events and methods of their intersections.

The novelty of the result is due to adapting the theory of eventology regarding the probability of occurrence of credit risk and taking into account the requirements of IFRS. The results of the calculations can serve as the basis for estimating the level of credit risk, which will determine the choice of the approach to estimating expected credit losses and impairment allowance for a financial instrument.

The advantages of using this method are as follows:
- it enables to eliminate quantitative scores of experts, often contradicting the heuristic nature of expert evaluation;
- the procedure of data collection to estimate the dynamics of credit risk is simplified as much as possible, with maximum convenience and minimal processing time;
- it takes into account various factors that influence the credit risk estimation, thus ensuring a multifactorial and comprehensive analysis of the observed dynamics.

Considering all the advantages of the proposed methodology, we can claim that eventology may be used for the practical implementation of the requirements of IFRS 9 "Financial Instruments" in the field of credit risk estimation.

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Analysis of CAMEL, Z-Score, and Bankometer in Assessment Soundness of Banking Listed on the Indonesia Stock Exchange (IDX) from 2012-2015

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Abstract:

This study analyses the soundness of banking companies listed in the Indonesia Stock Exchange (IDX) during the period of 2012-2015 using CAMEL, Z-Score and Bankometer analysis tools. The study aims to find the differences and appropriate analytical tools that can be used in analysing the health of a banking company in Indonesia. Existing samples in this study were 23 banking firms. After analysing the financial statements and calculating the variables, research showed that there were differences from each analysis tool.

According to the results of the analysis of CAMEL throughout the years 2012-2015, there is diverse soundness of the banking firm. There is a healthy bank, banks are quite healthy and there are less healthy banks. Then from the analysis of the Z-Score results using the same timeframe, results show there was no sound bank, but that the bank is in a grey area (grey zone) and there are some banks that have a strong potential for bankruptcy. While the results of the analysis from Bankometer indicated that during 2012-2015, all banks are in a healthy condition. Based on the results of research and analysis conducted, the analytical tools that can be used to analyse the health of banking in Indonesia is CAMEL. Z-Score analysis and Bankometer are options that can be used to supplement the results of the analysis of CAMEL; they cannot be used to replace the CAMEL tool, just remain complementary.

Keywords: soundness of bank; CAMEL; Z-score; bankometer

JEL Classification: G21; G33

Introduction

One of the functions of a bank is to act as a financial intermediary between those who have surplus funds with those who need funds. To carry out this function, the trust of the society is a major factor for bank. The bank's management faces several efforts to maintain trust. One of requirements is maintain the health of bank. The health of bank is a concern of all stakeholders: both owners and managers of banks, the society as users of bank services, and Bank Indonesia as the supervisor of the bank providing oversight from the government. If the bank can maintain its health, then the bank will surely gain the trust.

Some liquidation events that have occurred show that there are banks that have not been able to maintain their health. On November 1, 1997, the Government officially closed 16 commercial banks that are not healthy in order to more effectively nourish the Indonesian banking system (www.print.kompas.com). During 2011, the Indonesia Deposit Insurance Corporation (Lembaga Penjamin Simpanan, LPS) liquidated 15 banks in Indonesia (www.finance.detik.com) and in 2014, the Indonesia Deposit Insurance Corporation (LPS) had to liquidated 60 banks consisting of 59 rural banks and 1 commercial bank because these banks were not healthy (www.ekbis.sindonews.com). Another event since the beginning of January 2016 to May 2016 focused on the Indonesia Deposit Insurance Corporation (LPS) liquidating 5 rural banks due to the average capital adequacy ratio of the banks being minus 209.97% (www.infobanknews.com).

The above events show that it is important for banks to constantly maintain and analyse the level of their health. The goal was to determine the actual condition of the bank using the analogy of health: that is, a bank is in good health, is less healthy or is sick. The technique used for assessment of bank health is CAMEL, which is comprised of Capital, Asset Quality, Management, Earnings and Liquidity. Roman and Sargu (2013), for example,

were able to analyse the health of 15 banks in Romania using the CAMELS approach and advised banks to improve and enhance its performance.

In addition to using CAMEL analysis, banks can also use the method of Altman's Z-Score. For service companies, Altman developed a Z-Score of four ratios that were comprised of Working Capital to Total Assets, Retained Earnings to Total Assets, Earnings Before Interest and Taxes to Total Assets, and Market Value Equity to Total Liabilities. Research conducted by Al Zaabi (2011) shows the Z-Score model can predict bankruptcy and measures the financial performance of Islamic Bank in the UAE. Anjum (2012) states that Altman's Z-Score model can be applied in modern economics to predict distress and bankruptcy from one, two and three years in advance.

Going beyond the CAMEL and Z Score models and based on the recommendation of the International Monetary Fund (IMF), bank health can also be measured through the Bankometer equation (S-Score). The ratio used in this Bankometer consists of six ratios: namely Capital Asset Ratio (CA), Equity to Asset (EA), Capital Adequacy Ratio (CAR), Non-Performing Loans (NPL), Cost to Income (CI), and Loan to Asset (LA). Yameen and Ali (2016) analysed 13 banks using the Bankometer and the result is the banks are in good health and that Bankometer models are considered capable of detecting the problem of bankruptcy and can help quantify the problem of solvency.

In reference to these three models, the current research is conducted to analyse the soundness of banking companies that are listed on the Indonesia Stock Exchange (IDX) in the 2012-2015 period by using CAMEL, Z-Score, and Bankometer. This conceptual framework was adapted from Erari *et al.* (2013).

The research conducted by Erari *et al.* (2013) applies CAEL, Z-Score and Bankometer to analyse the performance of the Bank of Papua and then compares the results of the analysis. The results of the analysis CAEL and Bankometer show that Bank Papua is in a healthy condition four the years between 2003-2011, whereas the Z-Score analysis shows that the Bank Papua in 2007 and 2011 to be in bankruptcy.

However, limitation in the results from the study by Erari *et al.* (2013) can be found in that they used only one sample bank, Bank Papua in the 2003-2011 period. The current research avoids this limitation and therefore uses 23 banking companies listed in Indonesia Stock Exchange (IDX) in the 2012-2015 period as the sample. In addition, this research uses CAMEL in contrast to Erari *et al.* (2013) that use CAEL. The inclusion of management (M) in the model is important to the current research.

Based on above background, the research objectives therefore are:
- to analyse the soundness of banking companies listed in Indonesia Stock Exchange (IDX) in the period 2012-2015 by using CAMEL;
- to analyse the soundness of banking companies listed in Indonesia Stock Exchange (IDX) in the period 2012-2015 by using Z-Score;
- to analyse the soundness of banking companies listed in Indonesia Stock Exchange (IDX) in the period 2012-2015 by using Bankometer;
- to examine the difference between CAMEL, Z-Score and Bankometer in assessing the soundness of banking companies listed in Indonesia Stock Exchange (IDX) in the period 2012-2015.

1. Literature review

1.1. Bank and the soundness

According to Kasmir (2015), a bank is a financial institution whose main activities are collecting funds from the public and making funds available to the community and providing other banking services. The bank's financial statements show the overall financial condition of the bank. These financial statements act as measures of the actual condition of the bank, and can demonstrate the performance of the bank's management during the period.

Based on Circular of Bank Indonesia (*Surat Edaran Bank Indonesia*) No. 6/23/DPNP/2004, the soundness of banks is the result of qualitative assessments of various aspects affecting the condition or performance of a bank through the assessment for capital, asset quality, management, earnings, and liquidity. The health of a bank is the concern of all stakeholders, both owners and managers of banks, the society as users of bank services, and of Bank Indonesia as the supervisor of the bank from the government.

Given their important role in the financial well-being of communities, it is necessary to assess the soundness of banks. The goal is to determine if the actual condition of the bank is in good health, less healthy or sick. If the condition of banks in a healthy condition, it is necessary to maintain health. However, if the bank in an unhealthy conditions backspace, then immediate action should be taken to solve it (Kasmir 2015).

1.2. CAMEL

Reddy and Prasad (2011) defines CAMEL basically is a ratio based model for evaluating the performance of a bank. The model is a management tool to measure capital adequacy, asset quality, management efficiency, earnings quality and liquidity of financial institutions. The results of CAMEL measurement determine which bank is categorized as healthy, quite healthy, less healthy and unhealthy. Reddy and Prasad (2011) adapted the CAMEL model to measure the financial soundness of regional rural banks, namely Andhra Pragathi Grameena Bank and Sapthagiri Grameena Bank. Research shows that the overall performance of Andhra Pragathi Grameena Bankis better than Sapthagiri Grameena Bank.

Shar *et al.* (2010) use the CAMEL model to evaluate the performance and efficiency of the banking sector in Pakistan at the time before and after reforms. The results showed that before the reform of the banks in Pakistan there was in chaos. But overall after the reform, the soundness of the banking sector showed improvement and the positive impact of the reforms.

Adjacent to Pakistan, Reddy (2012) conducted a study using the CAMEL approach for evaluating the performance of the Bank of India. Reddy (2012) concluded that the CAMEL approach is an important tool for assessing the financial strength of a bank and it is helpful in suggesting necessary action to rectify the weaknesses of the Bank. The model was further reinforced by Roman and Sargu (2013) who analysed the health of 15 banks in Romania using the CAMEL approach and from the research, they suggested the 15 banks needed to improve and enhance their performance.

Erari *et al.* (2013) apply the CAEL model in analysing the financial performance of the Bank Papua from year 2003 to 2011. Analysis with the CAEL model shows that the Bank Papua during the year 2003-2011 was in a good health condition, very liquid, had strong capital, could manage well, had good profitability, asset quality was good but that the Bank Papua still lacked in efficiency.

Furthermore, Yuksel *et al.* (2015) examined the effect of the ratio of CAMEL as a determinant of the level of credit from deposit banks in Turkey. The results showed that the three components of CAMEL, namely Asset Quality, Management, and Sensitivity to Market Risk influential in the level of credit while the Capital Adequacy and Earning no effect. Turkish deposit banks should focus on fixed assets and interest income to have a better ranking.

1.3. Z-Score

Altman (1968) examined the use of financial ratio analysis with discriminant analysis, which is ultimately used as a tool for predicting corporate bankruptcy. The Z-Score was developed to predict the bankruptcy of a manufacturing company with about an 80% accuracy rate. But it is not accurate in predicting the likelihood of financial distress in the banking industry so in the next period the Z-Score model was developed to assess the bankruptcy of the banking industry and indicates the level of accuracy to be 70% (Qamruzzaman 2014).

Al Zaabi (2011), utilizing Z-Score model to predict bankruptcy and measure the financial performance of existing Islamic Bank in the UAE, introduced the Z-Score as a beneficial tool in calculating the possible causes ofdeclining financial performance. Also, Anjum (2012) concluded that the Altman Z-Score can be applied to modern economies in predicting distress and bankruptcy of one, two and three years.

Research conducted by Erari *et al.* (2013) applied the Z-Score in analysing the financial performance of the Bank Papua from2003 to 2011 states that the Z-Score analysis is able to pinpoint the critical situation faced by the Bank Papua in 2007 and 2011. While Duvvuri (2012) measures the health of the company Nagarjuna Fertilizers and Chemicals Limited by using the Z-Score with the results showing that the company successfully passed the grey zone leading to a safer zone. Using this model is an opportunity for investors who are interested in the fertilizer industry so that they can comfortable investing their funds in the company.

Then, Madona and Cestari (2015) verify the accuracy of three bankruptcy prediction models. These are the Altman Z-Score, Alberici Z-Score and discrimination functions of Bottani, Cipriani and Serao in companies located in the region of Emilia, Italy. The result is that the Altman Z-Score was able to detect signs of failure andable to distinguish companies that fail or thrive.

Moreover, research conducted by El Khoury and Al Beaino (2014) in classifying eleven manufacturing companies in Lebanon found that the Altman Z-Score, in addition to predicting bankruptcy, can also serve as a barometer to classify a company. These findings can be used by banks to classify their clients, and also can the used by the company to evaluate their performance as well as used by investors to pick stocks.

1.4. Bankometer

In 2002, the International Monetary Fund (IMF) developed a new model called Bankometer (S-Score). This model is a modification from the CAMELS and CLSA stress test parameters. The modification was made only to

synthesize the measurement of banks soundness. This procedure has a minimum number of parameters with a maximum of accurate results (Qamruzzaman 2014).

Yameen and Ali (2016) used Bankometer to evaluate the financial health of 13 banks located in Jordan. It can be concluded that the 13 banks examined are financially healthy. Bankometer model can help internal management of a bank to avoid bankruptcy with precise control over their operations and can help quantify the problem of solvency. A study conducted by Qamruzzaman (2014) compares the Z-Score model and Bankometer in assessing the financial health of private banks in Bangladesh for the period 2008 to 2012. The result of the Bankometer model shows the Bank to be in good financial health, while the Z-Score model shows the possibility of bankruptcy.

Meanwhile, Erari *et al.* (2013) who applied the CAEL, Z-Score and Bankometer models in analysing the financial performance of the Bank Papua from year 2003 to 2011 states that analysis with the Bankometer model showed similar results with the CAEL model. Results indicate that Bank Papua during the year 2003-2011 was in the "good" health condition, highly liquid, has strong capital, able to manage debt well, has good profitability, asset quality is good but still lacking in efficiency. Then, Nimalathasan *et al.* (2012) examined the financial condition of the Bank in Sri Lanka using Bankometer. The results showed that the government banks are in a better solvency position than the private banks.

Fayed (2013) analyses and compares the performance of three Islamic banks and six conventional banks in Egypt by using financial ratios to measure profitability, liquidity and credit risks as well as utilizes Bankometer for measuring solvency. The results showed that the conventional banks are superior to Islamic banks.

Then, Shar *et al.* (2010) applies Bankometer, CAMEL and CLSA stress tests on the banking sector in Pakistan. Banks that are healthy through stress tests CLSA also were declared healthy through Bankometer test results. Shar *et al.* (2010) concluded that Bankometer can be used by individuals or companies to analyse the solvency and soundness of a bank and that it can help internal management to avoid bankruptcy.

Shamanth and Rajgopal (2016) also considered that the Bankometer method can be used to assess the financial performance of banks. This is based on the research they conducted against eight banks in India using Bankometer. The results show that the banks are very liquid, possess strong capital are able to manage debt properly, have profitability and have good asset quality.

2. Methodology

The current research is designed to analyse the soundness of banking companies by using CAMEL, Z-Score, and Bankometer and aims to explore the difference of the three models in assessing the soundness of banking companies. This study concentrates on the four-year period from 2012 to 2015 and uses secondary data, which is comprised of financial statements of each bank. Table 1 shows the 23 banks used as a sample in this study. The 23 banks are listed in Indonesia Stock Exchange (IDX) from 2012-2015.

Table 1. Sample of banking company

No.	Code	Bank Name
1.	AGRO	Bank Rakyat Indonesia Agroniaga Tbk
2.	BABP	Bank MNC Internasional Tbk
3.	BBCA	Bank Central Asia Tbk
4.	BBKP	Bank Bukopin Tbk
5.	BBNI	Bank Negara Indonesia (Persero) Tbk
6.	BBRI	Bank Rakyat Indonesia (Persero) Tbk
7.	BBTN	Bank Tabungan Negara (Persero) Tbk
8.	BDMN	Bank Danamon Indonesia Tbk
9.	BJBR	Bank Pembangunan Daerah Jawa Barat dan Banten Tbk
10.	BKSW	Bank QNB Indonesia Tbk
11.	BMRI	Bank Mandiri (Persero) Tbk
12.	BNBA	Bank Bumi Arta Tbk
13.	BNGA	Bank CIMB Niaga Tbk
14.	BNII	Bank Maybank Indonesia Tbk
15.	BNLI	Bank PermataTbk
16.	BSIM	Bank Sinar Mas Tbk
17.	BSWD	Bank of India Indonesia Tbk
18.	BVIC	Bank Victoria International Tbk
19.	INPC	Bank Artha Graha Internasional Tbk

No.	Code	Bank Name
20.	MAYA	Bank Mayapada Internasional Tbk
21.	MCOR	Bank Windu Kentjana Internasional Tbk
22.	NISP	Bank NISP OCBC Tbk
23.	PNBN	Bank PAN Indonesia Tbk

2.1. Data analysis

CAMEL analysis

According to Rivai (2013), the CAMEL method comprises the steps assessed by calculating the ratio of the components in place (2013). Those components include:

- Capital: CAMEL component in the capital can use the Capital Adequacy Ratio (CAR);
- Asset Quality: The indicators used to assess the asset component is Non-Performing Loan (NPL);
- Management: Assessment of management can use indicators Net Profit Margin (NPM) on the assumption that all management activities are aimed at achieving operating profits of an enterprise;
- Earnings: Assessment can be done by calculating the Return on Assets (ROA) and Operating Expenses to Operating Income (ROA);
- Liquidity: Rate liquidity can be measured with a Loan to Deposit Ratio (LDR).

After calculating the ratio used later calculating the credit point for each CAMEL ratio and multiplying the credit point by the weight of each component. After that, sum throughout the value component of CAMEL and stipulate the category of health of banks based on the value obtained. The predicate of bank soundness is shown in Table 2.

Table 2. Predicate of Bank Soundness

Credit Score of CAMEL	Predicate
81-100	Healthy
66 - < 81	Quite Healthy
51 - < 65	Less Healthy
0 - < 51	Not Healthy

Z-Score analysis

The formula used for banking companies are:

$$Z = 6{,}56 \, X_1 + 3{,}26 \, X_2 + 6{,}72 \, X_3 + 1{,}05 \, X_4 \qquad (1)$$

where: X1 = Working Capital / Total Assets; X2 = Retained Earnings / Total Assets; X3 = Earnings Before Interest and Taxes / Total Assets; X4 = Market Value Equity / Total Liabilities.

After calculation by the above formula, the Z-Score value will be obtained and describes the condition of the banking company, which is divided into three levels, namely:

- Z-Score greater than 2.60: then the company is classified as a financially stable company (safe zone);
- Z-Score is between 1,1 to 2,60: then the company is classified to be in the grey zone, which means there is a potential the company will fall into bankruptcy;
- Z-Score is below 1.1: then the company is considered to have a strong potential for bankruptcy.

Bankometer analysis

The formula used is as follows:

$$S = 1{,}5CA + 1{,}2EA + 3{,}5CAR + 0{,}6NPL + 0{,}3CI + 0{,}4LA \qquad (2)$$

where: CA = Capital to Asset Ratio, according to the guidelines of the IMF, the minimum threshold for this ratio is 4% (Erari *et al.* 2013); EA = Equity to Asset Ratio, according to the IMF, this ratio should be more than 2% (Erari *et al.* 2013); CAR = Capital Adequacy Ratio; IMF sets limits on the minimum ratio is 8% (Erari *et al.* 2013); NPL = Non-Performing Loans; IMF gives limits NPL ratio should be below 15%; CI = Cost to Income Ratio, limits provided by the IMF for this ratio is below 40% (Erari *et al.* 2013); LA = Loans to Asset Ratio; IMF imposed a limit of this ratio should be lower than 65% (Erari *et al.* 2013).

Based on the value of S-Score obtained, the condition of the banking company is:

- S <50 can be interpreted as companies experiencing financial difficulties and the risk is high;

▪ 50 <S <70 then the company is in the grey zone and is vulnerable to experiencing financial difficulties;
▪ S> 70 provides an assessment that the company is in very good health.

3. Results

Table 3 shows the soundness of banks based on CAMEL analysis. From the CAMEL analysis can be seen that the soundness of banks from year 2012-2015 are varied. In 2012, there were three healthy banks, namely Bank Central Asia Tbk, Bank Rakyat Indonesia (Persero) Tbk and Bank Mandiri (Persero) Tbk. Then are two banks that are less healthy: Bank MNC Internasional Tbk and Bank QNB Indonesia Tbk. While the soundness of 18 other banks are quite healthy, they consist of Bank Rakyat Indonesia Agroniaga Tbk, Bank Bukopin Tbk, Bank Negara Indonesia (Persero) Tbk, Bank Tabungan Negara (Persero) Tbk, Bank Danamon Indonesia Tbk, Bank Pembangunan Daerah Jawa Barat dan Banten Tbk, Bank Bumi Arta Tbk, Bank CIMB Niaga Tbk, Bank Maybank Indonesia Tbk, Bank Permata Tbk, Bank Sinar Mas Tbk, Bank of India Indonesia Tbk, Bank Victoria International Tbk, Bank Artha Graha Internasional Tbk, Bank Mayapada Internasional Tbk, Bank Windu Kentjana Internasional Tbk, Bank NISP OCBC Tbk, dan Bank PAN Indonesia Tbk

In 2013, Bank Negara Indonesia (Persero) Tbk managed to increase the value of NPL and NPM, which causes the soundness of Bank Negara Indonesia (Persero) Tbk to increase from quite healthy to be healthy. That is, the number of healthy banks into four: Bank Central Asia Tbk, Bank Rakyat Indonesia (Persero) Tbk, Bank Mandiri (Persero) Tbk and Bank Negara Indonesia (Persero) Tbk. The model also shows the number of banks that are quite healthy in 2013 was reduced to 17 banks. Meanwhile, two other banks are still at unhealthy levels, namely MNC Bank Internasional Tbk and Bank QNB Indonesia Tbk.

Table 3. Calculation results CAMEL of the Twenty-Three Bank in Indonesia, 2012-2015 Period

Bank	Year	Net Value of CAR	Net Value of NPL	Net Value of NPM	Net Value of ROA	Net Value of BOPO	Net Value of LDR	Net Value Total of CAMEL Ratio	The soundness degree
Bank Rakyat Indonesia Agroniaga Tbk.	2012	25,00	27,88	2,27	5,00	5,00	10,00	75,15	Quite Healthy
	2013	25,00	29,16	2,78	5,00	5,00	10,00	76,94	Quite Healthy
	2014	25,00	28,36	2,33	4,90	5,00	10,00	75,59	Quite Healthy
	2015	25,00	28,36	2,39	5,00	5,00	10,00	75,75	Quite Healthy
Bank MNC Internasional Tbk	2012	23,73	23,02	0,04	0,30	0,20	10,00	57,28	Less Healthy
	2013	25,00	26,28	-2,68	0,00	0,00	10,00	58,60	Less Healthy
	2014	25,00	23,28	-1,68	0,00	0,00	10,00	56,60	Less Healthy
	2015	25,00	26,14	0,20	5,00	0,64	10,00	66,99	Quite Healthy
Bank Central Asia Tbk	2012	25,00	30,00	8,31	5,00	5,00	10,00	83,31	Healthy
	2013	25,00	30,00	8,44	5,00	5,00	10,00	83,44	Healthy
	2014	25,00	30,00	7,77	5,00	5,00	10,00	82,77	Healthy
	2015	25,00	30,00	7,63	5,00	5,00	10,00	82,63	Healthy
Bank Bukopin Tbk	2012	25,00	27,88	3,61	5,00	5,00	10,00	76,48	Quite Healthy
	2013	25,00	27,88	3,53	5,00	5,00	10,00	76,41	Quite Healthy
	2014	25,00	26,86	2,09	4,10	5,00	10,00	73,05	Quite Healthy
	2015	25,00	26,74	2,54	4,63	5,00	10,00	73,92	Quite Healthy
Bank Negara Indonesia (Persero) Tbk	2012	25,00	29,40	5,66	5,00	5,00	10,00	80,06	Quite Healthy
	2013	25,00	30,00	6,31	5,00	5,00	10,00	81,31	Healthy
	2014	25,00	30,00	6,36	5,00	5,00	10,00	81,36	Healthy
	2015	25,00	29,20	4,99	5,00	5,00	10,00	79,19	Quite Healthy
Bank Rakyat Indonesia (Persero)	2012	25,00	30,00	8,06	5,00	5,00	10,00	83,06	Healthy
	2013	25,00	30,00	7,87	5,00	5,00	10,00	82,87	Healthy
	2014	25,00	30,00	7,18	4,90	5,00	10,00	82,08	Healthy
	2015	25,00	29,96	6,49	5,00	5,00	10,00	81,45	Healthy
Bank Tabungan Negara (Persero) Tbk	2012	25,00	24,76	3,63	5,00	5,00	5,64	69,03	Quite Healthy
	2013	25,00	24,92	3,38	5,00	5,00	4,23	67,54	Quite Healthy
	2014	25,00	25,48	2,09	3,80	5,00	2,46	63,83	Quite Healthy
	2015	25,00	26,78	2,88	5,00	5,00	2,49	67,15	Quite Healthy
Bank Danamon Indonesia Tbk	2012	25,00	30,00	4,38	5,00	5,00	5,72	75,10	Quite Healthy
	2013	25,00	28,80	4,11	5,00	5,00	7,96	75,87	Quite Healthy
	2014	25,00	28,40	2,46	4,65	5,00	8,96	74,47	Quite Healthy
	2015	25,00	27,20	2,33	4,00	5,00	10,00	73,53	Quite Healthy
	2012	25,00	30,00	4,19	5,00	5,00	10,00	79,19	Quite Healthy

Bank	Year	Net Value of CAR	Net Value of NPL	Net Value of NPM	Net Value of ROA	Net Value of BOPO	Net Value of LDR	Net Value Total of CAMEL Ratio	The soundness degree
Bank Pembangunan Daerah Jawa Barat dan Banten Tbk	2013	25,00	29,72	4,01	5,00	5,00	7,41	79,19	Quite Healthy
	2014	25,00	28,92	2,94	5,00	5,00	8,73	79,19	Quite Healthy
	2015	25,00	29,28	3,24	5,00	5,00	10,00	77,52	Quite Healthy
Bank QNB Indonesia Tbk	2012	25,00	30,00	-1,96	0,00	0,00	10,00	63,05	Less Healthy
	2013	25,00	30,00	0,13	0,30	0,00	0,68	56,11	Less Healthy
	2014	25,00	30,00	2,12	3,50	5,00	8,61	74,23	Less Healthy
	2015	25,00	26,20	1,73	2,90	5,00	0,98	61,82	Less Healthy
Bank Mandiri (Persero) Tbk	2012	25,00	30,00	7,37	5,00	5,00	10,00	82,37	Healthy
	2013	25,00	30,00	7,26	5,00	5,00	10,00	82,26	Healthy
	2014	25,00	30,00	6,68	5,00	5,00	10,00	81,68	Healthy
	2015	25,00	29,68	1,73	5,00	5,00	10,00	76,41	Quite Healthy
Bank Bumi Arta Tbk	2012	25,00	30,00	4,31	5,00	5,00	10,00	79,31	Quite Healthy
	2013	25,00	30,00	3,39	5,00	5,00	10,00	78,39	Quite Healthy
	2014	25,00	30,00	2,35	5,00	5,00	10,00	77,35	Quite Healthy
	2015	25,00	30,00	2,07	4,43	5,00	10,00	76,51	Quite Healthy
Bank CIMB Niaga Tbk.	2012	25,00	30,00	5,62	5,00	5,00	7,98	78,60	Quite Healthy
	2013	25,00	27,90	5,24	5,00	5,00	8,20	76,35	Quite Healthy
	2014	25,00	27,12	2,56	4,80	5,00	6,22	76,35	Quite Healthy
	2015	25,00	27,82	0,45	0,80	1,64	6,81	62,51	Less Healthy
Bank Maybank Indonesia Tbk	2012	25,00	29,38	2,62	5,00	5,00	10,00	76,99	Quite Healthy
	2013	25,00	27,90	2,91	5,00	5,00	10,00	75,81	Quite Healthy
	2014	25,00	28,04	1,19	2,25	4,41	9,54	70,43	Quite Healthy
	2015	25,00	26,16	1,73	3,37	5,00	10,00	71,26	Quite Healthy
Bank Permata Tbk	2012	25,00	30,00	3,53	5,00	5,00	10,00	78,53	Quite Healthy
	2013	25,00	30,00	3,59	5,00	5,00	10,00	78,59	Quite Healthy
	2014	25,00	29,80	2,45	4,00	5,00	10,00	76,24	Quite Healthy
	2015	25,00	28,20	0,37	0,67	0,69	10,00	64,92	Less Healthy
Bank Sinar Mas Tbk	2012	25,00	25,86	2,37	5,00	5,00	10,00	73,23	Quite Healthy
	2013	25,00	26,76	2,22	5,00	5,00	10,00	73,98	Quite Healthy
	2014	25,00	25,88	1,28	3,40	3,41	10,00	68,97	Quite Healthy
	2015	25,00	25,02	1,11	3,17	5,00	10,00	69,30	Quite Healthy
Bank of India Indonesia Tbk	2012	25,00	29,28	6,30	5,00	5,00	8,72	79,29	Quite Healthy
	2013	25,00	29,38	6,67	5,00	5,00	8,50	79,55	Quite Healthy
	2014	25,00	29,84	5,60	5,00	5,00	10,00	80,44	Quite Healthy
	2015	25,00	21,08	-1,93	0,00	0,00	10,00	54,15	Less Healthy
Bank Victoria International Tbk	2012	25,00	27,48	4,28	5,00	5,00	10,00	76,76	Quite Healthy
	2013	25,00	30,00	3,85	5,00	5,00	10,00	78,85	Quite Healthy
	2014	25,00	25,78	1,22	2,65	4,22	10,00	68,87	Quite Healthy
	2015	25,00	23,14	1,06	2,17	3,82	10,00	65,18	Less Healthy
Bank Artha Graha Internasional Tbk	2012	25,00	29,40	1,72	2,20	4,36	10,00	72,67	Quite Healthy
	2013	25,00	27,48	2,79	4,63	5,00	10,00	74,90	Quite Healthy
	2014	25,00	27,62	1,20	2,65	5,00	10,00	71,47	Quite Healthy
	2015	25,00	28,50	0,71	1,10	2,09	10,00	67,39	Quite Healthy
Bank Mayapada Internasional Tbk	2012	23,29	26,72	3,79	5,00	5,00	10,00	73,80	Quite Healthy
	2013	25,00	29,80	4,08	5,00	5,00	10,00	78,88	Quite Healthy
	2014	22,22	28,08	2,98	5,00	5,00	10,00	73,28	Quite Healthy
	2015	25,00	26,48	3,23	5,00	5,00	10,00	74,71	Quite Healthy
Bank Windu Kentjana Internasional Tbk	2012	25,00	28,12	3,78	5,00	5,00	10,00	76,90	Quite Healthy
	2013	25,00	28,34	2,87	5,00	5,00	10,00	76,21	Quite Healthy
	2014	25,00	26,14	1,44	2,65	4,26	10,00	69,48	Quite Healthy
	2015	25,00	27,74	1,65	3,43	5,00	10,00	72,82	Quite Healthy
Bank NISP OCBC Tbk	2012	25,00	30,00	3,97	5,00	5,00	10,00	78,97	Quite Healthy
	2013	25,00	30,00	4,07	5,00	5,00	9,00	78,07	Quite Healthy
	2014	25,00	29,40	3,85	5,00	5,00	8,56	78,07	Quite Healthy
	2015	25,00	29,44	3,73	5,00	5,00	6,78	74,94	Quite Healthy
	2012	25,00	30,00	4,40	5,00	5,00	10,00	79,40	Quite Healthy

Bank	Year	Net Value of CAR	Net Value of NPL	Net Value of NPM	Net Value of ROA	Net Value of BOPO	Net Value of LDR	Net Value Total of CAMEL Ratio	The soundness degree
Bank PAN Indonesia Tbk	2013	25,00	29,50	4,35	5,00	5,00	10,00	78,85	Quite Healthy
	2014	25,00	29,96	3,81	5,00	5,00	7,81	76,59	Quite Healthy
	2015	25,00	29,90	2,25	4,37	5,00	6,47	72,98	Quite Healthy

Source: data calculated by researchers, 2016

The study showed in 2014 the number of healthy banks are still same as in 2013, namely four banks consisting of Bank Central Asia Tbk, Bank Rakyat Indonesia (Persero) Tbk, Bank Mandiri (Persero) Tbk and Bank Negara Indonesia (Persero) Tbk. The number of banks that quite healthy are still 17. But there is a change in which the Bank Tabungan Negara (Persero) Tbk which was quite healthy in the previous year (2014) became less healthy. This is because the value of NPM, ROA, and LDR of Bank Tabungan Negara (Persero) Tbk declined. The position of Bank Tabungan Negara (Persero) Tbk was replaced by Bank QNB Indonesia Tbk, which this year managed to increase the value of NPM, ROA, ROA and LDR so the level of health is quite healthy. Then in 2014, Bank MNC Internasional Tbk along with Bank Tabungan Negara (Persero) Tbk are the less healthy banks.

Based on the results of the research, only two banks in 2015 could maintain the health of the healthy category, namely Bank Central Asia Tbk and Bank Rakyat Indonesia (Persero) Tbk. Bank Negara Indonesia (Persero) Tbk and Bank Mandiri (Persero) Tbk has decreased NPL value and NPM value, which cause the soundness to go from healthy to be quite healthy. These two banks together with 14 other banks are in a quite healthy position, so that the number of banks that are quite healthy in 2015 was 16 banks. Then in 2015 the number of banks that are less healthy is the highest when compared to previous years, which was five banks. These banks are Bank QNB Indonesia Tbk, Bank CIMB Niaga Tbk, Bank Permata Tbk, Bank of India Indonesia Tbk and Bank Victoria International Tbk. These five banks are not able to maintain the value of their CAMEL.

Table 4. Bank Soundess by CAMEL Analysis

Year	Bank Soundness		
	Healthy	Quite Healthy	Less Healthy
2012	3	18	2
2013	4	17	2
2014	4	17	2
2105	2	16	5

Based on the analysis of the bank using the Z-Score during the year 2012 to 2015 as shown in Table 5 and Table 6, there was no bank with healthy soundness. In 2012, there were 13 banks that are in the grey area, meaning that the banks should pay more attention to the financial condition which can be improved so that it is more secure and can avoid potential bankruptcy. The data shows as many as 10 banks potentially face bankruptcy because of the Z-Score values that are less than 1,1. The banks facing a situation are Bank MNC Internasional Tbk, Bank Bukopin Tbk, Bank Negara Indonesia (Persero) Tbk, Bank Pembangunan Daerah Jawa Barat dan Banten Tbk, Bank Maybank Indonesia Tbk, Bank Sinar Mas Tbk, Bank Artha Graha Internasional Tbk, Bank Windu Kentjana Internasional Tbk, Bank NISP OCBC Tbk, dan Bank PAN Indonesia Tbk.

Table 5. Calculation of Z-score of the twenty-three bank in Indonesia, 2012-2015 period

Bank	Year	6,56 WC/TA	3,26 RE/TA	6,72 EBIT/TA	1,05 MVE/TL	Z-Score	Category
Bank Rakyat Indonesia Agroniaga Tbk	2012	0,9061	-0,0123	0,0856	0,1553	1,1348	Grey Zone
	2013	1,0492	0,0181	0,0938	0,2149	1,3760	Grey Zone
	2014	2,2619	0,0396	0,0861	0,1467	2,5344	Grey Zone
	2015	-0,1241	0,0593	0,0890	0,1667	0,1909	Potentially Bankrupt
Bank MNC Internasional Tbk	2012	0,1403	-0,0320	0,0054	0,1440	0,2577	Potentially Bankrupt
	2013	0,4998	-0,0618	-0,0548	0,1036	0,4868	Potentially Bankrupt
	2014	0,7447	-0,0723	-0,0499	0,1617	0,7842	Potentially Bankrupt
	2015	0,7908	-0,0540	0,0062	0,1348	0,8778	Potentially Bankrupt
Bank Central Asia Tbk	2012	0,0837	0,3351	0,2228	0,6039	1,2455	*Grey Zone*
	2013	0,1261	0,3628	0,2410	0,5739	1,3038	*Grey Zone*
	2014	0,4129	0,4016	0,2520	0,7146	1,7810	*Grey Zone*
	2015	0,7976	0,4497	0,2562	0,6859	2,1895	*Grey Zone*
Bank Bukopin Tbk	2012	0,1314	0,2473	0,1084	0,0841	0,5713	Potentially Bankrupt
	2013	0,6125	0,2923	0,1177	0,0876	1,1100	*Grey Zone*

Bank	Year	6,56 WC/TA	3,26 RE/TA	6,72 EBIT/TA	1,05 MVE/TL	Z-Score	Category
	2014	0,5660	0,2798	0,0764	0,0990	1,0214	Potentially Bankrupt
	2015	0,7198	0,2595	0,0839	0,0769	1,1401	*Grey Zone*
Bank Negara Indonesia (Persero) Tbk	2012	0,1742	0,1963	0,1794	0,2500	0,8000	Potentially Bankrupt
	2013	0,3339	0,2277	0,1960	0,2282	0,9859	Potentially Bankrupt
	2014	0,5349	0,2745	0,2182	0,3501	1,3777	*Grey Zone*
	2015	0,6480	0,2663	0,1515	0,2367	1,3025	*Grey Zone*
Bank Rakyat Indonesia (Persero) Tbk	2012	0,5576	0,3257	0,2908	0,3701	1,5442	*Grey Zone*
	2013	0,5701	0,3683	0,2996	0,3436	1,5816	*Grey Zone*
	2014	0,5859	0,3602	0,2581	0,4285	1,6327	*Grey Zone*
	2015	1,0153	0,3961	0,2486	0,3867	2,0467	*Grey Zone*
Bank Tabungan Negara (Persero) Tbk	2012	0,7444	0,0926	0,1120	0,1554	1,1045	*Grey Zone*
	2013	1,0896	0,1108	0,1097	0,0807	1,3909	*Grey Zone*
	2014	1,0517	0,1157	0,0734	0,1010	1,3418	*Grey Zone*
	2015	1,0512	0,1283	0,0994	0,0911	1,3700	*Grey Zone*
Bank Danamon Indonesia Tbk	2012	1,0838	0,3187	0,2367	0,4475	2,0867	*Grey Zone*
	2013	0,9001	0,3142	0,2017	0,2481	1,6641	*Grey Zone*
	2014	0,8174	0,3178	0,1219	0,2791	1,5362	*Grey Zone*
	2015	0,8021	0,3593	0,1173	0,2093	1,4881	*Grey Zone*
Bank Pembangunan Daerah Jawa Barat dan Banten Tbk	2012	-0,1956	0,1255	0,1435	0,1747	0,2481	Potentially Bankrupt
	2013	0,9862	0,1641	0,1660	0,1488	1,4650	*Grey Zone*
	2014	0,8430	0,1684	0,1261	0,1163	1,2538	*Grey Zone*
	2015	0,8093	0,1691	0,1338	0,1011	1,2133	*Grey Zone*
Bank QNB Indonesia Tbk	2012	0,9910	-0,0056	-0,0498	0,6824	1,6180	*Grey Zone*
	2013	0,8462	-0,0005	0,0031	0,3047	1,1535	*Grey Zone*
	2014	0,5963	0,0188	0,0525	0,2030	0,8706	Potentially Bankrupt
	2015	0,7609	0,0349	0,0545	0,1143	0,9646	Potentially Bankrupt
Bank Mandiri (Persero) Tbk	2012	0,4539	0,2363	0,2168	0,3820	1,2891	*Grey Zone*
	2013	0,6921	0,2652	0,2206	0,3223	1,5001	*Grey Zone*
	2014	0,6531	0,2823	0,2044	0,3550	1,4948	*Grey Zone*
	2015	0,7266	0,3196	0,1947	0,3078	1,5488	*Grey Zone*
Bank Bumi Arta Tbk	2012	0,7629	0,2625	0,1494	0,1352	1,3100	*Grey Zone*
	2013	0,7305	0,2598	0,1471	0,1094	1,2467	*Grey Zone*
	2014	0,6236	0,2277	0,0919	0,0842	1,0275	Potentially Bankrupt
	2015	0,5279	0,2006	0,0795	0,0864	0,8944	Potentially Bankrupt
Bank CIMB Niaga Tbk	2012	0,6446	0,2181	0,1970	0,1661	1,2258	*Grey Zone*
	2013	0,7853	0,2605	0,1791	0,1258	1,3507	*Grey Zone*
	2014	0,7888	0,2773	0,0922	0,1076	1,2660	*Grey Zone*
	2015	0,6223	0,2765	0,0160	0,0747	0,9896	Potentially Bankrupt
Bank Maybank Indonesia Tbk	2012	0,4634	0,1111	0,0984	0,2256	0,8985	Potentially Bankrupt
	2013	0,2169	0,1255	0,1044	0,1546	0,6015	Potentially Bankrupt
	2014	0,4610	0,1375	0,0456	0,1148	0,7589	Potentially Bankrupt
	2015	0,4857	0,1479	0,0621	0,0857	0,7815	Potentially Bankrupt
Bank Permata Tbk	2012	0,7951	0,3091	0,0963	0,1240	1,3245	*Grey Zone*
	2013	0,5783	0,2775	0,0933	0,1197	1,0687	*Grey Zone*
	2014	0,6328	0,3005	0,0742	0,1116	1,1190	*Grey Zone*
	2015	0,5994	0,3357	0,0108	0,0720	1,0179	Potentially Bankrupt
Bank Sinar Mas Tbk	2012	0,4482	0,1050	0,1266	0,1823	0,8622	Potentially Bankrupt
	2013	0,5822	0,1324	0,1102	0,2250	1,0498	Potentially Bankrupt
	2014	0,5580	0,1331	0,0635	0,2762	1,0308	Potentially Bankrupt
	2015	0,4606	0,1223	0,0576	0,2419	0,8825	Potentially Bankrupt
Bank of India Indonesia Tbk	2012	0,9826	0,2176	0,1955	0,6561	2,0518	*Grey Zone*
	2013	0,7778	0,2272	0,2044	0,1880	1,3974	*Grey Zone*
	2014	0,5983	0,2139	0,1839	0,2159	1,2119	*Grey Zone*
	2015	0,7819	0,1675	-0,0525	0,6589	1,5558	*Grey Zone*
Bank Victoria International Tbk	2012	0,7795	0,1609	0,1183	0,0624	1,1211	*Grey Zone*
	2013	0,7959	0,1651	0,1157	0,0481	1,5106	*Grey Zone*

Bank	Year	6,56 WC/TA	3,26 RE/TA	6,72 EBIT/TA	1,05 MVE/TL	Z-Score	Category
	2014	1,1240	0,1562	0,0382	0,7686	2,0870	*Grey Zone*
	2015	0,8972	0,1576	0,0272	0,7053	1,7872	*Grey Zone*
Bank Artha Graha Internasional Tbk	2012	0,6168	0,0100	0,0457	0,0537	0,7261	Potentially Bankrupt
	2013	0,7706	0,1107	0,0931	0,0672	1,0416	Potentially Bankrupt
	2014	0,6149	0,1143	0,0516	0,0001	0,7809	Potentially Bankrupt
	2015	0,4907	0,1165	0,0225	0,0393	0,6691	Potentially Bankrupt
Bank Mayapada Internasional Tbk	2012	0,2571	0,1069	0,1375	0,7204	1,2219	*Grey Zone*
	2013	0,5444	0,1065	0,1425	0,4639	1,2574	*Grey Zone*
	2014	0,4772	0,1083	0,1062	0,2055	0,8973	Potentially Bankrupt
	2015	0,5938	0,1270	0,1248	0,2063	1,0518	*Grey Zone*
Bank Windu Kentjana Internasional Tbk	2012	0,6835	0,0746	0,1324	0,1442	1,0347	Potentially Bankrupt
	2013	0,7986	0,0946	0,1008	0,1145	1,1085	*Grey Zone*
	2014	0,6722	0,0992	0,0492	0,1488	0,9694	Potentially Bankrupt
	2015	0,6646	0,1223	0,0643	0,2373	1,0885	*Grey Zone*
Bank NISP OCBC Tbk	2012	0,4072	0,1719	0,1038	0,1957	0,8785	Potentially Bankrupt
	2013	1,2011	0,1795	0,1054	0,1765	1,6625	*Grey Zone*
	2014	1,0209	0,2117	0,1158	0,1858	1,5342	*Grey Zone*
	2015	0,9506	0,2222	0,1116	0,1476	1,4320	*Grey Zone*
Bank PAN Indonesia Tbk	2012	0,4581	0,1992	0,1185	0,1215	0,8972	Potentially Bankrupt
	2013	0,8330	0,2551	0,1331	0,1154	1,3366	*Grey Zone*
	2014	0,8620	0,2873	0,1431	0,1970	1,4894	*Grey Zone*
	2015	0,8807	0,2959	0,0902	0,1362	1,4030	*Grey Zone*

Source: data calculated by researchers, 2016

In 2013, there are 5 banks that succeeded in increasing the value of Working Capital to Total Assets thus making the total value of the Z-Score higher and the number of banks that exist in the grey area amounts to 18 banks. The five banks are Bank Bukopin Tbk, Regional Development Bank of West Java and Banten Tbk, Bank Windu Kentjana International Tbk, Bank OCBC NISP Tbk and Bank PAN Indonesia TBK. In addition, the number of banks with strong bankruptcy potential this year decreased to 5.

In 2014, the number of banks that could become potentially bankrupt increased compared to the year 2013, which is nine banks. They are Bank MNC Internasional Tbk, Bank Bukopin Tbk, Bank QNB Indonesia Tbk, Bank Bumi Arta Tbk, Bank Maybank Indonesia Tbk, Bank Sinar Mas Tbk, Bank Artha Graha Internasional Tbk, Bank Mayapada International Tbk, and Bank Windu Kentjana International Tbk. So, the remaining 14 banks were in the grey zone.

For the year 2015 (shown in Table 5 and Table 6) the number of banks that could potentially become bankrupt is the same as in 2014, *i.e.* nine banks.

Table 6. Bank Soundness by Z-Score Analysis

Year	Bank Soundness		
	Healthy	Grey Zone	Potentially Bankrupt
2012	0	13	10
2013	0	18	5
2014	0	14	9
2105	0	14	9

But there are differences in the name of the banks that are listed in the potentially bankrupt category. The six banks that could potentially become bankrupt were Bank MNC Internasional Tbk, Bank QNB Indonesia Tbk, Bank Bumi Arta Tbk, Bank Maybank Indonesia Tbk, Bank Sinar Mas Tbk and Bank Artha Graha Internasional Tbk. Meanwhile, three other banks arein the grey zone: Bank Rakyat Indonesia Agroniaga Tbk, Bank CIMB Niaga Tbk and Bank Permata Tbk. Bank Rakyat Indonesia Agroniaga Tbk throughout the years of 2012-2014, but in 2015 the value of the Z-Score indicates that the bank has a potential bankruptcy. This is because in 2015, the value of Working Capital to Total Assets of bank is falling and negative. The soundness of bank CIMB Niaga Tbk and Bank Permata Tbk was also threatened and potentially powerful risk of bankruptcy because the value of EBIT to Total Assets and the value of the Market Value Equity to Total Liabilities of the two banks in 2015 decreased. From this, the number of banks that are in the grey zone in 2015 are 14 banks.

From Table 7 and Table 8, the research result by using Bankometer (S-Score) showed that during the year 2012 to 2015, all 23 banks in this study are healthy. This means that throughout the years 2012-2015, the banks are not experiencing financial difficulties or potential bankruptcy. This is because each bank can meet the criteria and maintain the component values associated with Bankometer and in accordance with the standards set by the International Monetary Fund (IMF). These values include the value of Capital to Asset Ratio should to be above 4%, the value of Equity to Asset Ratio should be more than 2%, the value of Capital Adequacy Ratio should be above 8%, the value of Non-Performing Loans of less than 15%, the value Cost to Income Ratio should be below 40%, and the value of Loans to Asset Ratio of less than 65%. Therefore, all 23 banks in this study meet the specified criteria and all the banks have a healthy soundness.

Table 7. Calculation results bankometer of the twenty-three bank in Indonesia, 2012-2015 Period

Bank	Year	1,5 CA	1,2 EA	3,5 CAR	0,6 NPL	0,3 CI	0,4 LA	S-Score	Category
Bank Rakyat Indonesia Agroniaga Tbk	2012	13,15%	11,05%	51,80%	0,94%	18,39%	24,14%	119,46%	Healthy
	2013	24,67%	19,44%	75,60%	0,55%	19,58%	28,08%	167,93%	Healthy
	2014	21,19%	16,81%	66,71%	0,79%	18,22%	28,76%	152,48%	Healthy
	2015	24,58%	19,40%	77,42%	0,79%	15,42%	28,28%	165,89%	Healthy
Bank MNC Internasional Tbk	2012	12,28%	11,52%	39,24%	2,39%	29,30%	27,14%	121,86%	Healthy
	2013	13,99%	11,28%	45,82%	1,42%	34,57%	26,35%	133,43%	Healthy
	2014	19,02%	15,69%	62,27%	2,32%	32,91%	26,00%	158,19%	Healthy
	2015	18,48%	16,89%	62,41%	1,46%	28,71%	23,23%	151,17%	Healthy
Bank Central Asia Tbk	2012	15,68%	14,06%	49,70%	0,12%	11,36%	22,82%	113,74%	Healthy
	2013	17,69%	15,05%	54,95%	0,12%	11,83%	24,69%	124,34%	Healthy
	2014	19,24%	16,43%	59,15%	0,12%	11,65%	24,58%	131,17%	Healthy
	2015	23,20%	18,09%	65,45%	0,12%	12,80%	25,48%	145,15%	Healthy
Bank Bukopin Tbk	2012	13,29%	9,13%	57,19%	0,94%	18,24%	27,15%	125,93%	Healthy
	2013	14,18%	10,79%	52,85%	0,94%	19,85%	27,45%	126,06%	Healthy
	2014	13,08%	10,33%	49,70%	1,24%	20,79%	27,50%	122,64%	Healthy
	2015	13,33%	9,58%	47,46%	1,28%	18,71%	27,49%	117,85%	Healthy
Bank Negara Indonesia (Persero) Tbk	2012	17,64%	15,67%	58,45%	0,48%	15,99%	23,26%	131,49%	Healthy
	2013	16,90%	14,80%	52,85%	0,30%	15,34%	25,93%	126,12%	Healthy
	2014	18,13%	17,58%	56,70%	0,24%	14,01%	25,99%	132,64%	Healthy
	2015	21,77%	18,51%	68,25%	0,54%	14,38%	24,70%	148,15%	Healthy
Bank Rakyat Indonesia (Persero) Tbk	2012	15,00%	14,12%	59,33%	0,20%	13,03%	24,38%	126,06%	Healthy
	2013	16,64%	15,25%	59,47%	0,19%	12,80%	26,78%	131,12%	Healthy
	2014	16,03%	14,62%	64,09%	0,22%	13,19%	23,90%	132,05%	Healthy
	2015	18,88%	15,45%	72,07%	0,31%	13,27%	24,92%	144,91%	Healthy
Bank Tabungan Negara (Persero) Tbk	2012	12,66%	11,04%	61,92%	1,87%	18,20%	26,71%	132,39%	Healthy
	2013	11,84%	10,61%	54,67%	1,82%	17,99%	27,87%	124,80%	Healthy
	2014	11,59%	10,17%	51,24%	1,66%	18,92%	29,02%	122,60%	Healthy
	2015	12,13%	9,68%	59,40%	1,27%	17,01%	29,34%	128,82%	Healthy
Bank Danamon Indonesia Tbk	2012	23,75%	22,13%	66,15%	0,12%	15,24%	23,34%	150,73%	Healthy
	2013	22,55%	20,55%	62,65%	0,66%	15,78%	22,46%	144,66%	Healthy
	2014	22,65%	20,01%	62,30%	0,78%	16,71%	21,81%	144,26%	Healthy
	2015	24,91%	21,83%	68,95%	1,14%	15,51%	21,16%	153,50%	Healthy
Bank Pembangunan Daerah Jawa Barat dan Banten	2012	9,68%	10,18%	63,39%	0,30%	19,32%	19,63%	122,49%	Healthy
	2013	11,29%	11,38%	57,79%	0,38%	19,97%	24,96%	125,77%	Healthy
	2014	11,39%	11,20%	56,28%	0,62%	21,43%	25,32%	126,24%	Healthy
	2015	11,41%	10,49%	55,48%	0,52%	20,20%	24,52%	122,60%	Healthy
Bank QNB Indonesia Tbk	2012	27,59%	22,30%	97,16%	0,19%	36,12%	27,29%	210,64%	Healthy
	2013	20,36%	16,31%	65,59%	0,06%	30,42%	29,67%	162,42%	Healthy
	2014	15,86%	13,04%	52,85%	0,14%	22,21%	28,97%	133,08%	Healthy
	2015	18,78%	11,29%	56,63%	1,44%	23,17%	32,28%	143,60%	Healthy
Bank Mandiri (Persero) Tbk	2012	14,62%	14,30%	54,18%	0,22%	13,64%	24,20%	121,17%	Healthy
	2013	15,01%	14,53%	52,26%	0,22%	12,88%	25,49%	120,39%	Healthy
	2014	15,00%	14,72%	58,10%	0,26%	14,14%	24,47%	126,70%	Healthy
	2015	17,70%	15,76%	65,10%	0,40%	13,53%	25,79%	138,27%	Healthy
	2012	18,47%	18,00%	67,13%	0,00%	19,77%	25,56%	148,93%	Healthy

Bank	Year	1,5 CA	1,2 EA	3,5 CAR	0,6 NPL	0,3 CI	0,4 LA	S-Score	Category
Bank Bumi Arta Tbk	2013	18,14%	16,74%	59,47%	0,00%	21,45%	27,89%	143,69%	Healthy
	2014	15,49%	14,02%	52,75%	0,05%	21,39%	27,38%	131,07%	Healthy
	2015	28,25%	22,55%	89,50%	0,23%	20,08%	26,15%	186,75%	Healthy
Bank CIMB Niaga Tbk	2012	17,75%	13,77%	53,06%	0,67%	14,62%	27,78%	127,65%	Healthy
	2013	18,42%	14,19%	53,76%	0,93%	15,29%	26,65%	129,25%	Healthy
	2014	19,06%	14,64%	54,53%	1,16%	15,98%	28,07%	133,45%	Healthy
	2015	19,03%	14,41%	56,98%	0,95%	17,63%	27,41%	136,42%	Healthy
Bank Maybank Indonesia Tbk	2012	15,09%	10,02%	44,91%	0,49%	14,77%	25,93%	111,19%	Healthy
	2013	15,33%	10,44%	44,59%	0,93%	13,04%	26,88%	111,21%	Healthy
	2014	19,03%	12,13%	55,16%	0,89%	19,18%	27,00%	133,39%	Healthy
	2015	17,16%	11,99%	53,10%	1,45%	20,67%	25,97%	130,33%	Healthy
Bank Permata Tbk	2012	19,12%	11,38%	55,51%	0,25%	20,85%	28,44%	135,54%	Healthy
	2013	16,72%	10,21%	50,05%	0,18%	20,61%	28,55%	126,33%	Healthy
	2014	16,05%	11,06%	47,60%	0,36%	16,96%	28,35%	120,38%	Healthy
	2015	17,83%	12,36%	52,50%	0,84%	15,73%	27,56%	126,82%	Healthy
Bank Sinar Mas Tbk	2012	17,72%	14,46%	63,32%	1,54%	11,54%	27,18%	135,75%	Healthy
	2013	22,68%	18,94%	76,37%	1,27%	12,69%	25,01%	156,96%	Healthy
	2014	21,00%	17,86%	64,33%	1,54%	13,98%	26,76%	145,48%	Healthy
	2015	17,49%	15,80%	50,30%	1,79%	14,85%	24,87%	125,10%	Healthy
Bank of India Indonesia Tbk	2012	20,17%	17,65%	73,85%	0,52%	12,75%	28,74%	153,68%	Healthy
	2013	17,14%	15,03%	53,41%	0,49%	9,63%	28,28%	123,98%	Healthy
	2014	14,52%	12,83%	53,87%	0,35%	8,70%	24,07%	114,34%	Healthy
	2015	22,13%	21,98%	83,48%	2,98%	8,81%	22,35%	161,71%	Healthy
Bank Victoria International Tbk	2012	18,57%	12,28%	62,86%	1,06%	13,30%	21,80%	129,87%	Healthy
	2013	18,35%	10,30%	62,83%	0,19%	13,85%	23,59%	129,11%	Healthy
	2014	17,39%	9,88%	64,23%	1,57%	23,39%	23,27%	139,73%	Healthy
	2015	17,47%	10,91%	67,55%	2,36%	25,03%	22,53%	145,84%	Healthy
Bank Artha Graha Internasional Tbk	2012	19,67%	11,31%	57,58%	0,48%	25,37%	29,60%	144,00%	Healthy
	2013	18,31%	14,65%	60,59%	1,06%	21,48%	28,96%	145,05%	Healthy
	2014	18,86%	13,76%	55,83%	1,01%	24,43%	29,01%	142,90%	Healthy
	2015	17,91%	13,21%	53,20%	0,75%	27,49%	27,25%	139,82%	Healthy
Bank Mayapada Internasional Tbk	2012	13,53%	12,90%	38,26%	1,28%	15,85%	28,47%	110,28%	Healthy
	2013	17,21%	11,87%	49,25%	0,38%	15,18%	29,44%	123,33%	Healthy
	2014	12,15%	9,22%	35,88%	0,88%	15,29%	28,74%	102,15%	Healthy
	2015	15,44%	11,64%	45,40%	1,36%	14,91%	28,95%	117,68%	Healthy
Bank Windu Kentjana Internasional Tbk	2012	16,61%	13,96%	48,51%	0,86%	20,22%	27,87%	128,03%	Healthy
	2013	18,31%	15,69%	51,38%	0,80%	20,22%	27,71%	134,11%	Healthy
	2014	17,69%	15,00%	49,53%	1,46%	23,56%	28,19%	135,42%	Healthy
	2015	20,56%	16,81%	57,37%	0,98%	22,00%	28,67%	146,39%	Healthy
Bank NISP OCBC Tbk	2012	18,71%	13,57%	57,72%	0,22%	17,12%	26,65%	134,00%	Healthy
	2013	21,96%	16,66%	67,48%	0,21%	16,54%	26,16%	149,01%	Healthy
	2014	22,35%	17,39%	65,59%	0,48%	16,64%	26,43%	148,88%	Healthy
	2015	21,77%	16,35%	60,62%	0,47%	16,03%	28,41%	143,65%	Healthy
Bank PAN Indonesia Tbk	2012	16,24%	12,27%	51,35%	0,29%	14,36%	21,24%	115,74%	Healthy
	2013	20,25%	14,29%	53,62%	0,45%	14,91%	25,11%	128,62%	Healthy
	2014	21,48%	16,03%	60,55%	0,31%	15,17%	25,94%	139,48%	Healthy
	2015	25,77%	20,19%	70,46%	0,33%	16,17%	25,72%	158,64%	Healthy

Source: data calculated by researchers, 2016

Table 8. Bank soundness by bankometer analysis

Year	Bank Soundness		
	Healthy	Grey Zone	Potentially Bankrupt
2012	25	0	0
2013	25	0	0
2014	25	0	0
2105	25	0	0

After doing the calculations and analysis using each model, this study showed different results with each other. In addition, it was found that each analysis tool used in this study has advantages and disadvantages. Z-Score and Bankometer are easier to use because the calculation method is not complicated. Although Bankometer also uses ratios similar to CAMEL, it cannot replace the CAMEL in conducting soundness assessments. This is because Bankometer itself has not really become established as a legitimate tool that can be used in the assessment of the health of banks, especially in Indonesia. Although the results of the Z-Score are contrary to CAMEL, the tool is complementary to CAMEL analysis. Results of the Z-Score can be used to predict the financial distress and bankruptcy within a period of 1 to 3 years.

This study suggests using CAMEL to be the main analytical tool in assessing the health of banks. This is because CAMEL has been set by Bank Indonesia as an analytical tool in the procedure of assessment of the health of banks. So, the analysis of CAMEL already has clear rules and as such is a reference in the assessment of the health of banks in Indonesia.

Table 9. Strengths and Weaknesses of CAMEL, Z-score and Bankometer

	STRENGTHS	WEAKNESSES
CAMEL	▪ The concise tool in ensuring the condition of a bank. ▪ Used universally and already have a clear standard. ▪ Consists of five categories of assessment so more detail available to see the strengths and weaknesses of the bank.	▪ The calculations are too complex that it would be difficult for external parties perform accurate calculations.
Z-SCORE	▪ Using a standard financial ratio that is more easily understood and calculated. ▪ Able to show critical points in the bank. ▪ It has been used in the service industry, manufacturing, and banks to predict bankruptcy.	▪ The results can not accurately describe the bank's performance when compared to CAMEL.
BANKOMETER	▪ Ratio and the calculation stages are easier to count when compared with CAMEL. ▪ The ratio used is a combination of financial ratios and the ratio of CAMEL.	▪ Not widely known and has not been confirmed as a valid tool in analysing the health of banks, especially in Indonesia. ▪ Not widely used to assess the health and predict the bankruptcy of a bank.

Conclusion

Based on the analysis of CAMEL, banks that are always healthy throughout the years from 2012-2015 were only two banks, namely Bank Central Asia Tbk and Bank Rakyat Indonesia (Persero) Tbk. The soundness of the banking companies throughout the years 2012-2015 are dominated by banks that are quite healthy. It is hoped these banks can improve their health so that the Indonesian banking sector is dominated by banks that are healthy. Additionally, according to the results of the Z-Score, there was no sound bank throughout the year 2012-2015. Most banksused in the population sample entered a grey area and the results show there are several potential bankruptcies. Meanwhile, according to the results of the analysis from using the Bankometer model during the year 2012-2015, all banking is in a healthy position.

Each model analysis used shows different results. This is because every aspect in each model is also different. The research concluded that the main and reliable analytical tool that can be used to calculate the soundness of banks in Indonesia is CAMEL. This is because CAMEL has been set by Bank Indonesia and has clear rules so that results can be a generalized reference in the assessment of the health of banks in Indonesia.Z-Score analysis results can be used to supplement the results of CAMEL analysis; Bankometer still needs to be investigated further because it is not well established as a valid tool that can individually be used to assess the soundness of banks, especially those in Indonesia.

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Efficiency Classification of Stock Market Indices: Construction of an Indicator Using Fractal and Long Memory Characterization

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Abstract:

An efficient market has been theoretically proven to be a crucial component for efficient resource allocation in an economy. Taken into account the Efficient Market Hypothesis (EMH) critics, we intend in this paper to study the degree of roughness, regularity variation and the unpredictability of the market. Doing so, we will be able to comment on stock market efficiency after controlling different types of inefficiencies. To classify market, we use an efficiency index for which we utilize long-term memory, fractal dimension and entropy as input variables. This measure takes into consideration the correlation structure of the returns (long-term memory), local herding behavior (fractal dimension) and uncertainty in the process (entropy). Applying this methodology on 5 stock market indices, Turkey (XU100), France (CAC40), Brazil (BSVP), Mexico (MXX) and China (SSEC), This study leads to the principal conclusion that the most efficient markets are situated in the Brazil (BSVP) and Turkey (XU100) closely followed by the French CAC40. The least efficient ones are Mexico (MXX) and China (SSEC).

Keywords: market efficiency; fractal dimension; long memory; hurst exponent; entropy

JEL Classification: D20; G18; P20; B28; B82; B84; A17

Introduction

Time series represent an interesting tool to understating the evolution of several phenomena in many fields. In fact, it can be very helpful in study of the past behavior and in forecasting. So, if we can examine different branches time series (for many countries or economic sectors), then we can compare their performances and provide the appropriate decisions. In addition, the exploitation of time series can lead the possibility of violating the market efficiency assumption.

The efficient-market hypothesis (EMH) was developed by Eugene Fama in early 1960s. This hypothesis maintains, unequivocally, that the market prices are an accurate reflection of all available information. The EMH is associated with the idea of a random walk, which illustrates that if the flow of information is unimpeded and information is immediately reflected in stock prices, then tomorrow's price change will reflect only tomorrow's news and will be independent of the price changes today (Fama 1970). The hypothesis of efficient capital markets is a central concept of modern financial theory. It constitutes certainly, an important debate among stock market investors. If markets are efficient, this means that no investment strategy cannot be allowed to generate for a given

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level of risk, an abnormal profit. More simply, this means that it is impossible to beat the market over the long term (Fama 1965).

The use of time series for forecasting or estimation needs requires some theoretical hypothesis (stationarity, independence, etc.). However, in reality, we usually confronted with characteristics that make the use of time series very difficult. These facts require prior and detailed study of series characteristics. In this paper devoted to the study of features financial index related to markets efficiency, we are particularly interested to the detection of long memory, degree of roughness and unpredictability of the presented series. It should be noted that for an efficient market, the correlation structure of the series, should not reveal neither the long memory nor local persistence or anti-persistence, reflected in rougher paths. Thus, the three aforementioned characteristics can be considered as symptoms of efficiency.

So, in the first step, we proceed to the detection of long memory, associated with low frequencies, and a global measure of the time series using the Hurst exponent. The second step consists to characterize the degree of roughness, or regularity variation, associated with fractal dimension. In the third, the degree of the unpredictability of the used series will be estimated using the entropy.

The layout of the paper is as follows. Section 2 presents a brief review of time series characteristics used. Section 3 we explain the composite efficiency index. Section 4 provides details of the data. Section 5 summarizes the main findings and discusses the empirical results and we finish the paper with some concluding remarks.

1. Identification of time series characteristics: long memory, roughness and unpredictability

1.1. Long memory

We can define briefly the long memory as a tendency for a slow decay of the magnitude of the time series correlations. In a broader sense, it is defined as a trend-like behavior which may reflect either persistence or anti-persistence. Therefore, a long memory process was originally defined by McLeod and (Hipel 1978) and (Hall 2004), as a stationary process for which autocorrelations absolute values are not summable in the discrete case:

$$\sum_{h=-\infty}^{+\infty} |\rho(h)| = +\infty \tag{1}$$

where: ρ(h) is the autocorrelation with the lag h.

Otherwise, the long memory can be characterized in time domain by power-law decay of autocorrelation function and in frequency domain by a power-law divergence of spectrum close to the origin.

Thus, the autocorrelation function ρ(h) decays as:

$$\rho(h) \propto k^{2H-2} \; for \; k \to +\infty \tag{2}$$

The spectrum $f(\lambda)$ with frequency λ of a long-range correlated process diverges as:

$$f(\lambda) \propto \lambda^{1-2H} \; for \; \lambda \to 0^+ \tag{3}$$

Long-memory can be characterized by the Hurst exponent H, which ranges between 0 and 1 for stationary process. We can distinguish three cases. The first one illustrates the random walk or an independent process when H = 0.5, while anti-persistent process is given when H < 0.5, and finally H > 0.5 indicates that there is a long memory, and we have a persistent process. (Amar *et al.* 2016).

The Hurst exponent can be calculated by rescaled range analysis (R/S analysis), proposed by (Mandelbrot 1972) to inspect the long memory for financial time series. It should be noted that the use of R/ S analysis is not restricted to finance. It is extended to several research fields. It is used for the earthquake prediction in Sichuan, China (Xiaolu *et al.* 2005), to Stock Market Indices (Nawrocki1995), to WiMAX Network Traffic (Lenskiy *et al.* 2012) and in Runoff Time Series and Stream Networks in Agricultural Watersheds (Zhou *et al.* 2006), *etc.*

To define R/S statistic, let us consider a time series $\{X_t\}$ of the sample length T, divided into k intervals of length n $(n * k = T)$, and the average of n series observed values is $\overline{X}_n = \frac{1}{n}\sum_{i=1}^{n} x_i$. We denote $R(n)$; the range of each subinterval and $S(n)$ the standard deviation.

Take the statistical R/S:

$$Q_n = R(n)/S(n) \tag{4}$$

The range $R(n)$ and the standard deviation $S(n)$ are respectively:

$$R(n) = max_{1 \le k \le n}\left[\sum_{j=1}^{k}(x_j - \bar{x}_n)\right] - min_{1 \le k \le n}\left[\sum_{j=1}^{k}(x_j - \bar{x}_n)\right] \tag{5}$$

$$S(n) = [\frac{1}{n}max_{1 \le k \le n}[\sum_{j=1}^{k}(x_j - \bar{x}_n)^2]]^{1/2} \tag{6}$$

We can prove that $P \lim_{n \to \infty}(n^{-H}Q_n) = C$, C is a constant and H is Hurst exponent. So can get approximate estimate H, $H = \ln(Q_n)/\ln(n)$.

In general, the R/S analysis method is described as follows:

$$(R/S)_n = C.n^H \tag{7}$$

where: R is rescaled range and S is a standard deviation. We introduce logarithm on equation (8):

$$\log(\frac{R}{S})_n = \log(C) + H.\log(n) \tag{8}$$

The Hurst exponent H is the slope obtained after a linear regression of $\ln(Q_n)$ on $\ln(n)$.

1.2. Fractal dimension

Many natural phenomena are better described using a dimension between two whole numbers, *i.e.,* a fraction. Thus, a fractal curve can have a dimension between one and two in contrast to the straight line that is one dimensional. Thus, the fractal dimension measures how much complexity is being repeated at each scale. It can be used also as a measure of roughness, and in opposition to the long memory characterization, it measures the local memory of the series (Kristoufek and Vorsvrda 2013).

According Hausdorff, the fractal dimension is defined to be the unique value

$$d = dim_H(X) \text{ } in \text{ } \mathbb{R}_0^+ \cup \{\infty\} \text{ } such \text{ } that \text{ } \mu_{d'}(X) = 0 \text{ } if \text{ } d' > d \text{ } and \text{ } \mu_{d'}(X) = \infty \text{ } if \text{ } d' < d. \text{ } where$$
$$\mu_d(X) = \liminf_{\substack{(U_i) \\ \varepsilon \to 0}} \sum_i (diam(U_i))^d \tag{9}$$

is a d-dimensional Hausdorff measure of a subset X in a metric space. The infimum is taken over all countable covers Ui of X such that diam(Ui) < ε.

The main problem with Hausdorff dimension is the fact that it is fairly hard to calculate in general. So, some other notions of dimension have been developed which are easier to estimate, principaly box-counting dimension defined as follow:

$$dim_B(F) = \lim_{\delta \to 0} \frac{logN_\delta(F)}{-log\delta} \tag{10}$$

In practice, we use box counting algorithm, which is intuitive and easy to apply (Laaroussi *et al.* 2015). Given a sequence (ε_n) decreasing and tends to 0 slowly enough (as a geometric sequence, for example). The fractal object (E) is covered with a mesh network square of side (ε_n), and includes the number (Ω_n) of square meeting point E.

$$D(E) = \lim_{n \to \infty} \left[\frac{log(\Omega_n)}{log(\frac{1}{\varepsilon_n})} \right] \tag{11}$$

The corresponding log-log diagram is defined as:

$$\left(log\left(\frac{1}{\varepsilon_n}\right), log(\Omega_n) \right) \tag{12}$$

For different value of ε_n, we find the number Ω_n, after this we draw this plot, and the fractal dimension is the opposite of the slope. For a univariate series, it holds that 1 < D ≤ 2.

In general, D = 1.5 holds for a random series with no local trending or no local anti-correlations. For a low fractal dimension D < 1.5, the series is locally less rough and thus resembles a local persistence. Reversely, a high fractal dimension D > 1.5 is characteristic for rougher series with local anti-persistence.

Fractal was used in many domains. We can evoke for example the paper elaborated by George (Sugihara 1990) to answer a variety of basic questions about scale, measurement and hierarchy in ecological systems, the article of (Molz *et al.* 2004) to analyze heterogeneity in subsurface hydrology, the work of (Losa 2012) which present a contribution of fractals to biology and medicine.

However, finance still the most popular practical applications of fractal geometry in today, since mandelbort has published his original work in econometrics and financial models, applying ideas of scaling and self-similarity

to arrays of data, generated by financial analyses. After that, many researchers have interested on the application fractal in finance, for example (Blaž *et al.* 2014), (Azar 2014), etc.

1.3. Entropy

Entropy is generally used for characterizing the probability of outcomes in a system that is undergoing a process. It was originally introduced in thermodynamics by (Clausius 1850) to measure the ratio of transferred heat through a reversible process in an isolated system. In statistical mechanics the interpretation of entropy is the measure of uncertainty about the system that remains after observing its macroscopic properties (pressure, temperature or volume). In finance, the entropy is usually used as a measure of uncertainty in portfolio management and as a financial risk measure, it can be used also as an alternative measure of dispersion.

According to (Shannon 1948), entropy satisfies the main properties of a good measure of uncertainty. Let p1, pn be the probabilities of occurrence of a set of events. The entropy for discrete distributions is given by:

$$H(X) = -\sum_i p_i \log p_i \tag{13}$$

For continuous distributions, where $p_X(x)$ is the density function of the random variable X, the entropy is given by:

$$H(X) = -\int p_X(x)\log p_X(x)dx \tag{14}$$

The entropy of a normal distribution can be parametrically estimated by:

$$H(X) = \frac{1}{2}\ln(2\pi\sigma^2) + \frac{1}{2} \tag{15}$$

where: σ is the standard-deviation and π is defined as usually.

The application of entropy in finance can be regarded as the extension of the information entropy and the probability entropy. (Philippatos and Wilson 1972) were the first two researchers who applied the concept of entropy to portfolio selection. In their thesis, a mean-entropy approach was proposed and compared to traditional methods by constructing all possible efficient portfolios from a randomly selected sample of monthly closing prices, on 50 securities over a period of 14 years. They found that the mean entropy portfolios were consistent with the Markowitz full-covariance and the Sharpe single-index models. Since this time, many other scholars have enriched the portfolio selection theory with entropy concepts. We can evoke for example, the paper of (Jana *et al.* 2007) which, after proposing a mean-variance-skewness model for portfolio selection, they added the entropy objective function to generate a well-diversified asset portfolio within optimal asset allocation. (Zhang *et al.* 2012) were developed in their article, a probabilistic mean semi variance-entropy model for multi-period portfolio selection with transaction costs. In addition, the entropy has been applied in option pricing such as in the Entropy Pricing Theory (EPT) introduced by Gulko. Entropy can be used also as an alternative approach to forecasting financial time series.

2. Construction of a composite efficiency index

According to Kristoufek and Vosvrda (2013, 2014), the Efficiency Index (EI) is defined as:

$$EI = \sqrt{\sum_{i=1}^n \left(\frac{\hat{M}_i - M_i^*}{R_i}\right)^2} \tag{16}$$

where: M_i is the ith measure of efficiency, $\hat{M}_i$ is an estimate of the ith measure, M_i^* is an expected value of the ith measure for the efficient market and R_i is a range of the ith measure. The defined efficiency measure is taken as a distance from an ideal efficient market situation.

The index above is based on the fact that both fractal dimension D and Hurst exponent H are bounded. Indeed, Hurst exponent for stationary series is defined on interval [0,1] and fractal dimension for a univariate case is defined on [1,2]. For each measure, the value for an efficient market lies in the center of its support, *i.e.* H = 0.5 and D = 1.5.

In our case, we consider three measures of market efficiency. Hurst exponent H with an expected value of 0.5 for the efficient market ($M_H^* = 0.5$), fractal dimension D with an expected value of 1.5 ($M_D^* = 1.5$) and the entropy with an expected value of 1 ($M_E^* = 1$). The estimate of Hurst exponent is obtained from R/ S analysis. The estimate of the fractal dimension is calculated using the relation D=2-H. For the entropy, we utilize formula given by (Shannon 1948).

3. Data

In this paper, we analyze 5 stock indices from various locations (Turkey (XU100), France (CAC40), Brazil (BSVP), Mexico (MXX) and China (SSEC)), between January 2010 and June 2015. This period is characterized by various phases of market behavior, especially financial facts. The data was collected from the Yahoo Finance publicly available database.

Figure 1. Evolution of the considered stock market indices from January 2010 to June 2015
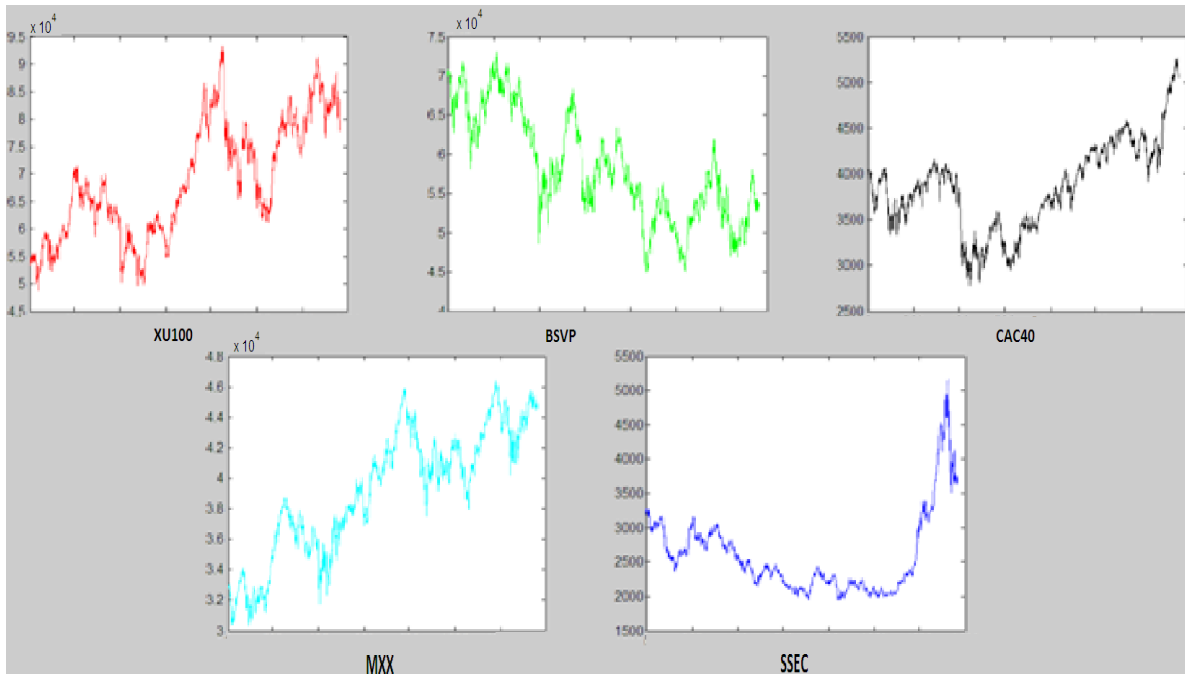
Source: Yahoo Finance database

To meet theoretical considerations of stationarity, we considered the logarithmic returns of those indices, which are asymptotically stationary, according to the KPSS test.

Figure 2. Evolution of the returns stock market indices from January 2010 to June 2015
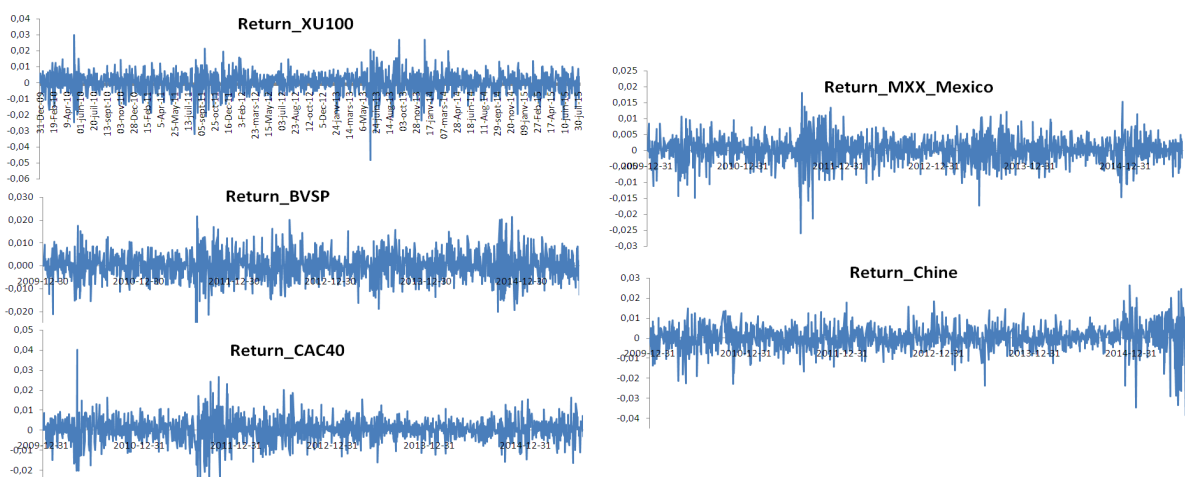
Source: Authors' calculations

4. Results and discussion

In this section, we present the numerical results, related to 5 stock market indices: Turkey (XU100), France (CAC40), Brazil (BSVP), Mexico (MXX) and China (SSEC). These assets are selected according to their market capitalization and liquidity. We have utilized long-term memory, fractal dimension and entropy as input variables to construct the Efficiency Index, represented in TABLE 1.

Table1. Stock market characteristics: long memory, roughness and unpredictability

Stock market	Hurst exponent	Fractal dimension	Entropy
SSEC	0.5986	1.4013	0.0002
MXX	0.4317	1.5682	0.0008
CAC40	0.4788	1.5211	0.0013
XU100	0.4777	1.5222	0.0020
BSVP	0.4038	1.5961	0.0557

Source: Author's calculation

The interpretation of calculated values of each characteristic (Hurst exponent, fractal dimension and entropy) can be done according reference value. In fact, 0.5 is considered as the reference value for the Hurst coefficient, which stands for the absence of either positive long memory or negative long memory.

Thus, if the Hurst coefficient is greater (resp. smaller) than 0.5, then there is positive (resp. negative) long memory in the series. We can remark that the China index (SSEC) has a positive long memory in the opposite of others indices. This means in restrict sense, that the time series has a trend-like behavior.

Otherwise, the reference value for the fractal dimension is 1.5, which stands for the absence of either local persistence or local anti-persistence. Thus, if the fractal dimension is greater (resp. smaller) than 1.5, it means that there is local anti-persistence (resp. persistence), and the series path is rougher (resp. less rough) than in the reference case. Regarding this explanation, all studied indices, except SSEC, are local anti-persistence, which means that the indices time series reverse their self-more often than a random series would. If the system had been up in the previous period, it is more likely that it will be down in the next period and vice versa. We can note remarkably that, among these indices, the BSVP has the greatest value of fractal dimension (1.59), which allows more fluctuations to BSVP, in comparison to other indices.

Concerning the entropy, which can be seen as a measure of the complexity, calculated values can be compared such as, the greater the entropy, the greater the randomness. Thus, the BSVP is the most random while the SSEC is the least random.

To be able to comment simultaneously the evoked results on stock market in terms of efficiency, we establish an efficiency index, represented in Table 2 and Figure 3.

Table 2. Efficiency market index

INDEX	SSEC	MXX	CAC40	XU100	BSVP
Efficiency Index	0.5190	0.5088	0.5002	0.5000	0.4913

Source: Author's calculation

For the utilized measures (Hurst exponent, fractal dimension and entropy) we present the absolute deviations from the expected values for comparison. For the Hurst exponent estimates, we observe huge diversity between 0.4 (for BSVP of Brazil) and practically 0.6 (for Chinese SSEC). The results for the fractal dimension vary closely across the stock indices, except for Chinese SSEC. The highest deviation is observed for the Brazilian BSVP and the lowest for Chinese SSEC. The entropy values vary strongly from BSVP which has the greatest values to lowest values for SSEC.

For efficiency index, we can note some discrepancies between indices in terms of deviations but they are not huge as those of characteristics. This is mainly due to compensation effect induces by the fact that the efficiency index is constructed as aggregation (quadratic sum) of the three characteristics. Noting that the lower the index is, the more the market is efficient, we get values of the efficiency Index (TABLE 3), graphically presented in FIGURE 3. For the ranking of indices according to their efficiency, the most efficient stock market turns out to be the Brazilian BSVP closely followed by the Turkish XU100 and the French CAC40. In the least we find MXX and SSEC.

Figure 3. Hurst exponent, fractal dimension, entropy and efficiency market index deviations for the considered indices
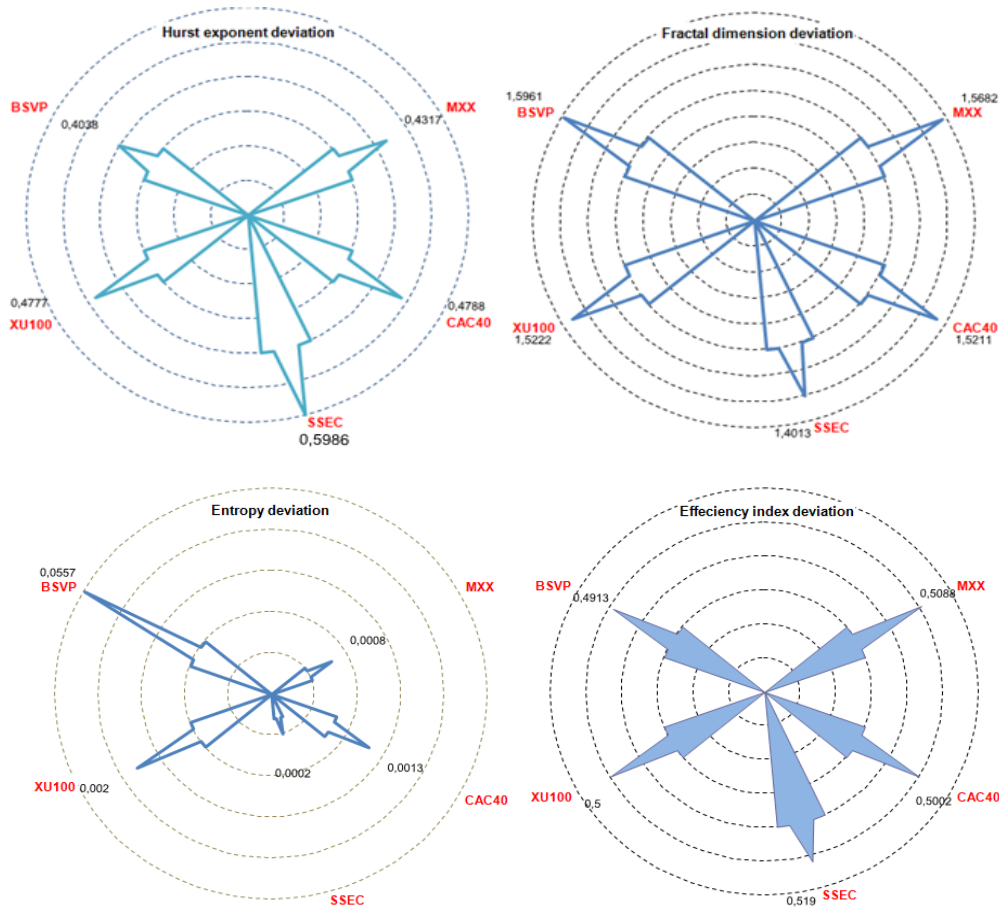
Source: Produced by the authors

Conclusion

This paper presents a study devoted to analyze and classify the market efficiency. The developed methodology is based on a composite index, which combines three characteristics, namely time series' long memory given by the Hurst exponent, the roughness associated with fractal dimension and the unpredictability estimated by the entropy.

The empirical part of the paper presents the result of the classification of five indices, which refer to five markets having different structure (size, foreign exchange, economic branch structure). The proposed index is actually under amelioration to integrate other characteristics of series behavior. The weights of each index component and the introduced mathematical distance are also under review.

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Exploring Bank Selection Factors: A Student Perspective

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Abstract:

The financial crisis has affected the redistribution of power in the banking system and has strengthened the battle between banks for clients. In such an environment, banks need to find new ways of overcoming the competition through bid differentiation and attracting more customers. The purpose of the paper is to explore the predominant bank selection factors among undergraduate population in post-transition country. Based on the survey conducted among student population three most important bank selection criteria have been identified. The empirical results based on survey conducted among student population and application of AHP methodology show that financial benefits, recommendations by parents and family members and location convenience are three predominant bank choice criteria among student population. Analysis shows that gender and status of bank client also have an impact on bank selection factors.

Keywords: bank selection factors; marketing strategy; analytical hierarchy process; undergraduate students

JEL Classification: C8; M3; G2

Introduction

Value added of service sector amounted 65.1 percent of GDP in Bosnia and Herzegovina (BA) in 2015 (World Bank 2017). This is below the European Union level of 73.9 percent, but still shows the importance of service sector for national economy. Changes in the financial environment are putting continuous pressure on financial institutions to offer new products and compete for new customers and market share. In highly turbulent and complex economic environment and increasing bank competition, the issue of bank selection process has gained rising attention. The paper is trying to identify the factors that determine how customers choose between different providers of financial services and their behaviour. Customer-oriented activities became key part of banking marketing strategy. However, successfulness of such activities, particularly aimed at attracting new customers, remained questionable. The size of banking market in BA has been increasing. In 2015, the banking sector contributed to about 87 percent of financial system, equivalent to 84 percent of GDP (IMF 2015a). Banks have major role in financial intermediation indicating the high dependency of national economy on banks behaviour in financial crisis and the volume and direction of bank' credit activities. The competition for clients within banking sector has increased forcing them to struggle for new clients to maintain or increase their market share. The bank market in Federation of BA is dominated by three big banks which hold 57.2 percent of banking sector asset. Share of foreign capital in Federation of BA banking sector amounted 86.1 percent. 41.9 percent of banking sector capital is owned by Austrian banking groups and 15.5 percent by Italian banking group.

The goal of this paper is to explore drivers of bank loyalty and the predominant bank selection criteria among undergraduate population in BA. The results of the research are based on a survey conducted among

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undergraduate students in BA. The size of undergraduate market in BA has been growing. In the last 15 years number of students doubled. In the winter semester of the 2015/2016 academic year there was over 70 thousand students enrolled in higher education institutions in Federation of BA (Institute for Statistics 2016). Paper also contribute to understanding the possibilities to use analytical hierarchy process (AHP) methodology to measure banks competitive advantages in order to enable them to better develop and focus their management and choose appropriate marketing strategies. By analysing student preferences, the research enables to identify the gap between young customer expectations and actual bank marketing strategy.

The paper is structured as follows. The next section provides an overview of the literature with the focus on bank choice criteria. Third section describes AHP methodology and the forth results of the survey conducted among undergraduates. Paper finishes with conclusions.

1. Literature review

The literature investigating bank selection criteria, as well as exploring the factors which contribute to customer loyalty has rising attention worldwide. However, for European countries is still quite rare. Bank selection criteria have been investigated in Romania (Katircioglu, Tumer and Kilinç 2011b), Cyprus (Katircioglu, Fethi, Unlucan and Dalci 2011a, Safakli 2007), Croatia (Podrug, Rašić Bakarić and Slijepčević 2007), UK (Thwaites and Vere 1995) and Turkey (Kaynak, Küçükemiroglu and Odabasi 1991). In addition, most of the academic literature focuses on investigation bank choice criteria among general population. Research of predominant factors for the selection of banks among the student population was carried out in Cyprus (Katircioglu *et al.* 2011b), Croatia (Podrug *et al.* 2007) and UK (Thwaites and Vere 1995) and in most of these countries bank location proved to be important factor for bank selection.

Table 1 summarizes the findings of the researches dealing with exploring the bank choice factors. It shows that although there are some common bank selection criteria among general population, student population is more oriented toward some additional privileges and incentives related to banking services (financial benefits for students, gifts, beneficiary interest rates specifically for young people, branch or ATM close to university) than working population (Lewis and Bingham 1991, Podrug *et al.* 2007, Thwaites and Vere1995).

Table 1. Literature overview on bank choice factors

Country	Bank selection criteria	Author
Bahrain	Bank's reputation, parking space, personnel, and availability and location of automated teller machines.	Almossawi (2001)
Croatia	Among students: family recommendation, financial benefits for students, location convenience	Podrug *et al.* (2007)
Cyprus	Among students: locational convenience and speed and service quality.	Katircioglu *et al.* (2011a)
Cyprus	Service quality and efficiency, bank Image, convenient location, parking facilities, financial factors and affected opinion.	Safakli (2007)
Malaysia	Among students: security, ATM service and financial benefits. Factors such as locational convenience and recommendation, which proved to be influential in previous studies, are no longer given with such importance.	Mokhlis *et al.* (2011)
Malaysia	Accessibility.	Saleh, Rosman, and Nani (2013)
Pakistan	Financial benefits, religious motives and quality of service.	Hasan, Subhani, and Osman (2012)
Romania	Locational convenience, availability of telephone and internet banking, giving personal attention to customers, reputation and image, confidentiality, personnel	Katircioglu *et al.* (2011b)
Sweden	For one third retail bank choice is random. Locational convenience, products are typical reasons for the choice.	Martenson (1985)
Turkey	Gender, age, level of education, profession and frequency of using a bank has an impact on bank selection factors.	Kaynak *et al.* (1991)
UK	For selection of student current account provider among students: service, locational convenience, image, non-core, incentives, borrowing, experience	Thwaites and Vere (1995)
UK	Among students: location convenience and family recommendation	Lewis (1982)
UK	Location convenience, products, free banking	Lewis and Bingham (1991)

Source: authors' research.

This shows that for attracting customers, banks need to reconsider their strategies toward more consumer oriented approaches, which are specifically designed for young population. As noticed by Larivière and den Poel

(2007) providers of banking services which have a goal to target young population need to develop privileges and offer financial products that concur with their living environment, attitudes and beliefs. Thus youth-oriented marketing strategies may include the offer of free or reduced-price ticket for festivals, discounts at selected stores or gifts, as it is the case in Belgium or Sweden.

Services have unique characteristics of intangibility, inseparability, heterogeneity, variability, access and perishability which differentiate them from physical products and therefore they need special marketing strategies in order to make them more visible and closer to the clients. Because of these specific characteristics banks have to use different marketing strategies since they are offering services which are different from those offered by some other firms which are selling physical products. These characteristics can make delivery process more difficult or much easier than for the physical products. For example, the characteristic of inseparability production from consumption enables banks to use more individual approach in offering financial services. So it is up to the bank to take advantage of services marketing.

The competition of banks to conquer the student market has been intensifying. The researches show that it is more expensive to gain new customer that customer retention, but also that banks are prepared to loss on student current accounts with the final goal to achieve high profitability in the future since it could be expected that graduates will have above-average wage (Thwaites and Vere 1995).

Customer loyalty is very complex, but very important topic for banking policy. Lewis (1982) noticed that there is larger possibility that the bank's clients will be loyal to the bank if they become customers as undergraduates. The literature shows that customers' loyalty is dependent on the level of customer satisfaction, but also on the level of attachment and commitment perceived service quality, image and trust (Afsar, Rehman, Qureshi, and Shahjehan 2010, Lewis and Soureli 2006, Levy 2014). The specific characteristic of loyalty to banking institution is that service loyalty is largely dependent on the development of interpersonal relationships (Bloemer, de Ruyter, and Peeters 1998).

Although there is an extensive literature dealing with bank selection criteria, the motivation for research in BA is in its specifics. On the one hand, BA has a large share of foreign-owned banks that are present across SEE region. On the other hand, the BA market is unique given that it is a multicultural, multiethnic and multireligious state. Such complex environment requires additional attention in the literature. In addition, this research could be observed as an extension of the previous efforts to identify bank selection criteria. By analysing the differences in the respondents' attitudes with respect to their gender and client's status in the bank, which is rare in the literature, paper tries to additionally contribute to research in this field.

2. Methodology

2.1 The Analytical Hierarchy Process

The paper uses Analytical Hierarchy Process (AHP) method to determine predominant bank selection factors among student population. Decision making consists of many criteria and sub-criteria for ranking the alternatives of a decision (Saaty 2008). One of the highly regarded and widely used multi-criteria decision-making theories is the AHP developed by Thomas Saaty (1980). By reducing complex problem into a hierarchy with goal at the top, criterions and sub-criterions at intermediate levels and sub-levels, and decision alternatives at the bottom of the hierarchy, AHP lastly accomplishes a scale of preferences among a set of alternatives. It is successive pair-wise comparison of the criteria and alternatives and not a simultaneous one, which enables decision makers to use simple hierarchy structure to deal with complicated problem and to effective handle both qualitative and quantitative data. Its main advantage is that generates ratio data. AHP is a mature technique, widely used in banking sector, manufacturing, public services, defence and other sectors, and specifically for decision making, strategy selection and evaluation purposes (Ishizaka and Labib 2011, Ishizaka, Balkenborg, and Kaplan 2011). The main steps of AHP methodology in a decisions problem are given in the following (Saaty 1980):

In the first step, criteria and alternatives of the problem have to be defined. The multi-criteria problem is then organized hierarchically with a number of small constituent elements (Figure 1). The overall goal of the decision making process (bank selection) is at the highest level; the criteria are gathered at the same middle level, while the bank alternatives are at the lowest level.

In the second step, a series of pair-wise comparisons are carried out among the *n* criteria elements at the same level. In each level criteria are compared on the basis of their level of influence and on the specified criteria at the higher level. To compare *n* criteria at the same level, a scale of numbers that indicates how many times more important one element is over another with respect to the criterion with respect to which they are compared (Saaty,

2008). Saaty's nine-point scale is used (listed in Table 2). Comparisons are made through fulfilling comparison matrix (Table 3).

In the third step, the relative weights of the decision elements (to generate the priority vector of alternatives) are estimated using the eigenvalue method.

In the final step, global priorities are obtained by aggregating local priority vectors with the application of a simple weighted sum. On the basis of the global priorities, the final ranking of decision alternatives is obtained.

Figure 1. Scheme of decision hierarchy for the bank selection decision
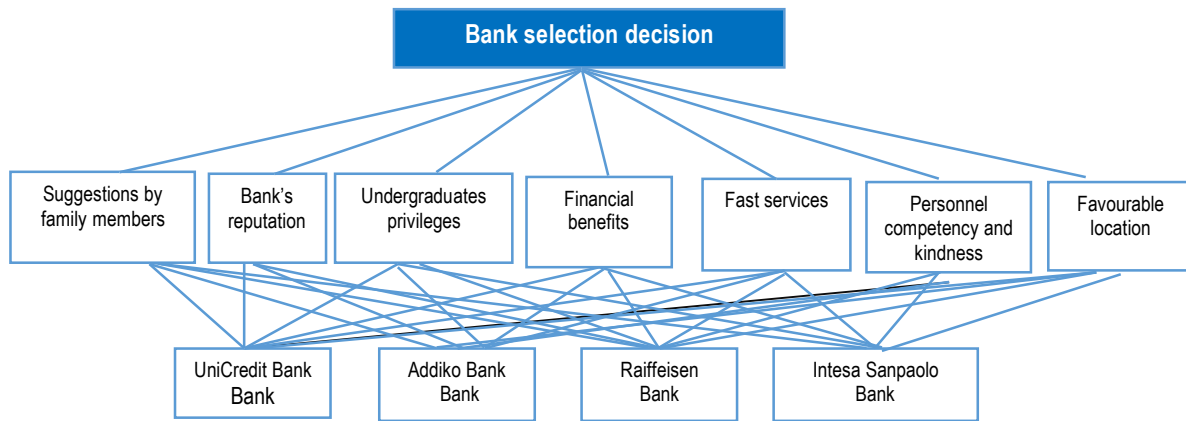
Source: author.

Table 2. The fundamental scale

Intensity of importance	Definition	Explanation
1	Equal importance	The compared criteria contribute equally to the goal
3	Moderate importance	One criterion is slightly favour over another
5	Strong importance	One criterion is strongly favour over another
7	Very strong importance	One criterion is very strongly favour over another
9	Extreme importance	The evidence favouring one criterion over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate scale	Intermediate scale between two adjacent judgments
Reciprocals		If one criterion has lower value than another one

Source: author according to Saaty (2008).

In the first section of questionnaire pair-wise comparisons of the seven criteria at the second level 2 was carried out by the respondents. The comparison was made by fulfilling comparison matrix. Since there were seven criteria in the Level 2 of the hierarchy, a total of 21 comparisons had been made. The input matrix A was composed as followed:

Table 3. Comparison matrix A – first section of the questionnaire

Criteria	C_j						
C_1	C_1	C_2	C_3	C_4	C_5	C_6	C_7
Suggestions by parents or family members C_1	1	a_{12}	a_{13}	a_{14}	a_{15}	a_{16}	a_{17}
Bank's reputation C_2	$1/a_{12}$	1	a_{23}	a_{24}	a_{25}	a_{26}	a_{27}
Availability of financial benefits for undergraduate C_3	$1/a_{13}$	$1/a_{23}$	1	a_{34}	a_{35}	a_{36}	a_{37}
Financial benefits C_4	$1/a_{14}$	$1/a_{24}$	$1/a_{34}$	1	a_{45}	a_{46}	a_{47}
Delivering fast services C_5	$1/a_{15}$	$1/a_{25}$	$1/a_{35}$	$1/a_{45}$	1	a_{56}	a_{57}
Bank service quality (quality of services of bank personnel) C_6	$1/a_{16}$	$1/a_{26}$	$1/a_{36}$	$1/a_{46}$	$1/a_{56}$	1	a_{67}
Favourable locations of the bank and its ATM's C_7	$1/a_{17}$	$1/a_{27}$	$1/a_{37}$	$1/a_{47}$	$1/a_{57}$	$1/a_{67}$	1

Source: author.

The element of comparison matrix a_{ij} gives relative importance of criterion C_i as compared with C_j. *where: i*, j = 1, ... , n (n – number of criteria in the Level 2), a_{ij} = 1, ..., 9 using a 1-9 scale.

When a respondent compares two criteria, convenient location C_7 and financial benefits C_4, and indicates that C_7 is extremely important than C_4, then value a_{74} = 9 is assigned to this pairwise comparison. The elements of the main diagonal are all ones since it makes no sense to compare the criterion with itself. Since the elements below the main diagonal represent the inverse values of the elements above the main diagonal, only the elements in the upper triangle of the matrix are compared. In the third stage of the AHP methodology the relative weights of the decision elements were estimated by conducting the eigenvalue method. The eigenvalue method of AHP takes in as inputs the pair-wise comparisons of the respondents' judgements and produces the relative weights of element at each level of hierarchy. Given that $\hat{A}$ is a matrix of relative preferences of surveyed students, and $W - (w_1, ..., w_7)$ is the second level priorities vector, as the vector of priorities is unknown, it has to be estimated. An estimate of W is noted $\hat{W}$. $\hat{W}$ is obtained from the equation $\hat{A} \cdot \hat{W} = \lambda_{max} \hat{W}$, where λ_{max} is the largest eigenvalue of $\hat{A}$ (Saaty 1980).

The same procedure is conducted for pair-wise comparison of the four banks. As there are 4 banks in the Level 3 of hierarchy, the comparisons result in seven matrices of size 4 x 4 (Table 4).

Table 4. Comparison matrix B-the second part of the questionnaire

Bank	Bank			
	UniCredit	Addiko Bank	Raiffeisen Bank	Intesa Sanpaolo
UniCredit	1	a_{12}	a_{13}	a_{14}
Addiko Bank	1/a_{12}	1	a_{23}	a_{24}
Raiffeisen Bank	1/a_{13}	1/a_{23}	1	a_{34}
Intesa Sanpaolo	1/a_{14}	1/a_{24}	1/a_{34}	1

Source: Author.

where: i, j = 1, ... , m (m – number of bank in the Level 3), a_{ij} = 1, ..., 9, using a 1-9 scale.

As it is necessary to obtain the vector of priorities for each criteria, let the vector be noted V – (V₁, ..., V₄). To obtain the priorities for Level 1 and Level 2 for the sample, the arithmetic means of the priorities obtained for each respondent were computed. The computed priorities are plausible only if the comparison matrices are consistent or near consistent. There are rules which can help user to obtain consistency. The elements a_{ij} comparison matrix A compare the alternatives i and j of a decision problem, are said to be consistent if they respect the following transitivity (1) and reciprocity rules (2) (Ishizaka 2005):

$a_{ij} = a_{ik} \cdot a_{kj}$ where *i, j* and *k* are any alternatives of the matrix (1)

$a_{ij} = \frac{1}{a_{ji}}$ (2)

One of the key advantages of the AHP method is that it measure the consistency of the evaluator's judgment through pair-wise comparisons by calculating consistency index (C.I.). When the observed values of $\hat{A}$ are consistent, the value of computed λ_{max} is very close to *n*. This property allows the construction of the consistency index (C.I.) as a measure of deviation from consistency.

$$\text{C.I.} = (\lambda_{max} - n)/(n-1)$$ (3)

The consistency index reflects the consistency in rating the relative importance of the criteria and the impact of the degree (or strength) of importance on all comparisons. The ratio of C.I. to the random consistency number of the same size matrix is called the consistency ratio (C.R.): $C.R. = $ (C.I./RI), *where:* RI is the average index of randomly generated weights. In the paper we used Saaty (1980) calculation for RI. Alonso and Lamata (2006) provide detail overview of results of various authors which used different simulation methods to calculate RIs. Matrix is consistent if C.R. is less than 0.10 (Saaty 1994).

3. Results

3.1 Sample

The decision on bank choice factors among student population in BA was made on the basis of literature review and the results of conducted focus group and interviews. The participants of the focus group were 30 undergraduates from the Faculty of Economics, University of Mostar divided in three small focus groups with moderator. The discussion was lead in two directions. The aim of the first part was to identify relevant criteria for undergraduates' bank selection decision. In this first phase, preliminary findings of focus group have been qualitatively assessed and analysed. As a result of the focus group discussion and the previous research review, the total of seven most influential factors for bank selection was identified. They were:

- Financial advantages (low interest rate on loans and high interest rates on savings);
- Suggestions by parents or family members;
- Favourable locations of the bank and its ATM's;
- Bank service quality (quality of services of bank personnel);
- Availability of financial benefits for undergraduate;
- Delivering fast services;
- Bank's reputation.

The least influential factors mentioned by focus group are: working time, bank liquidity, confidentiality of bank customer records and bank size (in number of clients and market share). Gifts for opening account or as a special student benefit, as well as bank's media advertisement have not been shown at all as factors contributing to the choice of the bank among the student population.

The second part of the discussion was conducted in order to identify undergraduates' familiarity with banks in Federation BA. Discussion showed that students are mostly familiar with following four banks: UniCredit Bank, Raiffeisen Bank, Intesa SanPaolo Bank and Addiko Bank due to the fact that most of the students from the focus group have account in at least one of these banks. These banks have 61.8 percent of total banking sector assets in Federation BA. Three of these four banks are also the three largest banks by assets in the Federation BA, while the fourth is in the ninth place in terms of the size of assets. All four banks are foreign-owned which is not surprising considering that IMF (2015b) analysis showed that banking sector vulnerabilities are mostly concentred within domestically-owned banks and some of them have been struggling to survive on the market. These four banks were chosen for the next step of the research. The result of conducted discussion showed that 45.1 percent of students were not familiar with the existence of financial products for students. On the other side, analysis of the data on the bank's Internet website indicates that 43.8 percent of banks do not offer financial services specifically intended for students. Such results point to shortcomings in the bank's marketing strategies.

Nine banks offer student current accounts, student loans or student packages. All four banks identified in interviews with the focus group participants offer financial products for students. Accordingly, Addiko Bank, Intesa Sanpaolo Bank and UniCredit Bank offer student current accounts, while Raiffeisen Bank student package of financial products.

Two surveys have been conducted among students. The content of the questionnaire was based on seven aforementioned criteria and four banks. The first survey contented the list of seven criteria, and the respondents had to make pair-wise comparisons of the criteria. In the second part of the questionnaire, respondents were asked to make pair-wise comparisons of the four banks with the respect to each of the seven criteria. For the pair-wise comparisons the nine-point fundamental scale proposed by Saaty (1980) was used. The printed version of the questionnaire was distributed to students. In addition of 30 students involved in focus group, total of 93 students were involved in these second part of the research.

Table 5. Sample characteristics of respondents, n=93

Respondent characteristics	%
1. Gender, in %	100.0
1.1. Male	21.5
1.2. Female	63.4
1.3. No answer	15.1
2. Average age	22
3. Employment status, in %	100.0
3.1. Employed	4.3
3.2. Unemployed	80.6

Respondent characteristics	%
3.3. No answer	15.1
4. Bank client status	100.0
4.1. Have bank client status	64.5
4.2. Without bank client status	20.4
4.3. No answer	15.1

Source: author.

The final sample included 63 percent of female and 22 percent male students with an average age of 22 years. Sample also includes both categories of customers: potential bank clients (64.5 percent) and students which have already bank account (20.4 percent).

3.2 Results and discussion

In the Table 6 the criteria of undergraduates by bank selection ranked by priorities are presented. The priorities of the Level 2 provide information on relative preference of the seven bank choice factors. The priorities of Level 3 provide the relative importance of the four banks with the respect to each of the seven factors. Consistency check has been applied according to Saaty (1980, 1990) procedure and all inconsistent matrix were dropped out from the further analysis.

Table 6. Priority vectors for the decision hierarchy

Rank of criteria	Criteria	Level 2 Priorities	Banks	Level 3 - Priorities (according to rank)	Consistency ratio
1	Financial advantages	0.2213	UniCredit Bank	0.398	0.04
			Addiko Bank	0.191	
			Intesa Sanpaolo Bank	0.163	
			Raiffeisen Bank	0.248	
2	Suggestions by family members	0.1668	UniCredit Bank	0.402	0.04
			Addiko Bank	0.199	
			Intesa Sanpaolo Bank	0.157	
			Raiffeisen Bank	0.242	
3	Favourable location	0.1363	UniCredit Bank	0.404	0.05
			Addiko Bank	0.195	
			Intesa Sanpaolo Bank	0.173	
			Raiffeisen Bank	0.228	
4	Bank service quality (bank personnel)	0.1323	UniCredit Bank	0.372	0.05
			Addiko Bank	0.166	
			Intesa Sanpaolo Bank	0.210	
			Raiffeisen Bank	0.252	
5	Availability of financial benefits for undergraduate	0.1264	UniCredit Bank	0.423	0.05
			Addiko Bank	0.192	
			Intesa Sanpaolo Bank	0.161	
			Raiffeisen Bank	0.224	
6	Delivering fast services	0.1248	UniCredit Bank	0.389	0.05
			Addiko Bank	0.192	
			Intesa Sanpaolo Bank	0.161	
			Raiffeisen Bank	0.259	
7	Bank's reputation	0.0980	UniCredit Bank	0.384	0.04
			Addiko Bank	0.224	
			Intesa Sanpaolo Bank	0.156	
			Raiffeisen Bank	0.235	
Consistency ratio		0.02			

Source: author.

The findings indicate that undergraduates place high emphasis on financial benefits, recommendations by parents and family members and location convenience. Therefore, to attract young student population, banks have to put into the core of their strategy: promotion of products with financial benefits for the students (higher interest rate on savings, lower interest rates on loans for undergraduate education *etc.*). It could be expected that global financial crises which influenced financial stability in BA had an impact on increasing the importance of parents'

recommendation when choosing a bank. So to keep or improve the current customer satisfaction with bank and to put an effort on maintaining a loyal customer gained additional importance in the post-crisis period.

Small value of the image as a predominant bank's choice factor in BA is in contrast to the results of research conducted in Cyprus (Safakli 2007) and Romania (Katircioglu *et al.* 2011a), where bank reputation and image has proved to be one of the most important factors for bank selection.

Splitting the sample in the two sub-samples also enabled to analyse the differences in predominant bank choice factors between male and female students. The results of the survey show that parents and family members' recommendations and financial benefits are among most important bank choice criteria. However, male respondents find location convenience more important, while female respondents rate higher competency and kindness of personnel.

Analysis of the results due to the students' experience in a banking transaction was conducted comparing the results between students who are bank customers and those who have no experience with bank operation, and represent a potentially new customer. Parental recommendation stayed important factor for bank selection. However, a recommendation by parents or family members is valued much more important for potential new customers than the others. Financial benefits and location convenience are more important factors for potential new customers, while experienced customers rate higher quality of services measured by competency of bank personnel. The above results have an influence on the choice of the bank, and the AHP application enables bank managers to identify weaknesses in marketing strategies. A detailed breakdown of the bank's differences with respect to more detail respondents' characteristics is in the table in the annex.

Finally, the application of AHP enables to identify general student preferences in the marketing mix categories (product quality, price, distribution and promotion) to determine the weaknesses in matching customer needs with the products and services of the bank and examine the implications of these findings for bank management. The criteria for decision making at second level hierarchy are grouped into four elements of marketing mix. The promotion dimension is contained in the recommendations of parents and other family members and the competency of bank personnel. The weight of the promotional mix marketing element is obtained as the sum of the weight of the components it consists of. Similarly, results for other marketing mix categories can be calculated. The price dimension includes financial benefits and availability of privileges for students. The product dimension includes the bank's image. Place (distribution) dimension includes a location convenience and fast availability of services.

Table 7. Marketing mix

	Average	Male	Female	Status of bank client	Without bank client status
Promotion	0.299	0.429	0.434	0.430	0.456
Price	0.348	0.256	0.251	0.249	0.284
Place	0.261	0.280	0.252	0.266	0.229
Product	0.098	0.035	0.064	0.056	0.032

Source: author.

The results of the analysis show that promotion is the most important factor in a successful bank marketing strategy targeted at student population. The promotion has a relative weight of 0.46, while price strategy has 0.28 and distribution strategy 0.23. The least important marketing mix category is banks image which represents product dimension.

Conclusion

Students could be important group of bank customers, but they are still not recognized enough by banks as potential bank customers. Despite the increasing number of undergraduates in BA and the fact that the highly educated individuals earn above-average earnings in the future, only 9 banks offer financial products specially designed for student population. Two most common types of financial product are current account and loans for student education.

The paper presented a use of multicriteria AHP method to determine predominant bank selection factors among student population. The result of conducted survey showed that financial benefits, recommendations by parents and family members and location convenience are three predominant bank choice criteria among student population. Quite interesting, banks image did not come up as a significant factor for bank selection. This may be due to the generally low level of trust in the financial system stability caused by the crisis, which is why the student

has far greater confidence in the recommendations of parents and relatives than in the bank's image. These criteria have an impact on young customer satisfaction and are also important contributing factor to bank loyalty.

Retaining existing customers is particularly important given the fact that the literature indicates that the savings achieved by reducing the number of customers switching to another bank may be higher than the profit that could be achieved by increasing the market share. As the students market is large and growing, they are interesting to banks for at least two reasons. The first is that a large number of students still do not have a bank, and thus represent a new market segment. Another reason is that identifying the most important criteria for selecting a bank and managing a targeted marketing strategy for that segment leads to greater satisfaction and retention in the client's status after employment when their revenues increase.

Analyses show that gender and status of bank client also have an impact on importance of bank selection factors among student population.

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APPENDIX

Criteria	Bank	Average - total	Female	Male	Employed	Unemployed	Status of bank client	No bank client status
Suggestions by parents or family members	UniCredit Bank	0.402	0.408	0.407	0.311	0.414	0.418	0.380
	Addiko Bank	0.199	0.197	0.207	0.171	0.202	0.178	0.262
	Intesa Sanpaolo Bank	0.157	0.163	0.144	0.117	0.162	0.169	0.129
	Raiffeisen Bank	0.242	0.231	0.241	0.402	0.221	0.235	0.229
	C.Ratio	0.04	0.04	0.03	0.03	0.04	0.04	0.03
Financial advantages (low interest rate on loans and high interest rates on savings)	UniCredit Bank	0.398	0.410	0.381	0.459	0.396	0.410	0.380
	Addiko Bank	0.191	0.203	0.138	0.142	0.193	0.162	0.276
	Intesa Sanpaolo Bank	0.163	0.156	0.202	0.104	0.173	0.170	0.153
	Raiffeisen Bank	0.248	0.232	0.278	0.295	0.238	0.258	0.190
	C.Ratio	0.04	0.04	0.03	0.04	0.04	0.0	0.06
Availability of financial benefits for undergraduate	UniCredit Bank	0.423	0.415	0.458	0.439	0.424	0.452	0.352
	Addiko Bank	0.192	0.204	0.151	0.132	0.196	0.159	0.283
	Intesa Sanpaolo Bank	0.161	0.172	0.135	0.124	0.167	0.171	0.142
	Raiffeisen Bank	0.224	0.209	0.256	0.305	0.213	0.219	0.224
	C.Ratio	0.05	0.06	0.04	0.00	0.05	0.05	0.05
Favourable locations of the bank and its ATM's	UniCredit Bank	0.404	0.390	0.446	0.294	0.412	0.442	0.292
	Addiko Bank	0.195	0.219	0.126	0.199	0.196	0.171	0.266
	Intesa Sanpaolo Bank	0.173	0.168	0.195	0.151	0.178	0.160	0.218
	Raiffeisen Bank	0.228	0.223	0.233	0.356	0.214	0.226	0.224
	C.Ratio	0.05	0.05	0.05	0.04	0.05	0.05	0.04
Delivering fast services	UniCredit Bank	0.389	0.387	0.389	0.433	0.384	0.408	0.332
	Addiko Bank	0.192	0.207	0.144	0.108	0.198	0.159	0.282
	Intesa Sanpaolo Bank	0.161	0.166	0.146	0.123	0.164	0.175	0.125
	Raiffeisen Bank	0.259	0.239	0.321	0.336	0.253	0.258	0.261
	C.Ratio	0.05	0.05	0.03	0.02	0.05	0.04	0.05
Bank service quality (quality of services of bank personnel)	UniCredit Bank	0.372	0.382	0.343	0.449	0.364	0.377	0.357
	Addiko Bank	0.166	0.155	0.196	0.150	0.168	0.151	0.209
	Intesa Sanpaolo Bank	0.210	0.229	0.154	0.092	0.221	0.221	0.177
	Raiffeisen Bank	0.252	0.233	0.308	0.309	0.247	0.251	0.256
	C.Ratio	0.05	0.05	0.03	0.04	0.05	0.05	0.05
Bank's reputation	UniCredit Bank	0.384	0.370	0.429	0.432	0.377	0.417	0.311
	Addiko Bank	0.224	0.243	0.168	0.150	0.233	0.194	0.293
	Intesa Sanpaolo Bank	0.156	0.154	0.160	0.096	0.163	0.143	0.184
	Raiffeisen Bank	0.235	0.233	0.243	0.322	0.227	0.246	0.212
	C. ratio	0.04	0.04	0.04	0.05	0.04	0.04	0.04

Source: author.

A Dynamic Analysis of the Nexus between Entrepreneurship, Human Capital Development and Financial Deepening: Evidence from Selected African Economies

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Abstract:

This paper examines whether human capital development is significant in the nexus between entrepreneurship and financial deepening, while also accounting for institutional quality as control variable in thirteen selected African economies from 1995-2014. Evidence from the augmented Toda-Yamamoto technique shows that human capital does not have long run causal effect on entrepreneurship and financial deepening, which suggests low quality human capital for entrepreneurial development. The paper recommends market-based funding for human capital development to enhance quality, creativity, entrepreneurship, and hence financial deepening. Global best-practice institutional governance system would reduce 'cost to start business' and thereby encourage growth of entrepreneurship.

Keywords: African economies; entrepreneurship; financial deepening; human capital

JEL Classification: O1; I2; O31; G100

Introduction

The need to deepen the nexus between entrepreneurship and financial development has been topical in developing economies. In recent times, given the increasing rate of socio-economic crises and the need to achieve inclusive growth, entrepreneurship is attracting the attention of policy makers, particularly in developing economies. Otchere, Senbet and Simbanegavi (2017) posit that lack of financial deepening and inclusiveness remain broadening challenging tasks for most African economies, as the state of financial development can barely compare with standards in low income countries. In Africa, irrespective of the recent annual growth rate of, average, 5.5 per cent up to 2015, non-inclusivity of virtually all human development parameters may have made the region to still remain poorest on earth (Knoop 2013).

While assessing the millennium development goals (MDG), the World Bank notes that many developing economies, particularly in Africa, may have improvement in access to education, but with respect to quality, the impact evaluation is not encouraging (World Bank 2011). Also, Ghatak, Morelli and Sjostrom (2002) note that talent is a basic requirement for entrepreneurial efficiency. Entrepreneurial talents can create markets for finance, labour, and allied factors of production as well as innovative ideas that boost creativity, and hence employment generation such as 'waste to wealth' schemes.

Financial deepening enhances rapid economic development if it provides mobilization, allocation, and operational efficiencies of financial resources. The truism about economic development is that all planning, innovations and struggles to improve human living conditions end up with financial resources being mobilized. Therefore, financial market institutions may be of crucial assistance for the success of entrepreneurship. Through innovation, given market risk, new product or service discoveries may create demand or market. On the other hand, availability of developed financial market is a major incentive that spurs entrepreneurial mind-set to establish an

enterprise. This aligns with Fogel, Hawk, Morck, and Yeung (2006) that institutional incentives and their availability can be very encouraging for wholesale entrepreneurship, while weak institutions can otherwise be detrimental to entrepreneurial spirit and financial development. Access to finance, as well as sound financial decisions are very critical as individuals seek to exit from poverty (George, Okoye, Efobi, and Modebe 2017)

The most effective antidote for fighting extreme poverty in developing economies may be in quality education and marketable skill (World Bank 2016). Successful economies like the United States, Japan, Britain, Turkey etc. may have employed quality human capital development to fast-track the transformation of their economies at both the micro and macro levels. Quality education system (gold standard) may produce quality thinkers, innovators and world class human capital required for global competitiveness. Scientific and technological innovators are sources of inventions that facilitate products and markets, which may broaden and deepen the financial system. Human capital development requires massive investments which can be sourced from the financial system in the form of cheap long-tenured education bond issues. Therefore, the conceptual framework that links quality education and financial system development is presented in Figure 1 below:

Figure1. Conceptual Framework: Human capital and financial development transmission
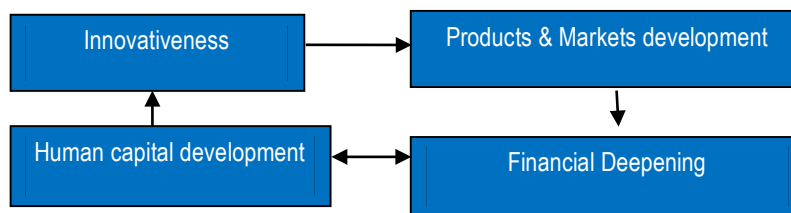
Source: Developed by the authors (2017)

With regard to quality of entrepreneurial institution, World Bank data-set shows that sub-Sahara Africa, Latin America and Caribbean regions performed below global average in the three incentives that drive entrepreneurship while East Asia and the Pacific regions performed below standard in the levels of bureaucracy, and the minimum number of days to start business. On average, it costs 55 per cent of estimated gross national income per capita to start business in sub-Sahara Africa, the global highest. The overall cost implication, measured by percentage of gross national income (GNI) per capita loss, indicates that Cameroon and Nigeria are the most uninspiring economies for entrepreneurship in Africa, with 32%, and 31% respectively (World Development Indicator (WDI 2016).

The major objective of this paper is to determine whether human capital development has a role in the nexus between entrepreneurship and financial deepening. The study is focused on selected African economies. To achieve this, the following hypotheses were proposed:

- there is no significant relationship between entrepreneurship and financial deepening *(Fdp);*
- there is no significant relationship between human capital development *(Hcd)* and financial deepening *(Fdp);*
- there is no significant relationship between human capital development *(Hcd)* and entrepreneurship.

1. Review of Theoretical Literature

Theories on economics of education and human capital compliments the Solow and Swan's exogenous theory and the 'new growth' (endogenous) theory to link poverty, sustainability and inclusivity with the quality of a country's education (Jhingan 2007). Economics of education theorists argue that though education may be costly in schooling time and financial outlay, its social and private benefits could outweigh the cost, particularly at the tertiary level (Musgrave and Musgrave 1989). Quality education has wide positive externalities as the most credible antidote for economic development. It is needed to unlock mechanisms that can transform enormous indigenous potential resources and may be useful to expand the frontiers of the financial system and create wealth for the people (OECD 2001, Sala-I-Martín, Crotti, Battista, Hanous, Galvan, Geiger, and Maiti 2015).

Perhaps, the intellectual foundation on the accretion of finance and its implication as economic development evolves was laid in Gurley and Shaw (1955). The relationship between financial system development and economic growth has been extensively discussed (Patrick 1966, King and Levine 1993b, Levine 2005, Claessens and Feijen 2006). The channels of influence of financial development on growth and *vice versa* include private sector development, improved productivity and capital accumulation, improvements in innovations, greater risk-sharing and potency for lower volatility (Claessens and Feijen 2006). At the higher stage of development, finance responds to growth because the attendant increase in demand for human capital exerts demand pressure on finance (Patrick 1966).

However, the channel of influence between educational development and financial development is not clearly defined in literature, particularly as education may be seen as a means to economic growth. The modes of relationship between educational investments and financial development may be examined in terms of financial services development as it relates to school enrolment, access to credit by the literate, women empowerment and gender equality, reduction in child labour, and provision of education infrastructures (Claessens and Feijen (2006). Financial development entails the integration of informal and formal financial sector operations thereby enhancing the capacity of the sector to support credit delivery (Okoye, Modebe, Evbuomwan and Ezeji 2016). Also, educational services that provide access to information for innovative thinking can improve financial development.

The knowledge spill-over theory of entrepreneurship is exploitable to further the nexus between human capital and the entrepreneur towards developing new competences and can also influence the entrepreneur to start new business. Given a world of high level business uncertainty, research and academic institutions serve as power house for entrepreneurs, and as the entrepreneur is constantly motivated by quest for profit, further investment in human capital may be expected (Audretsch 2012). In particular, this view applies to the intrapreneur that capitalizes on knowledge spill-over from current employment to establish new start-ups.

In African economies, access to finance, for both industrial and start-ups, is weak and problematic (WEF 2016). The dearth of formal finance for development of genuine start-up entrepreneur is attributed to deficiency of macroeconomic institutions that have made the financial environment onerous and risky (Knoop 2013). To this extent, informal finance is most common for start-up idealists and majority of micro and small-scale businesses.

The endogenous (new growth) models (Romer 1990, Lucas 1988) can be further explored towards improving Africa's entrepreneurship, through idea development for technological change. Lack of endogenous technological development remains one of many reasons of underperformance in developing countries as global development partners such as UNIDO admonishes developing economies to explore other development-oriented options such as adopting endogenous light technology rather than western model that is based on heavy technology in their development efforts (Eke 2018).

1.1. Review of Empirical Literature

William and Vorley (2017) examined the impact of institutional reforms on entrepreneurship in the post-conflict Kosovo relative to practices in the transitional economies. Main outcome of the study indicates that Kosovo is yet to witness institutional challenges similar to those of the transitional economies which may have led to changes witnessed in both the formal and informal institutions. Closely related is the study by Huggins, Prokop and Thompson (2017) which examined the factors responsible for firms' survival in peripheral regions such as Wales in the UK with the outcome that human capital as it relates to the entrepreneurs' experience and firms' growth motivation were responsible for their survival.

Haidar (2012) examined the business regulatory reform relative to economic growth in 172 different economies and found, on the average, that each reform linearly improves growth by 0.15 per cent. McGuick, Lenihan and Hart (2014) advanced the study on innovative human capital (IHC) by using the augmented innovative production function to examine innovative human capital effects on new firms' growth and performance. The outcome reveals that innovative managers are more valuable in small-sized firms with less than 50 employees than in larger-sized firms. In a study on the role of institutions in economic growth and development, Acemoglu and Robinson (2008) identify differences in economic institutions as major reasons for differences in prosperity across countries. They note the political challenges associated with institutional reforms and thereby recommend that institutions must be reformed to solve problems of development and poverty. In line with Acemoglu and Robinson (2008) we argue that institutional reforms will lead to improvement in the quality of human capital, and that entrepreneurial spirit and attitude may help to deepen the intermediacy of finance in both the short and the long term.

1.2. Theoretical framework

The endogenous (new) growth theory posits that long run growth and convergence depend on indigenous policies and technical progress, learning by doing or knowledge transfer. Investment in human capital produces ideas, or new knowledge as the main determinant of economic growth (Lucas 1988). For Lucas, investment in human capital has both internal effects and external (spill-over) effects. On Lucas technical framework, national output can be augmented by the following relations:

$$Y_i = A(K_i).(H_i).H^e \qquad\qquad (1)$$

where: A is the technical coefficient, K_i and H_i stand for physical and human capital inputs respectively, Y_i is the gross domestic output. Variable H is the average human capital capability of the economy augmented by parameter e, the 'public good' effects of H on the economy's gross domestic product.

By simple algebra: taking log of both sides and by transformation, equation 1 produces:

$$\log Y_i = \log A(K_i) + \log H_i + e \log H \tag{2}$$

Each sector, firm and the individual investor benefits from the average H in the economy- that is the average level of skill and knowledge is more crucial for entrepreneurial development transmittable to national output growth Y_i.

2. Methodology

Secondary data covering 2004-2015 were sourced from World Bank development indicators (WDI), United Nations development programme statistics, and National Bureau of Statistics of sampled countries. It is a panel data set, that is, series of observations across the thirteen countries, studied over-time, such that in variables x_{it}, y_{it}, i and t subscripts denote individual country and time respectively. It is an unbalanced panel data set as some countries have omitted observations in some years, that is:

$$\{x_{it}, y_{it}\} : for \quad i = 1..., N \; ; \; t = \underline{t_i},...,\overline{t_i} \tag{3}$$

This study is guided by the population of African capital market economies comprising the twenty-five (25) countries who are registered members of African Securities Exchange Association (ASEA) in 2015 (ASEA 2015). However, only sixteen of these economies had bond issues traded on their Exchanges as at 2014 (ASEA 2014). They are Botswana, Cameroon, Cote d' Ivoire, Egypt, Ghana, Kenya, Malawi, Mauritius, Morocco, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Tunisia and Uganda. However, Malawi, Rwanda and Uganda were excluded due to paucity of data observations, thereby reducing the sample size to thirteen. The sources, measurement indicators, literature justification and *a priori* expectations of each variable are presented in Table 1 below:

Table 1. Description of variables, data sources, measurements, with justification and a *priori* expectation

Variable description	Type/Source/Measurement	Literature justification	Parameters' *a priori* expectation.
Fdp = Financial deepening	Secondary/World Bank/ Growth of broad money	King and Levine (1993b), World Bank (2015)	>0
Hcd = Human capital development	Secondary/ World Bank/ Ratio of Government expenditure on education to total	Alexe and Alexe, (2017), McGuick *et al.* (2014), Huggins *et al.* (2017)	>0
Csb = 'Cost to start business' (proxy for entrepreneurship)	Secondary/ World Bank/ % of income per capita	Cull and Xu (2005); OECD (2004)	<0
Iqx = Institutions' quality index	Secondary/Worldwide Governance Indicators(WGI),2015:*www.govindicators.org/*consisting of regulatory quality; rule of law, governance effectiveness	Acemoglu and Robinson (2008)	>0

Source: Prepared by the authors (2017)

The 'cost to start business' *(Csb)* data is the proxy for entrepreneurship. It is measured as percentage of gross national income per capita in respective economies (WDI 2016). The World Economic Forum (WEF) reports on competitiveness that poor record of 'doing business index' reduce new entrants and foreign direct investment (FDI) which influences productivity, prosperity and well-being of citizens (WEF 2013b). For institutional quality *(Iqx)*, the relationship between institutions and growth of the financial and economic systems has been treated in various studies (Knoop 2013, Levine 2005, Detragiache, Gupta and Tressel 2005). Poor institutions and corruption are disincentives to entrepreneurial development, foreign direct investment (FDI), and may lead to de-industrialization (Cull and Xu 2005), while human capital development *(Hcd)* may provide the requite breakthrough in 'human ingenuity and technological innovations' (WEF 2015, WEF 2016). Since human capital and technological development are of long term gestation, it may require market-based finance, such as the development of Africa's

nascent bond market to close the education infrastructure deficit gap in African economies (Eke, Adetiloye, Adegbite and Okoye 2017).

2.1. The Model Specification

The underlying functional form of the conceptual and theoretical arguments can be presented implicitly in linear model form as follows:

$$Y_{it} = f\left(\alpha_1, X_{1it}^{\beta_1}, X_{2it}^{\beta_2}, X_{3it}^{\beta_3}, ..., \varepsilon_{it}\right) \tag{4}$$

where: Y_{it} represents financial deepening; X_1 is 'Cost to start business' (Csb), and X_2 is human capital development (Hcd); X_3 represents institutional quality index (Iqx).

In explicit form, and by applying the log transformation process, the model becomes:

$$\log Y_{it} = \alpha_1 + \beta_1 \log X_{1it} + \beta_2 \log X_{2it} + \beta_3 \log X_{3it} + ... + \varepsilon_{it} \tag{5}$$

The study adopts 'Cost to Start Business' (Csb), Human capital development (Hcd) as independent variables, and institutional quality (Iqx) as control variable as presented below:

Financial deepening_{it} = f (Cost to Start Business_{it}, Human capital development_{it}, Institutional quality_{it} ...) (6)

Given the nature of unbalanced panel data, the structure of the model assumes this form:

$$Fdp_{it}^{\bar{t}} = a_{it} + \beta_1 Csb_{it}^{\bar{t}} + \beta_2 Hcd_{it}^{\bar{t}} + \beta_3 Iqx_{it}^{\bar{t}} + \mu_i + \varepsilon_{it} \tag{7}$$

$$\quad\quad\quad - \quad\quad + \quad\quad +$$

where: *Fdp* is financial deepening, *Csb* is 'cost to start business', proxy for entrepreneurship; *Hcd* is human capital development.

Following King and Levine (1993a) this study adopts financial deepening as measure of financial development, due to its liquidity effects, and may substitute for economic growth. *Iqx* is institutional quality index.

2.2. Estimation Technique

A dynamic relationship is assumed, detailed in an augmented Toda-Yamamoto (ATY) between entrepreneurship, financial deepening, human capital and institutional quality. Toda-Yamamoto (1995) discusses long run regression, by extending granger causality methodology to handle causal relation models in a VAR environment involving non-uniform level of stationarity. The summarized specification of the original Toda and Yamamoto (1995) framework for Y_t and X_t series stated with panel notation are presented below:

$$Y_{it} = a + \sum_{j=1}^{m+d} \phi_j Y_{it-i} + \sum_{k=1}^{n+d} \varpi_k X_{it-j} + \varepsilon_{Yit} \tag{8}$$

$$X_{it} = a + \sum_{j=1}^{m+d} \varphi_j X_{it-1} + \sum_{k=1}^{n+d} \delta_k Y_{it-1} + \varepsilon_{Xit} \tag{9}$$

where: d represents maximum order of integration of the variable in the system, m and n are optimal lag of Y_t and X_t. The random error ε is assumed white noised.

This study extends the *TY* dynamic long run form by introducing short run innovation. The model adopts modified Wald test, whose statistics for *Y* equation is presented below:

$$F = \frac{(Rss_{RY} - Rss_{UY})/K}{Rss_{UY}/(N-K)} \tag{10}$$

where: *K* represents the number of estimated coefficient. Using the F-test and Chi-squared statistics, the null hypothesis of no co-integration relationship is defined as: $H_0 = \delta_1 = \delta_2 = 0$ against alternative hypothesis that $H_1 \neq \delta_1 \neq \delta_2 \neq 0$ of the presence of co-integration.

In explicit form, following Masmoudi (2010) on the dynamic linkage of Global hedged funds and traditional financial assets, the dynamic multivariate panel Granger-VAR system is presented and thus accounts for the elimination of individual country specific effects μ_i as shown in equations 11 to 14:

$$\Delta Fdp_{it} = \alpha_1 + \sum_{j=1}^{P} \theta_{1j} \Delta Hcd_{it-j} + \sum_{j=1}^{P} \delta_{1j} \Delta Csb_{it-j} + \sum_{j=1}^{P} \psi_{1j} \Delta Iqx_{it-j} + \sum_{j=1}^{P} \gamma_{1j} \Delta Fdp_{it-j} + \varepsilon_{it},$$
(11)

$$\Delta Hcd_{it} = \alpha_2 + \sum_{j=1}^{P} \theta_{2j} \Delta Hcd_{it-j} + \sum_{j=1}^{P} \delta_{2j} \Delta Csb_{it-j} + \sum_{j=1}^{P} \psi_{2j} \Delta Iqx_{it-j} + \sum_{j=1}^{P} \gamma_{2j} \Delta Fdp_{it-j} + \varepsilon_{it},$$
(12)

$$\Delta Csb_{it} = \alpha_3 + \sum_{j=1}^{P} \theta_{3j} \Delta Hcd_{it-j} + \sum_{j=1}^{P} \delta_{3j} \Delta Csb_{it-j} + \sum_{j=1}^{P} \psi_{3j} \Delta Iqx_{it-j} + \sum_{j=1}^{P} \gamma_{3j} \Delta Fdp_{it-j} + \varepsilon_{it},$$
(13)

$$\Delta Iqx_{it} = \alpha_4 + \sum_{j=1}^{P} \theta_{4j} \Delta Hcd_{it-j} + \sum_{j=1}^{P} \delta_{4j} \Delta Csb_{it-j} + \sum_{j=1}^{P} \psi_{4j} \Delta Fdp_{it-j} + \sum_{j=1}^{P} \gamma_{4j} \Delta Iqx_{it-j} + \varepsilon_{it},$$
(14)

where: $\theta, \delta, \psi, and \gamma$ are unknown parameters; α_{1-4} are constant terms; ε_{it} is the residual, white noise (idiosyncratic) compliant for each equation.

In addition, the VECM framework that allows for multiple co-integrating vectors, with each explanatory variable bearing its *speed-of-adjustment* parameter can be represented as:

$$\Delta Y_t = \alpha + \sum_{1=i}^{p} \Gamma_i \Delta Y_{t-i} + \Pi e_{t-i} + \varepsilon_t$$
(15)

$$\Gamma = \tau \beta'$$
(16)

where: *Y* represents vector of variables listed in 11-14; τ represents a matrix of speed of adjustment parameters, β represents matrix of co-integrating vectors, ε is vector of error terms.

3. Demonstrations

3.1. Unit root test

To determine the level of stationarity, within the context of heterogeneous panel, the study uses three panel unit root processing techniques. That is, the study assumes the common unit root based statistics; the Levin, Lin and Chu (LLC 2002); and we assume individual or entity based unit root statistics- Im, Pesaran and Shin (IPS 2003) and ADF-Fisher Chi-Square. This study places overriding priority on the IPS test for its superiority in handling heterogeneities among entity unit roots in panel.

The unit root test presented in Table 2 shows that Financial deepening *(Fdp) is stationary at level while* Institutions' regulatory quality *(Iqx)* is stationary at level. Cost to start business (*Csb),* and Human capital development *(Hcd)* are stationary at second difference. The outcome of the integrated variables partly influenced the Toda-Yamamoto estimation techniques, augmented for the short run innovation.

Table 2. Unit Root

Common unit root process assumed			Individual (country) unit root process assumed					
Variable	LLC test	Prob.	IPS test	Prob.	ADF-Fisher Chi- square	Prob.	Level of station-arity	Assumption on Exogenous variable
Fdp	-5.6666	0.000***	-2.3028	0.0106**	42.7283	0.010**	Level	Ind. Effects
Iqx	-3.3804	0.000***	-2.1539	0.0156**	37.3020	0.004***	1st diff.	Ind. effects
Csb	-	-	-3.7196	0.0001***	52.2211	0.000***	2nd diff.	Ind. effects
Hcd	-	-	-1.5466	0.0610*	30.9009	0.013**	2nd diff.	Ind. Effects

Source: computed by the authors using E-view 7. *; **; *** indicates significant at 0.1, 0.05 and 0.001 significant levels respectively

3.2. Lag selection process

An examination of Table 3 below reveals that the study chooses lag length 2 as the optimal, being a consensus of majority of the criteria: All Information Criterion (AIC), Final Prediction Error (FPE), and sequential modified LR test statistics.

Table 3. Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-289.6432	NA	0.015154	7.162030	7.279431	7.209165
1	-116.1258	325.8742	0.000325	3.320141	3.907146*	3.555815*
2	-94.72275	38.10787*	0.000286*	3.188360*	4.244968	3.612572
3	-79.98148	24.80847	0.000297	3.219061	4.745273	3.831811

Source: computed by the authors (2017) using E-view 7: where LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion. * denotes lag order selected by the criteria.

3.3. The Findings: short run (dynamic) and long run result

The result of the multivariate interactions is presented in Table 4 below, with four short run (dynamic) multivariate equation results of mixed outcome: Financial deepening *(Fdp)*, Human capital development *(Hcd)*, and Institutional quality *(Iqx)* produce the required standard negative short run adjustment coefficients, indicative of speed of adjustment to equilibrium It reveals that there are short run dynamic influences flowing from the respective explanatory variables jointly impacting the dependent variables. Thus, the results reveal reasonably that the models tend towards long run stability.

However, the 'cost to start business' *(Csb)* variable produces positive short run coefficient, an indication that the *Csb* models would not converge, tends to be explosive; its short-term instability may be transmitted further to the long term, hence no long term equilibrium.

Table 4. Short Run (Dynamic) Causality Results

Dependent variable	Optimal Lag order of exogenous variables	Coefficient: Short run residual	Std. error	Outcome and implication
Fdp	2	-0.34647	0.2593	Joint influence of the model's exogenous variables flow to the dependent variable and converges to equilibrium
Hcd	2	-0.16253	0.2429	Joint influence of the model's exogenous variables flow to the dependent variable and converges to equilibrium
Csb	2	0.02015	0.3013	No convergence to equilibrium
Iqx	2	-0.64305	0.4064	Joint influence of the model's exogenous variables flow to the dependent variable and converges to equilibrium

Source: Authors' computation (2017) using E-view 7.

3.4. Long Run Causality Result

The long run causality results presented in Table 5 shows negative long run causality from 'cost to start business' *(Csb)* (proxy for entrepreneurship) to financial deepening *(Fdp)*, albeit insignificantly. This suggests that the high 'cost to start business' in Africa is disincentive to prompting financial development.

For hypothesis 2, the Wald test result reveals that *Fdp* positively drives *Hcd* in the long term. An insight into these outcomes may underscore the contentious debate of whether growth drives financial development or otherwise in developing economies. Since *Hcd* does not drive *Fdp*, it can be deduced *a priori* that growth through human capital investments fail to drive financial development, while financial development drives growth in the African region.

The study fails to reject the null hypothesis of no significant causal flow from human capital development *(Hcd)* to entrepreneurship. The outcome suggests low quality education output which does not prompt entrepreneurship. Non-qualitative education system is likely not to produce genius, creativity and inventors. The reverse causality from entrepreneurship *(Csb)* to *Hcd* is however indicates that *Csb* significantly drives *Hcd*.

Further result reveals that financial deepening *(Fdp)* has positive long term causal relationship with institutions' regulatory quality *(Iqx)*, while the reverse causality is insignificant. Financial deepening may encourage risk taking and risk sharing attitude, which should inspire institutional support to drive effectiveness and efficiency in the financial industry. A dynamic financial market may inspire regulatory institutions, as Levine (2004) reveals

that developments in the money and capital markets have positive link with development of financial institutions, such as regulations that ensure fair secondary market trading, contract enforcements, adequate information dissemination or sharing, investors' protection, and so on. Moreover, the financial system can perform incredibly to aid growth and development if credible institutions are in place in African economies. The lack of long run co-integration flow from regulatory institutions to financial deepening may reveal poor state of institutional support for development in Africa.

Moreover, two positive and significant outcomes of the study are that one-way long-term causality exists from institutional quality *(Iqx)* to entrepreneurial development *(Csb)*, and from *Iqx* to human capital development *(Hcd*. The former result, that is, *Iqx* driving *Csb* may affirm that effective institutions' governance system is needed for wide-spread entrepreneurship in the region. Given that Africa is largely consumption-oriented population, global entrepreneurs may revert to African economies if requisite regulatory institutions and market-oriented policies are consistently in place. The latter case signals that quality institution significantly impact human capital, transmittable to deepening finance in the region. The result of human capital *(Hcd)* not driving institutional quality *(Iqx)* may have revealed the poor education output and 'training for leadership' of African education, such that by *a priori,* quality of education determines a nation's growth supporting institutions and hence the living standard.

Table 5. Long Run Causality Result: Augmented Toda-Yamamoto Granger (Non-causality & co-integration) Approach

Null Hypothesis	Coefficient	MWald test (p lag order =2) value/(prob.): χ^2 Stat. F-Stat.		Co-integration & Causality?
Csb does not cause Fdp	-0.0002	0.65(0.72)	0.32(0.72)	no
Fdp does not cause Csb	11.149	1.24(0.53)	0.62(0.54)	no
Hcd does not cause Fdp	0.188	2.45(0.29)	1.22(0.30)	no
Fdp does not cause Hcd	0.471	9.86(0.00)***	4.92(0.01)**	yes: Fdp→Hcd
Csb does not cause Hcd	-0.002	5.04(0.08)*	2.52(0.09)*	yes: Csb→Hcd
Hcd does not cause Csb	-9.775	1.97(0.37)	0.98(0.38)	no
Iqx does not cause Fdp	0.05	0.42(0.80)	0.21(0.81)	no
Fdp does not cause Iqx	1.82	5.39(0.06)*	2.69(0.08)*	yes: Fdp→Iqx
Iqx does not cause Csb	33.92	11.90(0.00)***	5.95(0.00)***	yes: Iqx→Csb
Csb does not cause Iqx	0.004	2.12(0.34)	1.06(0.35)	no
Iqx does not cause Hcd	0.065	5.19(0.07)*	2.59(0.09)*	yes: Iqx→Hcd
Hcd does not cause Iqx	-0.462	2.48(0.28)	1.24(0.30)	no

Source: computed by the authors (2017) using E-view 7; *,**,*** indicate significance at 0.1, 0.05 and 0.001 levels respectively. denotes one-way causality; yes: indicates co-integration and causality; no: indicates no co-integration and causality. Probability values are in parenthesis.

Presented in Table 6 below is the overall (Wald) test for individual equations in the multivariate model. Two equations, human capital *(Hcd)* and entrepreneurship (*Csb),* are statistically significant. It provides overall long run evidence that the explanatory variables- *Fdp, Csb, Hcd, and Iqx* jointly and contemporaneously influence the respective dependent variables (*Csb* and *Iqx)* in the long term. However, *Fdp* and *Iqx* equations are not significant which may suggest that their respective models require more explanatory variable.

Table 6. Long Run Causality results: Joint statistics modified Wald Test

Variables studied @ lag order P=2: *Fdp, Csb, Hcd, and Iqx*	Test statistics value χ^2 Stat. F. Stat.		Prob.(χ^2 Stat.) Prob.(F. Stat.)		Outcome: joint influence flow?
Dependent variable: Fdp	41.0016	5.1252	0.0000 ***	0.0005***	Yes
Dependent variable: Hcd	18.3284	2.2910	0.0189**	0.0500**	Yes
Dependent variable: Csb	229.503	28.6879	0.0000***	0.0000***	Yes
Dependent variable: Iqx	16.2833	2.3854	0.038 **	0.0787*	Yes

Source: Computed by the authors (2017) using E-view 7; *,**,*** indicate significance at 0.1, 0.05 and 0.001 levels respectively.

3.5. Diagnostic Tests

The time series properties of the data were further examined for evidence of long run relationship among the variables. Time series data are often associated with random behaviour, hence when two or more of such variables are included in a model, evidence that the series are co-integrated validates the regression estimates. The test results are presented below:

3.5.1. Co-integration test

To ascertain evidence of co-integration, the Pedroni residual result presented in Table 7 suggests rejection of the null hypothesis of no co-integration exists among the variables.

Table 7. Pedroni residual co-integration test

Test	Intercept	Intercept and Trend
Panel *adf*-statistics	-0.851552	-3.199410**
Panel *t*-weighted stat.	-1.665850*	-2.560699**
Panel *adf*-Weighted stat.	-2.061165**	-3.235299**
Group *t*-statistics	-2.507640**	-3.039117**
Group *adf*-stat.	-1.985863*	-4.519239**

Source: Computed by the authors (2017) using E-view 7; Pedroni (2004) one sided statistics critical values -1.64 ($k < -1.64$).
* & ** represents significance 5% and 1% respectively, suggests rejection of the null.

3.5.2. Serial correlation test

The Lagrange multiplier (LM) serial test result presented in Table 8 below reveals that the study fails to reject the null hypothesis that there is no serial correlation at both lags 1 and 2, as the probability is above 5% threshold.

Table 8. VAR residual correlation LM test

Lag	Observations	LM-Stat.	Probability
1	95	24.09619	0.0874
2	95	24.13770	0.0865

Sources: By the authors using E-view 7. Probs from chi-square with 16 df.

4. Discussion of results

A major outcome of the study is that both entrepreneurship *(Csb)* and financial deepening (*Fdp)* do not drive one another in the long term, neither does human capital *(Hcd)* co-integrate and cause entrepreneurship *(Csb)* and institutional quality *(Iqx)*. It may indicate poor state of human capital, as catalyst and 'vector' to critical growth variables, enroute impacting financial deepening. Quality education may open up the mind of the learner to latent business opportunity and assist in creating markets that would deepen finance. It points to the key challenge of the education system in developing economies, as current human capital being produced may be less relevant relatively, to match demand, and meet the fast-changing labour market opportunities (UNESCO 2014).

The lack of co-integrating linkage of human capital to entrepreneurship is more precarious, as this may have accounted for growing level of unemployment in the economies. Entrepreneurship theory reveals that human capital impacts entrepreneurial development directly and indirectly (Fogel *et al.* 2006). In addition to promoting basic knowledge, academic content of learning ought to promote problem-solving capacities and creative thinkers. Low factor productivity remains the most daunting causes of persistent poverty in developing countries (Altenburg 2011). Entrepreneurial talents require absorption, adaptation and application of knowledge and technology creatively. Similarly, the poor linkage from human capital to institutional quality evidences the underperformance of Africa's institutions and bane of her underdevelopment, unlike advanced economies.

Further result that financial deepening *(Fdp)* lacks co-integrating course with entrepreneurship *(Csb)* may have revealed the perverse state of African financial system, as its high interest cost discourages long term risk taking attitude. Though, for developing countries Mckinnon (1973) and Shaw (1973) emphasize financial repression as bane of financial development towards impacting the real sector growth, however African economies are noted for 'maladapted' financial system and bank disorientation against long term investments (Ojo 2010). Lack of legal support, information asymmetry, high interest rate on borrowings and corresponding low deposits rate still run in many African financial markets, hence long term borrowing for start-ups and entrepreneurship seem herculean (Knoop 2013).

Furthermore, one-way causal influence from financial deepening *(Fdp)* to human capital development is achieved, and as a fall-out from earlier paragraph, human capital *(Hcd)* does not drive financial deepening *(Fdp)*. As human capital creates market and functions it, the result may be an indication of paucity of the financial system to provide needful intermediation function. Given low annual public budget for education in majority of the economies, the low quality of education may not be in doubt, such that outputs may lack entrepreneurial innovativeness and capacity for critical thinking. In reality, quality education is required for the development of needful entrepreneurial 'spirit' in the modern higher school graduate for global competitiveness in innovation and

productivity. UNESCO (2014) contends that in many societies, knowledge acquired by recent graduates did not prepare them for the labour market.

Advocates of a knowledge economy contend that the weak 'state of doing business' index in developing countries may be overcome by requisite knowledge, skill and by extension enquiring mind wishing to overcome business obstacles (Altenburg 2011, World Bank 2001). Upon that feat can skilful innovators engineer financial development through product innovation. Furthermore, lack of creative human capital only end-up increasing the low productive distributive and service sectors for the new school leavers especially at the college graduate level, rather than the much needed higher value addition from new creativity and innovations. Should there be commitment to quality human capital, genuine entrepreneurial development can transform the African economies, improve the level of employment and the peoples' living standard, and reduce household poverty.

5. Summary of findings

Three hypotheses were tested. Results of the short-run dynamic residuals of financial deepening *(Fdp)*, Human capital *(Hdp)* and institutional quality *(Iqx)* produce negative coefficients, which suggest convergence and co-integration. Result of the first hypothesis reveal that in the long-term entrepreneurship does not significantly impact financial deepening; the second hypothesis similarly reveals that human capital development *(Hcd)* does not positively link financial deepening *(Fdp)* in the long term. Neither does human capital *(Hcd)* drive entrepreneurship

Conclusion and recommendations

Based on the findings above the study concludes that human capital development does not significantly drive entrepreneurship, which itself does not link financial deepening; an indication that risk taking tasks by prospective entrepreneurs may be a monumental task for financial market development, a negation of the growth led finance hypothesis.

The findings of this study have informed the following recommendations: First, the disconnect from entrepreneurship to financial deepening requires institutions in governments and private sector to devote commitment to entrepreneurship. Secondly, human capital development lacks long term causal relations with financial deepening. Here, a robust education curriculum that incorporates skill development by 'town and gown' interfacing can build the needed manpower to manage productive resources, to create wealth and build businesses.

Thirdly, human capital does not co-integrate with entrepreneurship. It is recommended that higher education should be privatized as competitiveness can produce a better-quality output. Government regulatory policies on education services should be on quality human output rather than quantity. Mechanisms of 'training the trainer' on the needs of the labour market through industry-college recurrent workshops, lectures, seminars and conferences can be initiated by proactive regulatory institutions.

Fourthly, as financial deepening does not influence entrepreneurship in the long term, it requires government to evolve stable macroeconomic system that will lower cost of funds. Government may have to intervene at influencing low monetary policy rates at the Central Bank.

Fifthly, financial deepening driving human capital significantly implies that education infrastructure can be further boosted by existing financial products. This study advocates development of education bond towards financing standard education infrastructures.

Sixthly, entrepreneurship drives human capital significantly in the long term. The paper recommends that the institutional challenges of entrepreneurship such as ease of doing business and financing issues be addressed by government.

Seventh, institutional quality adversely drives entrepreneurship. On institutions link with entrepreneurship, governments should periodically review the legal and regulatory policies to further give incentives to reduce the cost to start-up business and enhance the ease of doing business. Also, government should ensure adequacy and strict enforcement of property right laws. Finally, the non-linkage of human capital to institutional quality requires that government evolve a research culture, invest in research infrastructure, and promote competitive higher education by privatization. Scholarships should be provided for higher quality human capital development.

Acknowledgement

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Social Return on Investment as Instrument for Assessing Socially Responsible Investing in the Republic of Kazakhstan

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Abstract:

The index of social return on investment (SROI) is an efficient instrument to measure social impact, which has been given special attention over the recent years, and which is most widely used by social investment experts. This paper provides the results of researching a socially-oriented project implemented by an international group of companies in the Republic of Kazakhstan. This paper uses in practice the methodology for calculating social value and the SROI index for a group of interested parties. According to the author, further research related to applying SROI when assessing socially-oriented projects should be aimed at improving the methodological approaches to assessing, ensuring transparency and reliability of quantitative indices, and determining financial proxies.

Keywords: socially-oriented project; social investment; social entrepreneurship; social profitability; SROI; social value; outpatient care; management accounting; healthcare

JEL Classification: G10; G11

Introduction

Social investments are a combination of political measures and instruments that include investments in human capital and extending opportunities of people to participate in social and economic life and on the labor market.

The approach to social investments is largely based on the assumption that social and economic policies mutually reinforce each other and that the first one, when formulated in the antisocial investment perspective, does represent a "precondition" for the future economic growth and growth of employment (Bouget, Frazer, Marlier, Sabato and Vanhercke 2015).

Over the past decade, new forms of social investments have been rapidly introduced in the world. This growth is substantiated by changes both in demand (a new generation of social entrepreneurs and new opportunities for them) and supply (new investors' preferences, new ways of social actions) supported by tax incentives and other public policy instruments. Major changes take place in such areas as socially responsible investment (SRI), social investments, outpatient services, and social enterprises' investments.

SRI is the investment of the company's material assets in socially significant public facilities (Niggemann, Brägger 2011). This concept means the implementation of activities aimed at solving important social problems. Despite the widespread opinion, SRI is not just charity, but the process closely related to business and its goals.

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The level of SRI development in the USA and European countries is at a rather high level: many foreign companies invest their funds in solving important social problems. In the Republic of Kazakhstan, the practice of social investment has just started. Unfortunately, the country has not yet developed a clear system of mechanisms; each company in the Republic of Kazakhstan is looking for its own way in this area. The health care is not an exception, including polyclinics.

Many established forms of state investment, for example, the construction of schools, hospitals and polyclinics, can be considered as social investments. Particular attention is paid to nongovernmental and quasistate funds called to achieve certain social consequences. They were established and are supported by both governments and a new generation of philanthropists and funds aimed at maximizing social effect. Examples of such changes include the creation and rapid expansion of financial institutions for the development of communities, the development of "venture philanthropy", and the creation of venture capital funds financed by the state for public organizations.

Over the recent years, investments in social enterprises have been developing. Some social investors prefer to finance social enterprises. As a rule, these are organizations that are publically owned and pursue a combination of social and economic goals through market transactions.

Cooperatives in housing, retail, agriculture and financial services are a historically familiar form of social entrepreneurship and are still important in a number of sectors of the Kazakh economy. Over the past 20 years, new forms of social entrepreneurship have been developed to solve new social challenges in a wide variety of areas.

The state as a whole and every organization should know about the impact of social programs and projects on the social life as a whole and on certain groups of the population. When trying to estimate investments, it is necessary to expand the basic financial concept of return on investments for it to cover a broader concept of the value that is related to all aspects of economic, social, and environmental value. Decisions taken solely with regard to costs and instant return may not reflect wider and more long-term benefits.

This has resulted in the application of the method of estimating social return (SROI) that aims at covering not only the financial aspect (*i.e.* economic and socio-economic benefits), but also social aspects, such as extending rights and opportunities, social cohesion and participation in political life that are evaluated by using various quantitative and qualitative ways. The SROI method not only reflects the revenues generated for the investor, but usually also focuses on what social value was created for other interested groups, including society as a whole.

Social return means less tangible consequences, such as an increased sense of self-esteem and personal independence, as well as improvement of knowledge and skills, health and life duration of the population by improving outpatient care financing. These measures are expressed in terms of money, quantity or quality. Although the latter aspects are a key characteristic of SROI, monetization is as important.

Helping to identify the economic value of social and ecological results, SROI creates a unified perspective on whether a development project, a social business or a social enterprise is beneficial and profitable. The SROI analysis can accomplish a number of objectives. It can be used as an instrument for strategic planning and improvement, for informing about the impact and attracting investments or for making investment decisions. It also contributes to the development of management accounting in health care.

Despite the practical importance of the SROI method, there is still a lot of ambiguity in terms of its practical development. In terms of methodology, the impact on the social sphere is usually more complex than that on the commercial sphere (Mildenberger, Münscher and Schmitz 2012). The methodology of estimating social consequences is an area of research at the evolutionary stage (Yates, Marra 2017). Perhaps, SROI is just going to become an "area of research and practice, a combination of researchers and practitioners, a discourse and a community of practice" (Vanclay and Esteves 2011).

This research aims at eliminating this gap in knowledge and stimulating academic discourse around the SROI social return index from the point of view of its methodological development as well as practical application in socially responsible investing in the Republic of Kazakhstan.

1. Literature review

The initial concept of SROI was developed and applied by charitable funds that finance social programs to measure and show their impact. In the late 1990s, the Roberts Enterprise Development Fund developed the first version of SROI as an instrument to assess the efficiency of the projects financed by it (Banke-Thomas, Madaj, Charles, Broek 2015). In its initial work, the fund defined three types of values created by social enterprises: economic value, social value and socio-economic value.

The first is determined by the market value of resource inputs and products. The second one takes into account the things that are difficult to measure because of the lack of a direct market price (*i.e.* intangible assets), for example, the value of knowledge, health, life duration or heritage. Finally, SROI must fix the socio-economic value generated by the enterprise by taking into account the resulting savings of public expenditures and the increase in state revenues, in addition to the cash flow of business.

Since then, the concept of SROI has undergone a number of changes and attracted special attention of researchers. The *Social Value International* global network (SROI in action, Supplementary Guidance on Using SROI, *n.d.*) considerably contributed to the development of SROI. It made an attempt to provide a more complete overview of the social consequences of the program by taking into account a wider range of results related to various interested parties. The manual offered by SROI Network also defines some key steps in the SROI analysis and determines fundamental principles (Nicholls, Lawlor, Neitzert, Goodspeed 2009).

SROI is still being developed and improved both in organizational and academic areas, and new guiding principles are published by organizations and research centers (Brouwers, Prins, Salverda 2010). Generally speaking, SROI is based on the logics of choosing a rationale (Zappala and Lyons 2009), and is therefore fundamentally related to the concept of cost-benefit analysis (Rotheroe and Richards 2007). Nevertheless, this index makes a more detailed differentiation among the impact aspects (Smith 2010) and contributes to the consideration of various social situations (Taylor and Bradbury-Jones 2011).

At the same time, there is a tendency to increase the scale of monetization of the social effect. The question of how profitable this is for achieving the goals of creating social wealth is still disputable. Nevertheless, as Arvidson *et al.* (2010) note, special attention should be paid to the dual nature of SROI: extending the use of monetization as much as possible, it follows the logics of financial markets and commercial investments. At the same time, this method makes an exclusive focus on the social element and allows managers and investors to simultaneously use social and financial benefits, while in the classical cost-benefit analysis they are more likely to be considered as compromises (Lingane and Olsen 2004).

One more, quite clear feature is the focus on the analysis of the interested parties, which allows to integrally take into account all aspects of the impact. It is stipulated by the development of a rather clearly structured and standardized approach to analysis, including careful mapping of source inputs, results, impacts and relationships among them (Nicholls 2009a).

Zappala and Lyons note that SROI as a method of assessing social consequences is most often used by nonprofit organizations (Zappala and Lyons 2009). In the context of social entrepreneurship, the SROI method is placed in a broader scope that requires to improve the efficiency assessment instruments and to prove effects for the organizations specializing in this area (Haugh 2005).

Due to this, Loidl and Laskowski (2012) go further and state that SROI can play an important role in promoting professions in the social area. Since the measurement of the obtained effect is the central part of the definition of a profession, the instruments for enhancing it can contribute to the creation, stabilization and development of the latter. This reasoning can be especially important in the context of "quasiprofessions", such as social work or such area as social entrepreneurship.

2. Methods

This work analyzes the investment project in the social area by using the SROI index of one of the largest corporations in the Republic of Kazakhstan. The index of SROI allows bringing the created values and used resources to the common denominator, and it is calculated by using the following formula:

SROI = V/I   *where*: V is the value, I is the investment   (1)

SROI is calculated in several stages:
- stage 1 – selection of the analysis object and determination of key stakeholders;
- stage 2 – compiling the results' map. In order to show how the analyzed program or project use certain resources on the basis of the data obtained from stakeholders, an impact map is compiled;
- stage 3 – the results' monetization. This stage of analysis determines the financial equivalents of social results; they will allow giving an idea of the relative importance of the relevant changes for stakeholders;
- stage 4 – impact assessment. This stage determined what changes would occur in any case and which are due to the implementation of the social project (the so called "deadweight" is the Deadweight indicator). This indicator is expressed as a percentage and is calculated based on the general result;
- stage 5 – calculation of SROI.

Quantitative data are obtained from available sources (external and internal), such as corporate reports on the sustainable development of the Eurasian Resources Group (ERG) international group of companies in the Republic of Kazakhstan for 2014-2016, the database of the Kazakh Statistics Committee, as well as international and nongovernmental organizations.

3. Results

The ERG is a leading diversified company in the area of natural resources' extraction and processing, represented by operating enterprises and development projects in Kazakhstan. Throughout its history in Kazakhstan, the company annually takes part in implementing the most important social and economic projects in four regions of the country where its enterprises are located. ERG invests funds in creating social infrastructure facilities (polyclinics, medical centers, sports centers, swimming pools and cultural and entertainment centers, *etc*.). These facilities are fully accessible to employees, their families and local communities, including socially disadvantaged groups of the population. The access to them is simplified by providing benefits to retired employees of the company, low-income people, and large families. More than half of SRI in Kazakhstan are carried out in the framework of official agreements (memorandums of understanding) concluded annually between ERG and regional authorities.

In 2010-2017 enterprises of the Eurasian Group in Kazakhstan sent about 194 billion tenge for the social protection of employees and the maintenance of the social area, as well as for sponsorship and charity (the official website of the Eurasian Group in Kazakhstan. Social projects (https://www.erg.kz/en/content/ustoychivoe-razvitie/social-nye-proekty) where 119.6 billion tenge were spent for sponsorship and charity only (Official website of the Eurasian Group in Kazakhstan, *n.d.).* A separate block of social investments of the Eurasian Group is programs on training HR. They contribute to the further growth of the company's assets value. One of the areas in this work is vocational guidance in educational institutions of the ERG presence regions.

The object of assessment is the social project "Ecosystem of Student Entrepreneurship" initiated in March 2017 by the Eurasian Group in partnership with the Association of Friends of the Tel Aviv University, Almaty Management University and the MOST Business Incubator. Youth entrepreneurship is the theme that attracts and involves more and more people. Dozens of new business projects are opened every month in the Republic of Kazakhstan. Involving young people in entrepreneurial activities is not only an increase in the share of small business, but also a solution of the problem related to youth employment. The youth unemployment rate in the world had been increasing after several years of improvement, and, according to the World Bank, it reached 13.6% in 2016 (from 12.9 in 2015), and did not decrease in 2017.

The analysis of the entrepreneurial ecosystem in Kazakhstan shows that the Kazakh entrepreneurial ecosystem has a number of advantages. In particular, state support for entrepreneurship in Kazakhstan is strong; there are programs on supporting and developing entrepreneurship. At the same time, it is necessary to improve the level of education in the area of entrepreneurial activity, both on the school and higher education levels ("Global Entrepreneurship Monitoring: Kazakhstan 2016/2017" Report, Astana 2017).

The main challenge for Industry 4.0 will be the employment. The Eurasian Group offers one of the ways to solve the problem related to the employment – the development of active and adventurous youth in small towns. In this regard, the ERG Company, being guided by the principles of socially responsible business, announces about its readiness to support the transformation of regional universities into entrepreneurial ones and launches the "Creating an ecosystem of youth entrepreneurship in a student environment" project in the regions of the Group's enterprises' presence.

The project aims at developing entrepreneurial skills among students in the regions of the ERG enterprises' presence. The pilot project of ERG to support student entrepreneurship was tested on the basis of the Pavlodar S. Toraigyrov State University. The results achieved when implementing the pilot project can be analyzed by using the SROI calculation methodology. Based on analyzing the stakeholders, the project impact map has been compiled (Table 1).

Table 1. Impact map of the "Ecosystem of Student Entrepreneurship" project

Project goal	▪ Development of the entrepreneurial ecosystem of the university environment, the formation of entrepreneurial thinking and commercialization skills among students of higher and secondary educational institutions
Activity	▪ Formation of innovative training programs (for developing the youth's entrepreneurial potential); ▪ Assistance to local educational institutions in the transformation into entrepreneurial ones, involvement of future businessmen and leading coaches of the world for training, assigning mentors for initiative students.

The total amount of the required financial investments of stakeholders in the creation of the social value of the project is 414,147.8 thousand tenge per year, including the contributions from ERG -326,704.2 thousand tenge, the higher educational establishment's funds – 106,354.1 thousand tenge per year, and the regional budget funds – 181,089.5 thousand tenge.

Table 2 shows the results of analyzing the parties interested in the "Ecosystem of Student Entrepreneurship" Project.

Table 2. Results of Analyzing the Parties Interested in the "Ecosystem of Student Entrepreneurship" Project

Donatee	Result	Indicators	Resource of information
Students participating in the project	▪ Financial independence; ▪ Opportunity to reveal the entrepreneurial potential, networking, knowledge and skills; ▪ Creative freedom.	▪ Number of students who established their own business when training or during the first year after graduation; ▪ The number of students who obtained grants to start a business; ▪ Income growth.	▪ Students survey; ▪ Contests results.
State and regional authorities	▪ Creation of jobs; ▪ Socio-economic involvement of young people; ▪ Reducing tension on the labor market and increase in the population's welfare; ▪ Increase in the share of SMEs in the region's economy; ▪ Increase in the taxable base.	▪ Number of jobs created in the region; ▪ Volume of products, works performed and services rendered, thous. Tenge; ▪ Growth of tax receipts and other obligatory payments, thous. Tenge; ▪ Unemployment rate among youth; ▪ Share of small and medium-sized enterprises in the GRP.	▪ Committee on Statistics of the Republic of Kazakhstan
University	▪ Competitive faculty; ▪ Preference in choosing a university by students and employers; ▪ Reducing dependence on the state budget .	▪ Number of business projects implemented jointly with Kazakh and international companies on the basis of the university; ▪ Growth in the number of applicants and students; ▪ Increase in revenues from providing paid services.	▪ Self-examination of the university; ▪ Financial statements of the University.
ERG	▪ Creation of highly professional human resources; ▪ Improvement of business reputation in the regions of presence.	▪ Savings on the search and selection of personnel; ▪ Savings on retraining and training of personnel; ▪ Growth of the share of highly qualified personnel; ▪ Goodwill.	▪ Corporate reporting of ERG; ▪ Assessment of the ERG HR Development Department; ▪ Financial statements.

According to the results of surveying students of the Pavlodar S. Toraigyrov State University on their attitude to the entrepreneurship conducted in the early 2018, a rather high level of students' interest and willingness to start their own business was revealed. Out of 620 respondents, 58% of the students answered that they would like to become an entrepreneur at one of their career stages. At the same time, it is necessary to note that most of the students surveyed plan to start their business not earlier than in 5 years (32%), or not earlier than in 2-3 years after the graduation (17%). It proves that students are not ready to run business and simultaneously study at the university. Only 5% of the respondents answered that they wanted and were ready to start their business right after the graduation from the university, and 4% – while studying at the Pavlodar S. Toraigyrov State University. It is also interesting that since the start of the "Ecosystem of Student Entrepreneurship" project, 3% of the students surveyed had already registered their small enterprise and were running them.

When analyzing SROI, it was decided to take into account only the number of the students who started their own business when implementing the project or during the first year after the graduation. As on the analysis date, this indicator is 56 people.

The results assessing the project impact on stakeholders' activity are shown in Table 3.

Table 3. Results of assessing the impact of the "Ecosystem of Student Entrepreneurship" project on the stakeholders' activities

Indicator	Result	Dead weight	Financial proxy		Financial impact, thous. tenge per year (V)
			Criterion	Cost	
Students participating in the project					
Establishing own business by project participants during training or during the first year after graduation	56	7.0%	Profit (loss) before taxation, thous. tenge per 1 SME employee per year	1,295.1	67,449
Obtaining income and financial independence	56	91.0%	Average monthly salary of one employee, tenge	112,463.0	567
Obtaining grants for establishing business	2	0.0%	Average grant amount	1,000.0	2,000
In total, thous. Tenge					70,016
Regional authorities					
Increase in the share of SMEs in the total volume of production in the region	147	47%	The volume of products, works performed and services rendered per 1 workplace, thous. tenge	10,566.90	823,267
Taxes and other mandatory payments to the budget	147	9,5%	Taxes and other mandatory payments to the budget per 1 SME employee, thous. tenge per year	240.06	31,936
Reduction of youth unemployment	56	0%	Unemployment benefit, tenge per month (minimum size from 28,284*replacement ratio – 0.3)	8,485.20	5,702
In total, thous. Tenge					860,905
University					
Growth in the number of students, persons	113	3.0%	Increase in the number of students	0	110
Increase in income from educational activities	110	3%	Income of the university from 1 student per year, thous.tenge	223.76	23,875
Income from implementing business projects jointly with Kazakh and international companies at the University	12	5%	Average income from implementing a business project at the university	3,420.70	38,996
In total, thous. Tenge					
ERG					
Savings on the search and selection of personnel	40	5%	Savings on the search and selection of personnel; Growth of the share of highly qualified personnel; Goodwill.	331.16	12,584
Savings on retraining and training of personnel	112	5%	Savings on training and improvement of personnel, thous. tenge per 1 employee	416.80	44,348
Improvement of goodwill	5%	0%	Increase in the index of the Kazakh enterprises goodwill, thous. Tenge	103,683	266,768
In total, thous. Tenge					323,700

Table 4 shows the results of calculating the SROI index for the first year of the social project implementation for every stakeholder.

Table 4. Calculation of the SROI Index for the First Year of the "Ecosystem of Student Entrepreneurship" Social Project

Parties in interest	Social value, thous. tenge	Investments, thous. tenge	SROI
Students	70,016	0	-
Regional authorities	860,906	289,902.9	2.97
University	62,981	18,523.2	3.40
ERG	323,700	77,812.5	4.16
In total for the project	1,317,603	386,238.6	3.41

Thus, when implementing this project, the social values obtained by all interested parties will exceed the amount of invested financial resources almost 3.4 times. The ERD company will get the highest return on investment due to the improvement of business reputation and image of a large socially-oriented company on the market of the Republic of Kazakhstan.

4. Discussion

The SROI methodology is a new word in assessing social values, which has proved itself in foreign countries, and shows an innovative approach not only to measuring social results, but also to forecasting them. In the Republic of Kazakhstan, the first steps are being taken to apply this methodology in assessing social values. It is necessary to note that even in the developed countries, the areas of applying and the existing interested parties are still considerably limited to the classical areas of applying SROI.

The use of the SROI methodology in the outpatient clinic is recommended to assess the flow of funds and for obtaining visual information in the context of programs on the prevention and sanitation of certain categories of citizens that will cause an increase in life duration. It will help managers of health care organizations to develop management accounting in polyclinics, and to take management decisions. The area to be studied the most carefully is that of the SROI methodological development. The key issue here is the interpretation of the conducted analysis, especially with respect to the SROI correlation and reflecting critical assumptions behind it. However, although this can be changed quite easily, there are basic issues related to indicators, financial proxies and the notion of social effects.

First of all, and it is the most important aspect, it is necessary to monetize the subject of a critical discussion. Where is it reasonable to monetize and where to look for alternative ways of capturing the created value? Taking this as a starting point, it would be easier to discuss how and what indicators should be used. This may change over time when there are new and viable ideas on how different kinds of impacts can be covered, but first of all a common basis is required. As for the indicators, it is necessary to make sure that it is not enough to merely increase their number to assess the created impact. It is necessary to always take into account a combination of quality (how things change and to what extent) and quantity (in how many cases this happens). Based on this principle, there happens to be the need in standardizing certain areas.

What is to be developed locally is transparent information and agreed standards of application. Databases should use accessible and objective data sources from the existing national and international surveys or research projects, especially with regard to financial intermediaries. To improve comparability, it is necessary to make sure that the analysis uses analogous or even the same data.

Finally, it is necessary to address the most underdeveloped area: the description of social elements in SROI. Now there is a serious shortage of standardized and meaningful ways to do this not only because of the desire for monetization, but also because of a weak theoretically grounded discourse about the measurement methods to be applied. A potential starting point could be the linking of this discussion to the CSI concept about four functions of social investments (Then and Kehl 2012a). In addition to the rather simple economic function, this definition helps to further differentiate the social element as the one consisting of social, political and cultural aspects. The use of this keener understanding of broader social effects can enhance the ability of SROI research to fuller and more accurate understand the latter.

Conclusion

The approach provided in this paper has several limitations. For example, it cannot be representative of all the studies available in this area, because many of them are considered confidentially and not published – sometimes due to unfavorable results, sometimes due to other reasons. Nevertheless, the conducted research will help to get an idea of the public image of SROI. Data evaluation, of course, can be challenged, but an attempt has been made to ensure the highest degree of objectivity.

In any case, this research is a valuable starting point, because both general practical discourse and academic discussion of SROI, and measurement of impact in a broader sense are in their infancy.

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The Armey Curve: Size of Public Spending and Economic Growth in Peru

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Abstract:

In this study the relationship between public expenditure and the economic growth rate in Peru is analyzed using data for the period 1984-2017. The main objective is to test whether or not there is an inverted-U relationship between public spending and economic growth, and to determine the optimum level of public spending for Peru. The regression and Armey curve methods are used. The Armey curve shows that there is a positive relationship between public spending and gross domestic product (GDP) until a maximum point is reached, after which GDP decreases as public expenditure increases. The empirical findings show the inverted-U between public expenditure and growth, while the optimal level of public spending as a proportion of GDP is found to be 20.76% for the Peruvian case.

Keywords: armey curve; economic growth; optimal public spending

JEL Classification: H50; O40

Introduction

Stiglitz (2003) refers to an economy as mixed when many economic activities are carried out by private companies, but others are performed by the state. Moreover, in a mixed economy the behavior of the private sector is influenced through a variety of regulations, taxes, and subsidies. It is the very fact that mixed economies have to constantly define the frontiers between public and private activities that make the study of the economies of such countries so important and interesting.

According to Fernández (2014), scrutiny in the form of public regulatory and operational auditing can play a role that is not only necessary, but essential, under the following circumstances: when public resources are scarce as a result of economic crises; when numerous administrative and governance structures are in question; when all eyes are on the public sector to meet its obligations as a guarantor of basic citizen's rights vis-a-vis given excesses; when public authorities are called upon to actively involve themselves in economic recovery and in the design of a more solid, durable, and sustainable development model; and when, more than ever, effectiveness, efficiency, and economics - as well as other variables such as environmental sustainability, equity, or gender impact - must form the basis of public management, not only in terms of revenues and budget execution, but also as regards inherent organizational and regulatory aspects.

In the case of Peru, this focus is justified as part of ensuring the optimal government size for sustainable growth, and to ascertain whether a causal relationship exists between larger government size and economic growth. This is important for public-policy decision-making in favor of the country's sustainable development.

The objective of this study is to analyze the relationship between optimal public spending and economic growth in Peru.

1. Literature review

According to Altunc and Adyin (2013), economic theory offers a range of tools and methods for demonstrating the role of the state in the economic process; one such method is to look for the existence or otherwise of an inverted-U relationship between public spending and economic growth in order to determine the optimum level of public spending. This approach has been applied to the economies of Turkey, Romania, and Bulgaria. In theory, the relationship between optimum public spending and economic growth is associated with Armey curves. The Armey curve shows that there is a positive relationship between public spending and the gross domestic product (GDP) until reaching a maximum point, after which GDP decreases as public expenditure increases.

According to Zugravu and Sava (2012) there is increasing debate in the literature as to the efficiency of the public sector, especially concerning the determinants of efficiency and their impact on economic growth. Much of

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the current debate is centered on strategies for increasing the efficiency of the public sector in order to drive economic competitiveness and foster economic growth. Moreover, a more-efficient public sector is considered, in many countries, to be the only way of increasing the quality and quantity of public goods utilized, without exacerbating budgetary deficits.

Comín *et al.* (2009) state that there is a relationship between public spending and economic growth, but what is not clear is the direction of the causality; Wagner's law holds that it is growth that facilitates the expansion of the public sector, while the Keynesian hypothesis contends that the causality is the other way round. They assert that Wagner's law has been fulfilled in terms of the causal relationship between GDP and public spending in Argentina, Brazil, Mexico, and Spain throughout the 20th century, the explanation being that a scaled-back public sector cannot readily exert a direct influence on production in the case of the four afore-mentioned economies. However, the three Latin American economies kept their public sectors small throughout the century, while Spain's increased in size when it developed a welfare state alongside the other members of the European Union (UE)

According to Pinilla *et al.* (2013) the Armey curve graphically represents how the expansion of government is conducive to growth, but at a certain point it starts to have negative repercussions upon prosperity.

Silveira (2014) considers Brazil to be a centralized state that promotes economic growth through the induction of development in those sectors subject to *bottlenecks.*
The capacity of state agencies varies enormously within Latin American states. While the ministries of foreign affairs and the central banks function at a similar level to those of their counterparts in developed countries, the agencies responsible for healthcare and education often display all of the negative stereotypes associated with third-world bureaucracies (Dargent 2014).

Jaén-García and Piedra-Muñoz (2012) analyze the relationship between public infrastructures and economic growth in Spain. Using a Cobb-Douglas model with constant yields to scale and a translog production function, they demonstrate that public capital positively influences Spanish economic growth at both national and regional levels. With both the trans-logarithmic and Cobb-Douglas functions, GDP elasticity vis-a-vis public capital is very high. In the case of the Cobb-Douglas function, it reaches values of between 0.19 and 0.26 without taking into account the spillover effect ("the effect of infrastructures on production depends on the level of development achieved, and, therefore, on the stock of public infrastructures already accumulated[56]"), and of up to 0.42 if the effect is taken into account.

Poel *et al.* (2014) find a negative correlation between the administrative burden and economic growth. However, in theory, in some cases administrative burdens could lead to an increase in economic activity, for example the regulation of property rights (Helm 2006 quoted by Poel *et al.* 2014). The authors attempt to take a more empirical view of the exact relationship between reducing administrative burdens and economic growth. The econometric results for a panel of 182 countries suggest that a reduction in administrative burdens has an impact on growth: the reduction in the number of procedures and the time necessary for their execution was found to have a significant positive effect on economic growth. The results of the fixed-effect estimates prove to be more reliable than the OLS estimates. The regulation variables with the greatest impact on growth are the time necessary for paying taxes and the number of procedures for starting a business. Moreover, through the use of a panel of 26 countries in the UE, the results of the regressions suggest that a 25% reduction in administrative burdens (the reduction target set by the European Commission) has a positive effect on economic growth of 1.62%.

According to Pop and Mutu (2013), as well as the classical determinants of economic growth such as technology, trade, natural resources, or population, special attention is paid to the role of human capital in improving economic growth and, more recently, the role of institutions. As to the contribution of institutions to economic growth, the literature identifies two types: formal, such as laws or regulations; and informal, made up of social or cultural capital (Tabellini 2005 quoted by Pop and Mutu 2013).

A host of institutional variables are analyzed in the empirical studies. In general, such studies consider government efficiency, corruption, regulatory effectiveness, political stability, rule of law, investment profile, free trade, or property rights, to name but a few (Pop and Mutu 2013).

Osipian (2012 quoted by Pop and Mutu 2013) states that high levels of corruption can drive down economic growth in the case of Russia, affecting total factor productivity in the long run. In one analysis encompassing a sample of 44 countries over the period 1999-2005, (Tridico 2007, quoted by Pop and Mutu 2013) provides evidence that institutions such as government effectiveness and political stability have a significant impact on the growth of emerging and transition economies.

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[56] Translation by the author.

The quality of government policies is also very important in explaining economic growth. The studies on government effectiveness demonstrate that policy problems, lack of vision, and high bureaucracy can cause a government to spend resources inefficiently, which requires larger budgets and ultimately leads to reduced growth (Sarte 2001 quoted by Pop and Mutu 2013). The quality of government policies is analyzed through the *government stability index* published by the International Country Risk Guide (ICRG). This is a multidimensional index that reflects government unity, legislative strength, and popular support.

The corruption index (proposed by ICRG, with scores from 0 to 6.0 represents the highest level of corruption and 6 the lowest level) reflects control of corruption in the political system, encompassing financial corruption (import and export licenses, exchange controls, tax assessments, or police protection) as well as other forms such as patronage, nepotism, job reservations, "favor-for-favors", and secret party funding. For a sample of 20 countries, the country most affected by corruption (low levels of corruption controls) is Russia, followed by Thailand and Egypt. At the other end are Chile, Hungary, and Morocco, with the lowest recorded average levels of corruption (high control of corruption) over 2000-2010. There is a negative relationship between corruption and the real GDP per capita. The higher the level of corruption, the lower the economic growth in those countries (Pop and Mutu 2013).

According to Pop and Mutu (2013), the country with the highest level of risk associated with government stability is Peru, followed by the Czech Republic and the Philippines. At the other extreme were Russia, China, and Morrocco, with the lowest risk of government stability over 2000-2010.

Kuncic (2014) compares different institutional classification systems, and shows how to empirically operationalize the institutional concepts. He groups (clusters) more than 30 established institutional indicators into three homogeneous groups of formal institutions - legal, political, and economic - that capture a large expanse of the entire formal institutional environment of a country. The author argues that it is best to examine the quality of institutional representation within each group when the average values for each proxy are compared, among clusters of legal, political, and economic institutions, respectively. On this basis, the characteristics of the average cluster can also be interpreted. Group 1 scores very poorly, as it consistently has a standard deviation below the average. In contrast, Group 5 is doing very well, with one or more standard deviations above the average on a consistent basis. Group 4 is also good, with most of the institutional authorities considerably above the average. Groups 2 and 3 are more interesting. As to the legal environment, Group 2 has low scores for quality of courts and protection of property rights, and reasonably good scores for freedom of press, civil liberties, and interference of religion; the opposite is the case for Group 3.

As to economic institutions, Group 2 performs poorly, with scores significantly below the average, while Group 3 is doing well - but again with the exception of oppression of the press. Out of 42 countries, Peru features in Group 2. The only Latin American countries included in Group 4 are Chile, Uruguay, and Costa Rica.

For Shera *et al.* (2014), corruption damages a country's economy. It is one of the main factors that reduce economic growth in many countries. Corruption is a common problem in many developing countries due to public position abuse for private benefit, in the management of a common good. Based on the empirical analysis of panel data carried out for 22 developing countries over the period 2001-2012, corruption is found to have a significant negative effect on economic growth.

Anti-corruption efforts must consider moral education, values and society's rules and effective mechanisms must be implemented to hold accountable those individuals who have committed corruption acts. It is especially important to conduct a detailed analysis of the motivations and factors that lead to corruption (Shera *et al.* 2014).

Pascual Sáez *et al.* (2017) found a positive relationship between government spending and economic growth for some UE countries (Portugal and United Kingdom) while it is negative for others (Austria, Filand, Italy and Sweden) for the period 1994 - 2012. However, considering the European countries as a whole and using panel techniques, this relationship is negative.

Lazarus, *et al.* (2017) investigate the impact of government spending on economic growth of 77 OECD and African countries for the period 1970-2015 and found the optimal government sizes of 36.61%, 15.61% and 23.13% for the 27 OECD countries, 50 African countries, and the 77 OECD and African countries, respectively. The actual government sizes were 18.9%, 14.06%, and 18.76% of the real DGP for the respective countries. It is argued that the low level of government size in African countries reflects the low level of economic development in Africa and vice versa for OECD countries. The study proved that there is an inverted U-shaped curve in the three panel regression models estimated.

Mahnaz and Tasnim (2017) analyze the role of government size for economic growth using a panel data for Pakistan, India, Bangladesh and Bhutan covering the period from 1990 to 2016. The results indicated that there is a nonlinear relationship between government size and economic growth and the existence of the Armey curve relationship in the selected panel is confirmed.

Tabaghua (2017) estimates the optimal government size equivalent to 21% of Georgia's GDP for the period between 2000 and 2015. Similar to other studies, the actual size of government is higher than the optimal one.

Varol and Turan (2017) investigate the relationship between the government size and economic growth for Turkey by using threshold regression model and quarterly data over the period 1998:1 – 2015:1. Their findings strongly indicate that there exists a non-linear relationship in the case of Turkey and confirm the validity of Armey curve.

2. Methodology and results

The study covers trends in public spending in relation to economic growth in Peru over the period 1984 – 2017, as follows:

- Universe: Public sector, and units of analysis: size of public spending.
- Procedure: first, we review trends in the size of the public sector in developed countries, in Latin American countries, and in Peru; second, we study the nexus between government and growth in the world, and in Peru; then, we conduct an empirical analysis on the results concerning the association between economic growth and public spending in Peru.
- We use the regression and Armey curve methods to estimate optimum government size, aided by SPSS software.

According to Altunc and Adyin (2013), it is possible to express the Armey curve as a quadratic function:

$$GDP_t = \beta_0 + \beta_1 S_t + \beta_2 S^2_t + \mu_t \qquad \beta_2 \langle 0 \qquad (1)$$

$$\text{Optimal spending } (S^*) = -\frac{\beta_1}{2(\beta_2)} \qquad (2)$$

where: S = Public spending; t = 1984, 1988, …, 2017.

In the Armey curve function (1), the positive sign in the linear expression of public spending denotes that it has a positive impact on economic growth. Moreover, that the quadratic function of public expenditure is negative in the function denotes the negative consequences of a bloated state. Given that the quadratic expression increases more rapidly than the linear expression in terms of value, it is understood that the negative effects of public spending exceed the positive effects and thus represent the decreasing slope of the curve (Altunc and Adyin 2013).

Table 1. Gross Domestic Product and Public Spending, Peru 1984-2017 (Millions of soles)

Year	GDP (at 2007 prices) 1/	Growth (% var.)	Public spending 2/	Percentage of GDP
1984	163,842	3.6	0.03	22.9
1985	167,219	2.1	0.08	23.1
1986	182,981	9.4	0.13	20.4
1987	200,778	9.7	0.23	19.4
1988	181,822	-9.4	1.49	17.1
1989	159,436	-12.3	30.22	16.4
1990	151,492	-5.0	1,689.32	16.9
1991	154,854	2.2	3,682	13.8
1992	154,017	-0.5	7,268	16.2
1993	162,093	5.2	10,915	15.8
1994	182,044	12.3	16,824	17.1
1995	195,536	7.4	21,335	17.7
1996	201,009	2.8	24,253	17.7
1997	214,028	6.5	27,870	17.7
1998	213,190	-0.4	29,812	17.9
1999	216,377	1.5	32,937	18.9
2000	222,207	2.7	34,356	18.5
2001	223,580	0.6	33,562	17.7
2002	235,773	5.5	34,596	17.2
2003	245,593	4.2	36,622	17.1
2004	257,770	5.0	39,730	17.0
2005	273,971	6.3	44,492	18.0
2006	294,598	7.5	48,847	17.0
2007	319,693	8.5	54,777	17.1

Year	GDP (at 2007 prices) 1/	Growth (% var.)	Public spending 2/	Percentage of GDP
2008	348,923	9.1	64,377	18.1
2009	352,584	1.0	73,394	20.1
2010	382,380	8.5	83,169	19.8
2011	407,052	6.5	87,542	18.6
2012	431,273	6.0	97,899	19.3
2013	456,366	5.8	111,770	20.5
2014 3/	467,280	2.4	123,845	21.5
2015 3/	482,797	3.3	130,205	21.3
2016 3/	501,699	3.9	131,460	19.9
2017 3/	514,927	2.5	141,340	20.1

Note: 1/ Memoria, BCRP (2016) Anexo1; 2/ Public spending (non-financial, by general government), taken from Memorias BCRP; 3/ Preliminary.

Source: BCRP (several years), own elaboration.

To estimate government size and growth in Peru, we use time-series data for a large sample n = 34 (Table 1).

Figure 1. The relationship between economic growth and public expenditure, 1984 - 2017
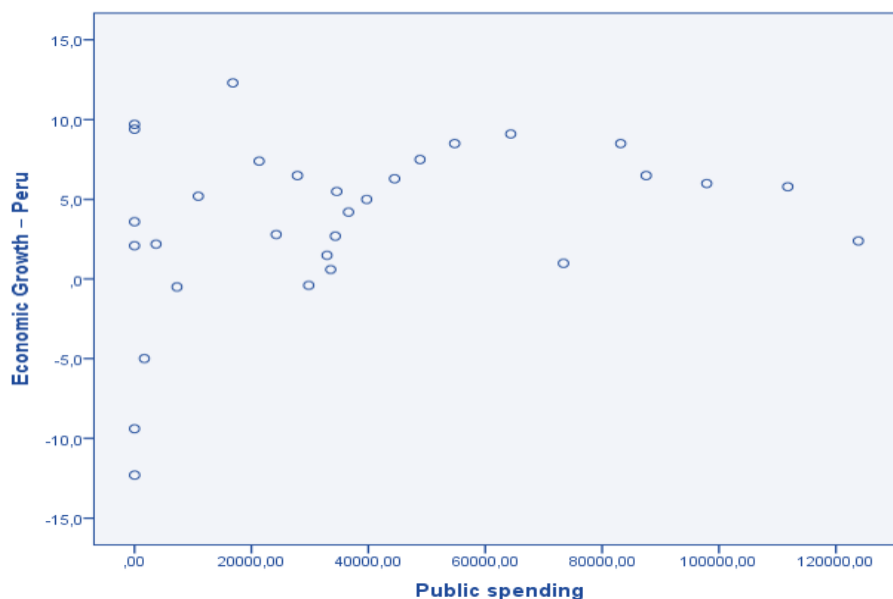
We also found, in terms of natural logarithms, that public spending has a negative effect on the GDP growth rate (Table 2).

Table 2. Results of the logarithmic regression of GDP in relation to public expenditure 1984-2017

COEFFICIENTSᴬ					
Model	Non-standardized coefficients		Typified coefficients	T	Sig
	B	Typ. error	Beta		
(Constant)	,524	,010		54,632	,000
Ln(Public spending)	-,052	,009	-,727	-5,903	,000

Table 3. Analysis of variance (ANOVA)

	Sum of squares	df	Quadratic mean	F	Sig.
Regression	148,292	2	74,146	3,253	,052
Residual	706,490	31	22,790		
Total	854,782	33			

Note: The independent variable is public spending (non-financial, by general government).

With the variance analysis (Table 3), we validate the significance of the quadratic regression model (α = 10%).

Table 4. Quadratic regression of economic growth in relation to public spending, 1984-2017

Model	Non-standardized coefficients		Standardized coefficients	T	Sig.
	B	Typical error	Beta		
Public spending (non-financial, by general government)	,000161	,000065	1,383	2,477	,019
Public spending (non-financial, by general government) ** 2	-1,066E-009	,000	-1,223	.	.
(Constante)	,533	1,499		,355	,725

Source: own calculation

$$Optimal\ spending\ (S^*) = -\frac{\beta_1}{2(\beta_2)} = -\frac{0.000161}{2(-1.066E-009)} = 75,515.95\ (\text{Mill. soles S/.}) \qquad (3)$$

Figure 2. The linear and non-linear relationship between economic growth and public spending, 1984 - 2017
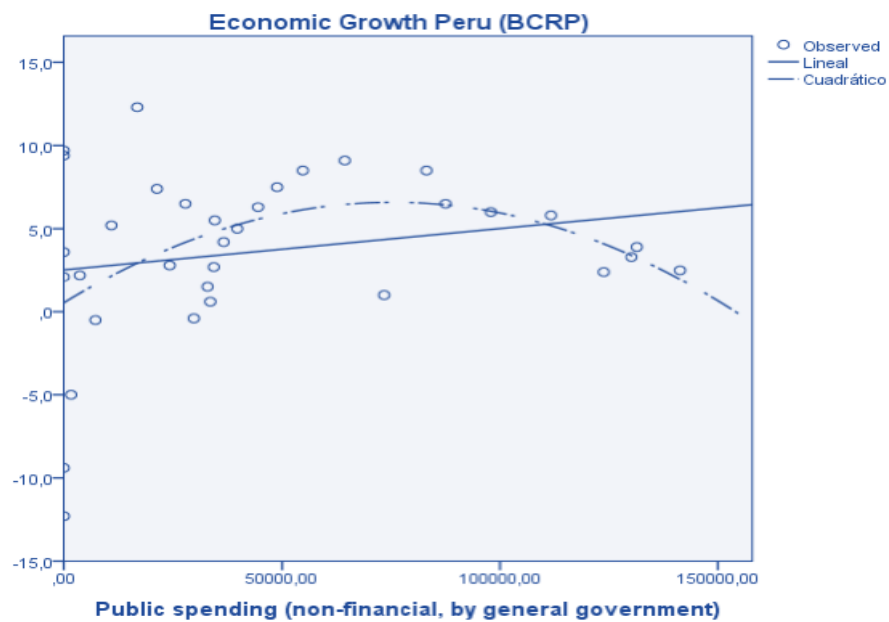
Table 5. ANOVA for the quadratic regression of the dependent variable: GDP (at 2007 prices)

	Sum of squares	df	Quadratic mean	F	Sig.
Regression	137061514293,468	2	68530757146,734	6,880	,003
Residual	308765550662,297	31	9960179053,622		
Total	445827064955,765	33			

Note: The independent variable is public spending (percentage of GDP).

Based on the variance analysis (Table 5), we validate the quadratic regression model (α = 5%).

Table 6. Quadratic regression of GDP in relation to public expenditure, 1984 - 2017

Model	Non-standardized coefficients		Standardized coefficients	T	Sig.
	B	Typical error	Beta		
Pub. S./ GDP	280.120,514	11.6801,601	4,862	2,398	,023
Pub. S./ GDP ** 2	-6.745,081	3.089,703	-4,426	-2,183	,037
(Constante)	-2571.898,625	1.096.932,299		-2,345	,026

Source: own calculation

Considering the estimation of the quadratic regression in Table 6, both the proportion of linear public spending and of quadratic public spending significantly influence the GDP (at 2007 prices). We also corroborate the quadratic function of the Armey curve, which states that after a limit in the positive contribution of public expenditure to growth, this relationship results in a negative sign, $\hat{\beta}_2 = -6745.1$

Figure 3. The linear relationship and the Armey curve, Peru 1984 - 2017

For the Peruvian case, the Armey curve evidences a non-linear inverted-U relationship between growth and public spending (Figure 3).

$$Optimal \ spending \ (\% \ S^*) = -\frac{280120.514}{2(-6745.081)} = 20.76 \ (\% \ GDP) \tag{4}$$

For Peru, the optimum level of public expenditure as a proportion of GDP would be 20.76.

3. Discussion

To test whether an inverted-U relationship exists between economic growth and public spending and to find the optimum level of public expenditure in three countries - Turkey, Romania, and Bulgaria -- Altunc and Adyin (2013) use the Armey curve, which shows a relationship between public spending and positive GDP up to a certain point, after which the relationship becomes negative. They validate the existence of the Armey curve for Turkey, Romania, and Bulgaria (1995-2011), and find the optimum level of public spending (% GDP) to be 25.21, 20.44, and 22.45 respectively. On the other hand, for the period 2000-2015, Tabaghua (2017) obtained the optimal size of government equal to 21% of Georgia's GDP. For the Peruvian case, we also find the existence of an Armey curve (1984-2017), and the optimum level of public spending proves to be 20.76 (% GDP).

Taking the lead from (Sarte 2001, quoted by Pop and Mute 2013), some policy-makers in Peru have not implemented high-quality government policies, which is a very important factor behind public growth. Policy problems, lack of vision, and high bureaucracy can cause a government to spend funds inefficiently, which results in the need for a bigger budget; that is, inefficient management of public spending will ultimately lead to reduced growth.

For future studies, the scope should be expanded to consider the relationship between public spending and, besides economic growth, sustainable development, including variables such as institutional quality, natural (environmental) capital, and social capital. Following on from the discussion of this paper in the *24th Meeting on Public Economics*, optimal public spending should be estimated, disaggregated by sectors such as education, health, and others.

Conclusions

An inverted-U relationship between the size of public spending and economic growth in Peru (1984-2017) was corroborated, known as the Armey curve. The Armey curve represents a positive relationship between public spending and gross domestic product (GDP) until a maximum point is reached, after which GDP decreases as public expenditure increases. We find that the optimal level of public spending as a proportion of GDP is 20.76% for the Peruvian case.

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Digital Reorganization as a Driver of the Export Growth of Italian Manufacturing Small and Medium Sized Enterprises[57]

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Abstract:

In this paper, we argue that digital reorganization, encompassing the introduction of digital technologies that require changes in business processes and improvement in internal digital skills, is significantly related to the international activities of SMEs and is therefore an important driver of export growth. We apply binary probit models to microdata gathered from a survey carried out in 2015 on a representative sample of 426 exporting Italian manufacturing SMEs in Italy. Our results show that the likelihood of increasing exports is correlated with more advanced digital technologies becoming embedded within organizational innovations of firms, thereby gaining a competitive edge.

Keywords: digitalization; innovation; export; competitiveness; manufacturing; SMEs

JEL Classification: L23; O33

Introduction

An increasing number of studies have investigated the advantages of digitalization on the economic system (Spiezia 2012, OECD 2016, Evangelista *et al.* 2014). The adoption of digital technologies and their integration into industrial processes has broadened firms' competitive advantage in global markets (Hagsten and Kotnik 2017, Diaz-Chao *et al.* 2015).

By providing new channels of marketing and sales information and reducing distance and entry-related costs, internet-based technologies may help to overcome the constraints of some SMEs when moving into foreign markets by also supporting the integration into the global value chains (GVCs) (De Marchi *et al.* 2018). Bell *et al.* (2001) introduced the term internetization to indicate the increasing adoption and diffusion of internet-based technologies that progressively act as the "back bone of internationalization" (Etemad *et al.* 2010).

Despite existing research on the internationalization of SMEs, the extent to which different digital technologies (DTs) help firms in exporting into international markets is still unclear (Liao *et al.* 2009, Mostafa *et al.* 2005, Reuber and Fischer 2011). In fact, digitalization is a very complex phenomenon, which is substantially changing the nature of products, services, and organizations (Yoo *et al.* 2012). For instance, Hagsten and Kotnik (2017) and Pickernell *et al.* (2016) observed that website usage by firms is main determinant SMEs decisions while online sales are insignificant. On the other hand, for Hagsten (2015) online sales are significant.

Bianchi and Mathews (2016) and Bianchi *et al.* (2017) pointed out that internet technologies may affect export growth only indirectly, while Mathews (2011) found a direct relationship. The impact on competitiveness is only due to which forms of DT are adopted, but also how they are used. Galandary (2013) found that ICTs become

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a determinant of international market performance only in terms of seeking information and increasing long-term relationships, rather than supporting online sales.

Many scholars have also underlined that DTs foster a firm's performance when they are embedded within organizational changes (Powel and Dent-Micallef 1997, Booth and Philip 1998, Barney 2001, Li and Ye 1999, Tippins and Sohi 2003, OECD 2016). Improving digital organization internally may be the right way to integrate digital technologies into a firm's strategy and skills development. Indeed, firms today cannot ignore the incumbent digital paradigm, and thus have to adapt their strategies to new scenarios and transformations due to global challenges, including digital contents and human skills. Consequently, the individual skills employed must be converted into collective skills that enable firms to operate and compete in wider markets. Thus, the improvement of digital organization should be embedded within internal processes in which skills, innovation, and organizational culture grow simultaneously.

In this paper, we focus on the role of organizational changes related to the adoption of advanced DTs in affecting the international market performance of firms. More specifically, we empirically investigate whether the likelihood of export growth is related to the organizational innovations resulting from the implementation of software tools that enable firms to share information with their suppliers, customers, and business partners along the supply chain (such as Enterprise Resource Planning - ERP - and Supply Chain Management - SCM – applications, cloud computing and e-business services). These technologies have received comparatively less attention from scholars even though they are perceived to be particularly suitable for the internationalization strategies of small firms. We use binary probit models and compute marginal effects. Also, we test the impact of several variables that explain the role of organizational innovation of firms and firm's investment in digital skills. Finally, we control for size, location and sector of activity. Our results show that the likelihood of increasing export is correlated with the embedding processes of DTs within the organizational innovations of firms, which exploit the potential of DTs to increase their competitiveness.

The structure of this paper is as follows. In Section 2 we review the related literature. Section 3 outlines the methodology adopted and summary statistics. Section 4 presents the results and discussion. Section 5 concludes the paper.

1. Literature review

The relationship between information technologies and productivity, industrial performance, innovation and export growth of national and regional economic systems has been the subject of many studies (Freund and Weinhold 2004, Spiezia 2012, Portugal-Perez and Wilson 2012, Evangelista *et al.* 2014, OECD 2016). The Internet, online activities and ICT usage have been found to positively affect foreign sales (Prasad *et al.* 2001, Aspelund and Moen 2004, Morgan-Thomas and Bridgewater 2004, Clarke 2008, Bianchi and Mathews 2013, Hagsten 2015, Bennett 1997, Bianchi and Mathews 2016).

Among the drivers affecting a firm's performance, DTs are increasingly becoming a determinant of export growth (Bianchi and Mathews 2016, Bianchi *et al.* 2017, Galandary 2013). DTs facilitate access to international markets, increase the rate and speed of internationalization process by reducing distance and entry-related costs through a greater integration between business partners, suppliers and customers (Liu *et al.* 2016) as well as increasing knowledge of foreign markets (Bianchi and Mathews 2013, Freund and Weinhold 2004).

More specifically, DTs reduce the transactional costs (Lohrke *et al.* 2006, Kontinen and Ojala 2010) related to environmental uncertainties and to communication (Samie 1998, Dandridge and Levenburg 2000, Daniel *et al.* 2002, Bell and Loane 2010, Sinkovics *et al.* 2013). Indeed, DTs improve the efficiency of the information exchange (Gabrielsson and Kirpalani 2004, Loane *et al.* 2004, Mathews and Healy 2008) with international customers, suppliers and partners (Hamill 1997) as well as providing further and faster information on competitors (Petersen *et al.* 2002, Loane *et al.* 2004, Borges *et al.* 2009). They also increase knowledge regarding the varieties of goods and their related characteristics (Bianchi and Mathews 2016, Loane and Bell 2006, Mathews and Healy 2008, Borges *et al.* 2009). The higher quality of knowledge information supports firms in their decision-making process (Samie 1998, Teo and Choo 2001).

DTs facilitate the development of both the internal and external relations of firms (White and Daniel 2004), produce new international business networks (Petersen *et al.* 2002) and increase trade relationships with customers and suppliers (Samie 1998, Teo and Choo 2001, Morgan-Thomas 2009), thus fostering integration in the GVCs (De Marchi *et al.* 2018). DTs allow small firms to increase export activities through lower investments, thus overcoming their traditional burdens linked to size issues (Overby and Min 2001, Arnott and Bridgewater 2002, Houghton and Winklhofer 2004, Simpson and Docherty 2004, Saban and Rau 2005, Fillis and Wagner 2005,

Maranto-Vargas and Gómez-Tagle-Rangel 2007, Mathews and Healy 2008, Tseng and Johnsen 2011, Consoli 2012, Tarutė and Gatautis 2014).

Regarding the role of DTs on export activity and performance, the literature has focused both on mature ones, such as websites and e-commerce (Hagsten and Kotnik 2017, Pickernell *et al.* 2016, Bianchi and Mathews 2013, Daniel *et al.* 2002, Morgan-Thomas 2016, Saban and Rau 2005), and more advanced ones, such as enterprise resource planning (ERP) and customer relationship management (CRM) (Oviatt and McDougall 2005, Reuber and Fischer 2011, Ross and Blumenstein 2015, Tseng and Johnsen 2011). ERP and CRM are useful for improving internal organizational processes and for facilitating the relationships with supply chain partners (Porter 2001).

Nevertheless, investments in DTs may not lead to increasing competitiveness level when considered alone (Li and Ye 1999, Trainor *et al.* 2010). The Internet generates a competitive advantage and positively affects a firm's performance when it is embedded within organizational practices or processes (Powel and Dent-Micallef 1997, Booth and Philip 1998, Barney 2001, Li and Ye 1999, Tippins and Sohi 2003, OECD 2016). Introducing DTs may involve organizational changes, such as re-engineering business processes and the adoption of new marketing methods (Spiezia 2012), including production planning, inventory management, order scheduling and CRM (Jean 2007, Sanders 2005, Marinagi *et al.* 2014).

The potential of DTs also depends on internal skills for managing such technologies appropriately (Brynjolfsson and Hitt 2000, Díaz-Chao *et al.* 2015, Jones *et al.* 2014, Moen *et al.* 2008, Bianchi and Mathews 2016, Jean 2007, Liu *et al.* 2016, Sanders 2005) and for converting specific competences absorbed from the outside into new human resources for the firm (Cohen and Levinthal 1990, Li 2009).

The empirical literature has only recently started to investigate the relationship between digital technologies and export behaviour in more depth (Hagsten 2015, Hagsten and Kotnik 2017, Ghalandari 2013, Love and Roper 2015, Pickernell *et al.* 2016, Bianchi and Mathews 2016, Bianchi *et al.* 2017, Sinkovics *et al.* 2013, Rangriz 2012, Olejnik and Swoboda 2012). Some scholars (Cassetta *et al.* 2016, Pickernell *et al.* 2016, Hagsten and Kotnik 2017) have analyzed the effects of internet-based technologies on the presence of firms on foreign markets, whereas others (Morgan-Thomas and Bridgewater 2004, Murphy and Bruce 2003, Morgan-Thomas 2009, Toften and Hammervoll 2011, Bell and Loane 2010, Mostafa *et al.* 2005) have focused on the impact of the Internet on market performance. Morgan-Thomas and Jones (2009) found that SMEs that invest in ICT are more likely to be larger and register a more rapid growth in their sales abroad. Moon and Jain (2007) found internet marketing abilities (internet marketing research, support services, and promotional activities) are positively related with profit, sales and market share.

Focusing on export growth in Chilean firms, Bianchi and Mathews (2016) found that internet marketing capabilities (online sales, advertising and research) positively affect export market growth only indirectly by improving business network relationships, which in turn foster international performance. This finding is confirmed by Bianchi *et al.* (2017) using slightly different indicators to measure internet capabilities (investments in technology, IT operation capabilities, e-commerce activities). A direct relationship between DTs and international market growth was found for Australian firms by Mathews (2011) and Bianchi and Mathews (2010); here internet usage (including websites) and internet marketing intensity (including e-commerce) positively influence foreign sales. Focusing on Iranian firms, Galandary (2013) found that using ICT for information searches and long-term communicational development and interaction, positively affect international market performance.

2. Methodology

2.1. Data and variables

Our data source was a survey carried out by the Italian Union of Chambers of Commerce (Unioncamere-Si.Camera) in 2015 on a representative sample of 426 exporting manufacturing SMEs in Italy, with at least four employees. Data collected include information on firms' structural characteristics such as size, geographical location at a macro-territorial level (north-west, north-east, centre-south and islands) and industrial sector. The survey also includes a wide range of different data on digitalization, such as website use and e-commerce activities, digital organization, and employment of people with high-digital skills. The dataset also includes issues regarding internationalization, particularly on export performance and drivers of competitiveness.

Zucchella *et al.* (2007) observed three dimensions of export, based on:
- geographic scope (number of exporting countries);
- precocity (early start of international activities) and speed of foreign sales;
- export intensity (percentage of export of total sales).

Leonidou *et al.* (2002) pointed out that export intensity can be measured through indicators, such as export sales growth, export profit, export sales volume or export profit contribution.

Research carried out in Italy (Basile 2001, Majocchi *et al.* 2005, D'Angelo 2012) has mainly adopted the ratio between export sales and total sales as a proxy of export intensity. Bianchi and Mathews (2016) analysed the international performance of SMEs using variables such as the growth of new customers in new or existing export markets.

Table 1. Variables definition

Variables	Type	Description
Dependent		
Export increase	Dummy	Whether the firm has registered export growth in 2015 (yes = 1. no = 0)
Independents		
Mature digital technologies	Dummy	Whether the firm uses website in at least one foreign language and carries out e-commerce activities (yes = 1. no = 0)
Digital organization	Dummy	Whether the firm during 2012-2014 has introduced organizational changes related to digital technologies (ERP, SCM, e-business services, web-marketing, *etc.*) (yes = 1. no = 0)
Digital skills	Dummy	Whether the firm during 2012-2014 has employed persons with high-digital skills (*e.g.* software development, engineering, database managers, *etc.*) (yes = 1. no = 0)
Product Innovation	Dummy	Whether the firm during 2012-2014 has introduced product innovation (yes = 1. no = 0)
Process innovation	Dummy	Whether the firm during 2012-2014 has introduced technological process innovation (yes = 1. no = 0)
Competitiveness quality	Dummy	Whether the firm bases mostly its international competitiveness strategy on the quality of goods produced rather than lower prices (yes = 1. no = 0)
Human capital	Continuous	Share of graduated employees
Control variables		
Micro	Dummy	Firms with 4-9 employees (yes = 1. no = 0)
Small	Dummy	Firms with 10-49 employees (yes = 1. no = 0)
Medium	Dummy	Firms with 50-249 employees (yes = 1. no = 0)
Technology sectors	Dummy	Whether the firm belongs to a medium-high/high technology intensive sector (yes = 1. no = 0)
Traditional sectors	Dummy	Whether the firm belongs to a medium-low/low technology intensive sector (yes = 1. no = 0)
North-West	Dummy	Whether the firm is located in the North-West (yes = 1. no = 0)
North-East	Dummy	Whether the firm is located in the North-East (yes = 1. no = 0)
Centre-South and Islands	Dummy	Whether the firm is located in the Center-South and Islands (yes= 1.no = 0)

Source: Authors' elaboration.

Ghalandari (2013) measured international performances through the degree of satisfaction of the management, taking into account some indicators including sales growth. Bianchi *et al.* (2017) used indicators related to improving international market share, growth and profitability.

In our empirical analysis, we use export growth: the variable is 1 if the firm registered an export increase in 2015, and 0 otherwise.

Digitalization is a very complex phenomenon, since different technologies produce heterogeneous effects on a firm's performance (Garicano and Rossi-Hansberg 2006, Bloom *et al.* 2014). In line with Bianchi and Mathews (2010), Mathews (2011), Hagsten and Kotnik (2017) and Bianchi and Mathews (2016), we tested website and e-commerce usage (mature digital technologies): our variable is 1 if the firm has a website not only in Italian but also in a foreign language and carries out e-commerce activities.

According to Bianchi and Mathews (2016) and OECD (2016), we measured the relationship between the international sales growth and the organizational changes involving the adoption of digital technologies. To capture this linkage, we included a dummy variable accounting for whether the firm is innovative in terms of digital organization (such as supply-chain management, business re-engineering, enterprise resource planning, *etc.*). Then, to account for the effect of digital skills, we included a binary variable: 1 if the firm has employed people with high-digital skills, 0 otherwise. Finally, we included a proxy of human capital, calculated as the proportion of employees with a university degree.

To evaluate the relationship between international performance and innovation (Basile 2001, Ozcelik and Taymar 2004, Lopez Rodriguez and Garcia Rodriguez 2005, Love and Roper 2015, Nassimbeni 2001, Higón and Driffield 2011) we introduced two dummy variables: if the firm has realized product innovation, and if the firm has realized process innovation. To overcome the potential causal effect between export and innovation, innovation variables were lagged by one year (Lopez Rodriguez and Garcia Rodriguez 2005, Spanos *et al.* 2004, D'Angelo 2012).

To capture the impact of the quality of production on performance in the foreign markets we computed a dummy variable: 1 if the firm has oriented its international competitiveness on production quality, 0 otherwise.

To control for the characteristics of firms, we included size (Lopez Rodriguez and Garcia Rodriguez 2005, Cavusgil and Zou 1994). Also, we controlled for the macro-territorial areas (north-west; north-east; and centre-south and islands), to take into account the different geographical locations (Del Monte and Papagni 2003). Then, to test the impact of technological intensity on export growth (Zou and Stan 1998, Cavusgil and Zou 1994) we used a dummy variable accounting for whether a company works in a technology (medium-high and high intensity) sector.

2.2. The econometric model

To empirically test the effects of digitalization on export growth, we included a binary dependent variable (increase/no increase in exports) and several predictors. Each of them is a dummy variable with two possible values (0, 1). Only human capital is a continuous variable and accounts for the proportion of employees with a university degree.

In order to model such a limited dependent variable, we used a probit regression model. Since the probit model is nonlinear, it models the conditional probability of a "successful" outcome, that is, $Y_i = 1$, *i.e.* whether the firm has increased exports during the period in question. In other words, depending on the regressors, the probability that the outcome variable Y_i is 1, is a certain function of a linear combination of the regressors. We also tested the marginal effect of the specific predictor which is equal to the relevant slope coefficient and which measures how much the mean of the outcome variable changes when that predictor varies, while all the other predictors are held at some values. Unlike with a linear model, with a probit model the coefficients do not directly measure the marginal effects and therefore the marginal effects need to be calculated:

$$\frac{\partial P(Y_i = 1 | X_{1i}, \dots, X_{Ki}; \ \beta_0, \dots, \beta_K)}{\partial X_{ki}} = \beta_k \phi \left(\beta_0 + \sum_{k=1}^{K} \beta_k X_{ki} \right) \tag{1}$$

where: $\phi(\cdot)$ is the standard normal probability density function. As highlighted by the right hand side of the formula, this marginal effect depends not only on the regression coefficient β_k, but also on the values of all the other predictors, as well as the regression coefficients.

Depending on the choice of the other predictors used in this formula, various marginal effects were then calculated. The most common marginal effects reported are those where all the other predictors are set to their mean values. More specifically, the marginal effect of a covariate may be interpreted as the partial derivative of the event probability with respect to the independent variable that we are taking into account. Marginal effects xi in the probit model correspond to φ(x'b)bi, where φ(x'b) is the density function of the standard normal, x'b is the outcome of the vector of chosen values, and bi is the parameter estimate for xi.

2.3. Summary statistics

Table 2 shows the summary statistics. The variables are all qualitative except human capital. A total of 18.5% of firms considered have registered an export growth in 2015. The majority of the firms are small (10-49 employees) and represent 47.7% of the sampled SMEs, micro firms (4-9 employees) 27.7% and medium sized firms 24.6%. A total of 43.4% were located in the north-west, 29.8% in the north-east and 26.8% in the centre-south and islands. By using EUROSTAT taxonomy (http://ec.europa.eu/eurostat/cache/metadata/FR/htec_esms.htm) the proportion of high and medium-high technology firms was 35.9% of the total, and 9% of the employees have a degree.

Focusing on digitalization, 72.5% of the sample have a website in a foreign language[61] and use e-commerce (mature digital technologies), whereas 29.8% have innovated in terms of digital organization; 24.6% have employed people with high-digital skills. Firms that have innovated their products and processes represent 22.5% and 27.5%

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[61] We took into account the foreign language to link above all the digitalization factor (website use) to internationalization issues.

of the sample, respectively. Finally, around 40% of the total firms base their international competitiveness on production quality rather than low prices.

Table 3 displays the correlation matrix among variables. All correlation coefficients are positive and only one is slightly negative (-0.03); they also present values lower than 0.3. The only exception is the relationship between digital organization and process innovation (r = 0.42, p-value < 0.01).

Table 2. Summary statistics

Variables	Mean	95% CI		S.D.
Export increase	0.185 (0.019)	0.148	0.223	0.389
Mature digital technologies	0.725 (0.022)	0.683	0.768	0.447
Digital organization	0.298 (0.022)	0.255	0.342	0.458
Digital skills	0.246 (0.021)	0.205	0.288	0.431
Product innovation	0.225 (0.020)	0.186	0.265	0.418
Process innovation	0.275 (0.022)	0.232	0.317	0.447
Competitiveness quality	0.392 (0.024)	0.345	0.439	0.489
Human capital	8.948 (0.711)	7.551	10.345	14.670
Micro	0.277 (0.022)	0.234	0.320	0.448
Small	0.477 (0.024)	0.429	0.524	0.500
Medium	0.246 (0.021)	0.205	0.288	0.431
Technology sectors	0.359 (0.023)	0.313	0.405	0.480
Traditional sectors	0.641 (0.023)	0.595	0.687	0.480
North-West	0.434 (0.024)	0.387	0.482	0.496
North-East	0.298 (0.022)	0.255	0.342	0.458
Centre-South and Islands	0.268 (0.021)	0.225	0.310	0.443

Source: Authors' elaboration.

Table 3. Correlation matrix

Variables	1	2	3	4	5	6	7	8
1. Export increase	1.000							
2. Mature digital technologies	0.158*	1.000						
3. Digital organization	0.230*	0.125*	1.000					
4. Digital skills	0.274*	0.157*	0.270*	1.000				
5. Product innovation	0.162*	0.068	0.152*	0.070	1.000			
6. Process innovation	0.126*	0.108*	0.415*	0.234*	0.159*	1.000		
7. Competitiveness quality	0.149*	0.085	0.086*	0.177*	-0.030	0.077	1.000	
8. Human capital	0.088*	0.164*	0.035	0.052	0.108	0.098	0.640	1.000

Note * p-value < 0.01.
Source: Authors' elaboration.

3. Results and discussion

Table 4 shows the results from binary probit models and marginal effects. In the first specification (Model 1) we measured the impact of mature digital technologies on the export growth. Then, we included digital organization (Model 2); finally, we added digital skills (Model 3).

The adoption of mature technologies (website/e-commerce) has a positive and significant effect on export increase at the 5% (Model 1) whereas it loses significance moving from Model 1 to Model 3. When digital organization is included in the model its marginal effects are significant at p < 0.01, both in Model 2 and Model 3. When we tested mature technologies, digital organization and digital skills all together (Model 3), digital skills had the highest values. Product innovation is statistically significant and moves from 1% (Model 1) to 5% (Model 3). Conversely, process innovation does not show any significant effects. Also, our results show that competitiveness quality is statistically significant at 1% in all the specifications.

Concerning control variables, there was a slightly more positive relationship between medium firms and an increase in exports, compared to micro sized firms. Furthermore, no significant effect was found between low-tech intensity and the probability of increasing exports, compared to high-tech sectors. Finally, unlike other research focusing on Italy (D'Angelo 2012, Pini and Quirino 2016), geographical location did not show any significant effect.

The results support the idea that digital technologies have a positive impact on export growth. However, the literature is still unclear regarding the relationships between digitalization and international performance (Liao *et al.* 2009, Mostafa *et al.* 2005, Reuber and Fischer 2011). For instance, e-commerce is not significant for Hagsten and

Kotnik (2017) and Pickernell *et al.* (2016), in contrast to Hagsten (2015). Moreover, while Mathews (2011) underlined a direct effect of internet activities on export growth, Bianchi and Mathews (2016) and Bianchi *et al.* (2017) found an indirect effect. Ghalandari (2013) highlighted the importance of ICTs when used for seeking information and strengthening relationships rather than online sales activities.

Our results may also support the idea of the need of including digital technologies in the internal organization processes of a firm. Powel and Dent-Micallef 1997, Booth and Philip 1998, Barney 2001, Li and Ye 1999, Tippins and Sohi 2003, OECD 2016 observed that digital organization has a positive effect on firms' competitiveness. According to Giovannetti *et al.* (2014), firms with a tightly integrated supply chain exhibit better performance in international markets. This means that transformation is not about only technological innovations and related adoption or integration into business activities, it also concerns how these innovations are adopted. Indeed, technological innovation implies digital transformation not only of methods and tools but above all internal organization, as it involves competitive positioning at all levels including the whole supply chain.

Also, in line with Jean (2007), the importance of digital skills is also supported by the results of human capital: in fact, human capital does not seem to show any significant effect on export growth. This may be explained with the "digital gap paradigm", *i.e.* the need to recruit employees with specific digital skills should be a prerequisite for competing more into international markets.

The results concerning the positive impact of product innovation and the absence of significance of process innovation are in line with D'Angelo (2012), and Higón and Driffield (2011) who found a stronger relationship for product innovation than process innovation. This may be explained by the fact that products depend more on consumer demand than processes. However, process innovation is a very complex phenomenon with considerable differences across all the value chain supply. Process innovation can lower costs, especially in the initial stages of an entrepreneurial activity. Nevertheless, innovation processes could require more financial resources, and may represent a constraint to smaller firms that have fewer resources available. Firms need to focus on internal changes in their organization, which includes more flexibility and openness to outside.

Product quality is another key element for improving standards of firms' competitiveness, as it ensures faster processes in line with the increasing dynamics of global markets. By using digital technologies and digital marketing tools, firms may promote their quality and provide useful information about the variety and differentiation of the goods produced and supplied.

Finally, the literature does not provide any clear explanations on the effect of size on export performance (Zou and Stan 1998): for instance, while some scholars (Dharanaj and Beamish 2003, Majocchi *et al.* 2005, D'Angelo 2012) have found a positive relationship, others (Wolff and Pett 2000, Bonaccorsi 1992) have observed negative or no significant effects. Our results indicate that size matters. In fact, it is more likely that medium firms are positively related with higher export growth, compared to micro firms.

Table 4. Results from binary probit models and marginal effects at means

Variables	Model 1	dy/dx (1)	Model 2	dy/dx (2)	Model 3	dy/dx (3)
Mature digital technologies	0.462** (0.194)	0.113** (0.047)	0.449** (0.198)	0.108** (0.047)	0.370* (0.202)	0.086* (0.047)
Digital organization			0.556*** (0.170)	0.133*** (0.041)	0.432*** (0.176)	0.101*** (0.041)
Digital skills					0.637*** (0.170)	0.149*** (0.040)
Product innovation	0.467*** (0.167)	0.114*** (0.041)	0.413** (0.171)	0.099** (0.041)	0.397** (0.174)	0.093** (0.041)
Process innovation	0.219 (0.162)	0.054 (0.040)	-0.001 (0.178)	-0.000 (0.043)	-0.059 (0.180)	-0.014 (0.042)
Competitiveness quality	0.447*** (0.150)	0.110*** (0.037)	0.412*** (0.152)	0.099*** (0.036)	0.344** (0.156)	0.080** (0.036)
Human capital	0.003 (0.005)	0.001 (0.001)	0.003 (0.005)	0.001 (0.001)	0.003 (0.005)	0.001 (0.001)
Small *(Micro)*	0.281 (0.195)	0.062 (0.041)	0.270 (0.197)	0.059 (0.041)	0.285 (0.200)	0.059 (0.039)
Medium	0.415** (0.217)	0.099** (0.052)	0.411* (0.219)	0.096* (0.051)	0.495** (0.224)	0.115** (0.052)
Traditional sectors *(Technology sectors)*	0.107 (0.160)	0.026 (0.039)	0.122 (0.163)	0.029 (0.039)	0.106 (0.166)	0.025 (0.039)
North-West	0.048	0.012	0.001	0.000	0.037	0.009

Variables	Model 1	dy/dx (1)	Model 2	dy/dx (2)	Model 3	dy/dx (3)
(Center-South and Islands)	(0.191)	(0.046)	(0.193)	(0.046)	(0.196)	(0.046)
North-East	0.082 (0.201)	0.020 (0.049)	-0.009 (0.206)	-0.002 (0.049)	-0.006 (0.210)	-0.001 (0.048)
Constant	-2.035*** (0.292)		-2.092*** (0.298)		-2.166*** (0.304)	
Observations	426	426	426	426	426	426
LR chi^2	37.18		47.87		61.82	
Log likelihood	-185.701		-180.354		-173.380	
Prob > chi^2	0.000		0.000		0.000	
Pseudo R^2	0.091		0.117		0.151	

Note: Standard error in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. In the fist column reference category is shown in parentheses.

Source: Authors' elaboration.

On the other hand, we found no significant results in relation to business sectors of activity and location of the firm. This probably means that other factors may account for export growth. In fact, issues such as internal organization processes may be the key element for improving competitive advantages. These results require further investigation in a multilevel framework, as the interplay between micro and context variables may provide different impacts, regardless of the location and sector of activity.

Conclusions

The process of modernising a business and the use of new digital technologies is of great interest for both academics and policy makers. Although digital technologies have considerable advantages, many firms seem reluctant to use them. The lack or scarcity adoption and use of these technologies is due to several factors such as limited resources and the effectiveness in terms of return on investment that digital technologies can provide. Nevertheless, these constraints need to be overcome to ensure the survival of firms given the increasingly competitive global markets.

In such competitive markets, the need to create and improve a "digital culture" is key factor in explaining the digital transformation process. Embedding the digital culture in a firm is of primary importance for attracting skilled people and improving the way firms interact with other competitors. This entails companies reassessing their operating models by leveraging on new practices. In fact, digital organization means not only digital products, services, innovative products and processes, but also strengthening core operations with technology, which in turn increase the competitive advantage of a firm.

Today, whereas most internet users search for products online, many firms, organization are still uncertain about the importance of digital skills, and there is a digital skills gap across broad industrial sectors and services as well. The adoption of some forms of (both basic and advanced) technologies, as well as investments to improve digital skills is geographically uneven, thus affecting the available policy options. Future research should also further explore potential heterogeneity in digitalization paths among different industries, as well as in other countries.

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Does the Development Potential of the Country Meet Its Productivity? The Case of World Trade Organisation Members and Criterion of Competitiveness Fever

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Abstract:

Changes in the global economy during the last quarter-century or so have intensified competition and increased the need for government support. Competitiveness is thus high on political agenda and depends on a multiplicity of actions that can optimize the development potentials of countries and internal factor endowments. However, do all countries have the same opportunities in terms of competitiveness with respect to their development potential? Countries face very different challenges and priorities as they move from resource-based to knowledge-based stage, what influences their competitive advantages. All countries possess development opportunities – however, use these options must be efficient enough.

Competitiveness and performance importantly affecting the world trade and international relations, especially nowadays, in view of the changing position of the world leaders and growth of new economic powers. This creates new threats and challenges in terms of drivers of the economy for all players. The article focuses on using the Data Envelopment Analysis (DEA) and the Cluster Analysis (CA) for comparing the productivity level and efficiency changes of the World Trade Organization (WTO) members. Applicability of evaluation is illustrated by a real dataset involving the factors of competitiveness based on the World Economic Forum (WEF) approach in reference period 2007-2017.

Keywords: cluster analysis, DEA method; competitiveness; productivity; stage of economic development; WEF; WTO

JEL Classification: C67; C82; E60; F02; O11; P51

Introduction

The issue of competitiveness has attracted a lot of attention, both at academic and practical levels, during the last quarter-century, *i.e.* since the emergence of the new economic philosophy in favour of market orientation and trade liberalization. Openness to the world is crucial to competitiveness. No country has developed successfully in modern times without opening its economy to international trade, investment, and the movement of people across borders. But openness on its own has its limits. To reap its benefits fully, it must be combined with productivity-enhancing reforms at home and with boosting the internal factor endowments of the economy, resp. the country as such.

The effect of openness, trade liberalisation on economic growth as well as relationships between economic growth and competitiveness remain highly contentious issues. Today's economic circumstances are full of challenges. Yet it is advanced economies that have historically been the drivers of a more globally integrated world, leading eventually to a multipolar world with changing global political-economic relations. At the same time, there are signs of new energy in global integration and when viewed from a longer perspective, this energy (in the form of the growth potential of developing economies) is not surprising, forming part of a long trend towards more closely interlinked global markets. These developments have intensified relations in global markets, which, in turn, implies a greater need to be competitive and efficient to generate additional market opportunities and economic links in the presence of many more participants vying for the same space.

1. Research background

In recent years, the topics about measuring and evaluating competitiveness have enjoyed economic interest. Although there is no uniform definition and understanding of competitiveness, this concept remains one of the basic standards of performance evaluation and it is also seen as a reflection of the success of area (company, country, and region) in a wider comparison. Competitiveness occurs through the actions of a firm, located in a specific country with specific characteristics and environment, against other nations as well as international firms, with a particular product or products, in a marketplace with a specific structure, under certain world economic conditions;

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its aim is to obtain certain development objectives at the level of firm and nation. To obtain their objectives, firms and their governments take some specific actions and pursue a strategy over time. An important aspect is a level at which the concept of competitiveness is defined; in most cases, the micro and macroeconomic level are considered, which are strictly interrelated. This concept has extended from micro-level of firms to macro-level of countries which is the focus of this article. Macroeconomic competitiveness is monitored by many institutions, however, two well-known international institutes, *i.e.* Institute for Management Development (IMD) and World Economic Forum (WEF) publish most reputable competitiveness reports. To compare a level of competitiveness of individual countries in the article, the meaning of competitiveness by WEF and subsequently its database are employed.

The first reason for choosing WEF's approach is its long-term continuity and international recognition of stakeholders. Since 1979, WEF publishes Global Competitiveness Report (GCR) that produces annual Global Competitiveness Index (GCI) to rank national economies. GCR aims to serve as a neutral and objective tool for governments, the private sector, and civil society to work together on effective public-private collaboration to boost future prosperity (WEF 2017a).

The second reason for choosing WEF is its approach to perceiving competitiveness and suitability in terms of an applied quantitative method what is linked with productivity concept. Based on WEF's approach, competitiveness can be defined as the set of factors – policies, institutions, strategies and processes – that determine the level of sustainable productivity of an economy, be it the world, a continent (or macro region), nation, region or even a city (WEF 2017a). WEF defines competitiveness as the set of institutions, policies, and factors that determine the productivity level of a country. Productivity level, in turn, sets the level of prosperity that can be reached by an economy. Productivity level also determines the rates of return obtained by investments in an economy, which in turn are the fundamental drivers of its growth rates. In other words, a more competitive economy is one that is likely to grow faster over time (WEF 2016, 35).

In WEF's definition of competitiveness is an important term – productivity. Many authors, with Krugman (1996) and Porter (1990) among others, agree on the definition of competitiveness as productivity, which is measured by the value of goods and services produced by a nation per unit of human, capital and natural resources, especially in the form of competitive advantage determined by the strength of factor endowments. They see as the main goal of a nation the production of high and rising standard of living for its citizens which depends essentially on the productivity with which a nation's resources are employed. The concept of competitiveness is thus linked to productivity, usually based on Porter's approach (1990). Competitiveness is determined by productivity with which a location uses its human, capital, and natural endowments to create value. Endowments create a foundation for prosperity, but true prosperity is created by productivity in the use of endowments. Productivity ultimately depends on improving the microeconomic capability of the economy and the sophistication of local competition. It is not what a location competes in that determines its prosperity, but how productively it competes. Macroeconomic competitiveness sets the potential for high productivity but is not sufficient. Competitiveness thus centres on productivity – the efficiency with which an economy uses available inputs to produce outputs.

Nowadays, competitiveness is monitored characteristic of national economies which is increasingly appearing in evaluating their performance. The need for a theoretical definition of competitiveness at the macroeconomic level emerged with the development of the globalization process in the world economy as a result of increased competition between countries. In an increasingly global economy, the future prosperity of a country thus depends more and more on the macroeconomic competitiveness in an international context. Nations adopt economic policies that directly affect the ability of enterprises and industries engage in international trade and investment (Fojtíková 2013). This concept is thus often used in analyzing countries' macroeconomic performance. It compares, for a country and its trading partners, a number of salient economic features that can help explain international trade trends, especially between members of the World Trade Organization (WTO). It should be emphasized here that openness to global markets and the internationalization of economies play an increasing role in productivity and competitiveness enhancement (Fojtíková and Staníčková 2017), and WTO thus interconnects interest of global economy in the form of openness and competitiveness.

Therefore, policy-makers at all levels have been swept up in this competitiveness fever. This growing interest may perhaps be partly attributable to their awareness of the fact that all countries are having to contend with raised standards of economic efficiency as a result of the globalization of goods and factor markets. Macroeconomic competitiveness of individual countries is considered by national governments to be important policy targets and, at the same time, for issues that need to be solved. For a number of years, government objectives have been set not only in terms of improving macroeconomic performance against other countries but also in terms of creating

conditions (especially by efficient and effective using of internal factor endowments) to allow less productive countries to reduce the 'gap' between themselves and the most productive ones.

Comparative analysis of efficiency in the public sector is thus the starting point for studying the role of efficiency, effectiveness and performance regarding the economic governance of resource utilisation by public management for achieving the short/medium-term objectives of economic recovery and sustainable development of national economies (Mihaiu, Opreana and Cristescu 2010, 132). Increasing performance is generally considered as the only one sustainable way of improving living standards in the long-term, *i.e.* the main aim of competitiveness concept. However, do all countries have the same opportunities in terms of competitiveness? GCR emphasizes an increasingly important theme confronting many nations – countries face very different challenges and priorities as they move from resource-based to knowledge-based economies, what influences their competitive advantages and also disadvantages. It is generally accepted that the level of economic development is not uniform across territories.

On the contrary, it substantially differs. As an economy develops, so do its structural bases of global competitiveness. This process can be described as a sequence of stages, each with a different set of economic characteristics and challenges (Porter 1990, 555-565): Factor-driven stage: competitive advantage is based exclusively on endowments of labour and natural resources; investment-driven stage: Efficiency in producing standard products and services becomes the dominant source of competitive advantage; and Innovation-driven stage: the ability to produce innovative products and services at the global technology frontier using the most advanced methods becomes the dominant source of competitive advantage.

Successful economic development is thus a process of successive upgrading, in which businesses and their supporting environments co-evolve, to foster increasingly sophisticated ways of producing and competing. Seeing economic development as a sequential process of building not just macroeconomic stability but also interdependent factors such as quality of governance, the societal capacity to advance its technological capability, more advanced modes of competition, and evolving forms of firm organizational structure, helps to expose important potential pitfalls in economic policy. To evolve successfully through different levels of development, key parts of the economic environment must change at appropriate times. Lack of improvement in any important area can lead to a decline in productivity and stalled economic growth. Stage of development taxonomy provides a framework for action for countries that wish to improve their competitiveness.

Using interconnections between competitiveness – productivity and WEF's meaning of competitiveness, it´s possible to make a decision about a quantitative method to competitiveness measuring and evaluating. Statistical evidence to help policymakers to understand the routes to performance growth and competitiveness enhancement, especially those influenced by the government, can help to lead to better policy. To get empirical applications for economic policy, the Data Envelopment Analysis (DEA) approach is used in this article. DEA can be considered as a suitable method for productivity measurement because it does not evaluate only one factor, but a set of different factors that determine the level of productivity. Variables employed in empirical analysis are chosen based on the WTO approach to competitiveness, *i.e.* in the form of GCI which has many dimensions. Treating some these dimensions as inputs and outputs in a production process, the article exploits the notion of productive efficiency to extract information for policymakers, which cannot be otherwise obtained from conventional studies on competitiveness or indices approach alone. Using thus DEA approach is also suitable with respect to link to the main aim of competitiveness; it is the competitiveness of economies – the level of productivity of continents, nations, subnational regions, and even cities – that determines how well they translate openness to trade and investment into opportunities for their firms, farms, and people and into overall transformation process in the form of input-output relations.

Total competitive performance does not depend primarily on efficiency, but the effectiveness of the overall economic processes. Efficiency is given by the ratio of inputs and outputs. Effectiveness implies the relationship between outputs and outcomes. In this sense, the distinction between output and outcome must be made. The outcome is often linked to welfare or growth objectives and therefore may be influenced by multiple factors (including outputs as well as exogenous environmental and social factors). Effectiveness is thus more difficult to assess than efficiency since the outcome is influenced by political choice. There are thus three key topics for the article concept: competitiveness – productivity – stage of development, and their interdependence show Figure 1.

Based on the research background explained above is possible to specify the orientation of the article. The main aim of the article is to propose an application in order to evaluate efficiency changes and to analyse a level of productivity depending on each country's stage of development. DEA approach applies in the form of output-oriented Malmquist productivity index with constant returns to scale (OO MPI CRS). Multivariate Cluster Analysis (CA) defines clusters of countries based on DEA results and shows a degree of association between development potential and productivity of the economy. The calculation is verified on the sample of 137 WTO members with the

balanced number of inputs and outputs in the reference period 2007-2017 (including all the years inside this range). Variables of inputs and outputs present the factors of competitiveness based on GCI, which is part of GCR published by WEF every year.

Figure 1. Interconnect among concepts competitiveness, productivity and stage of development
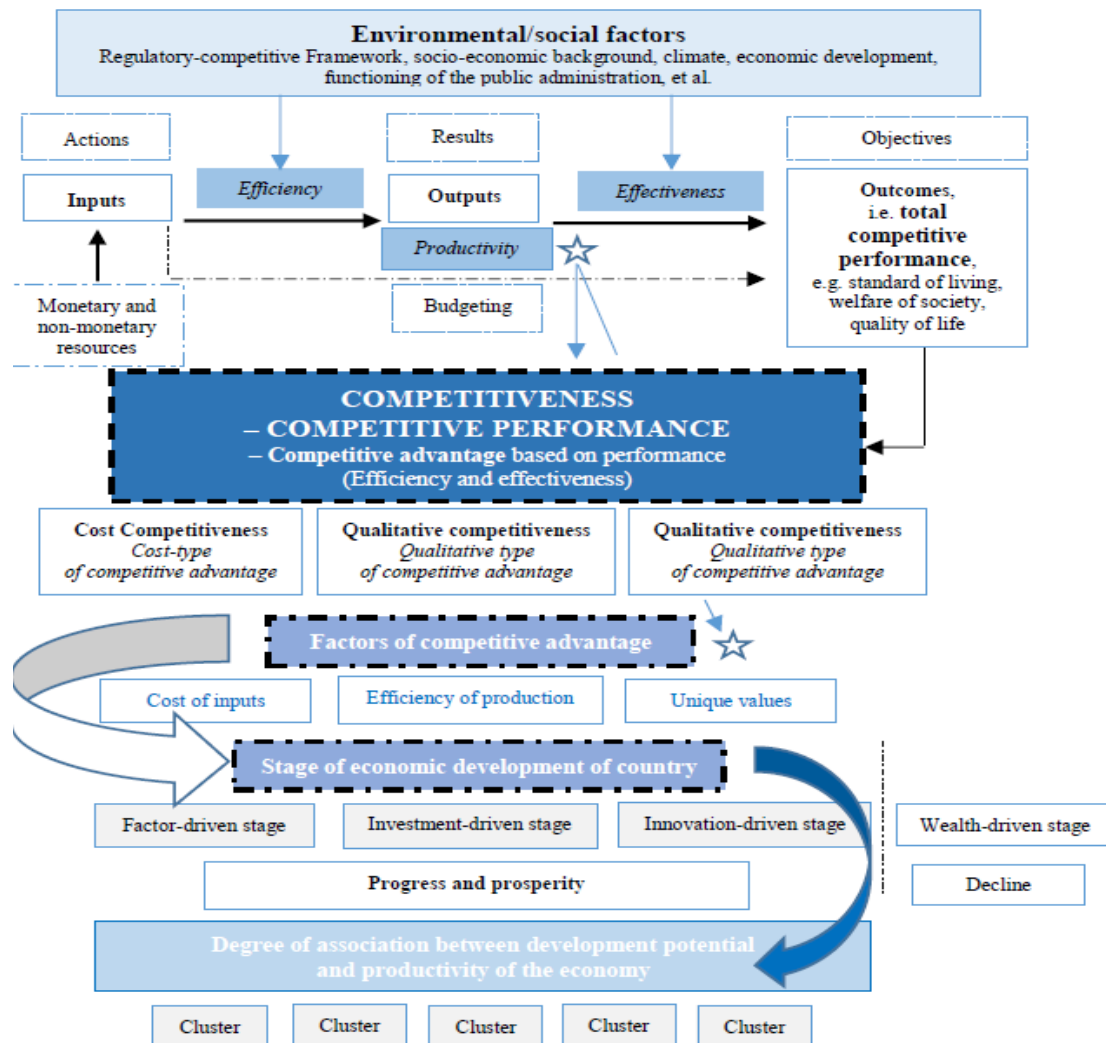
Source: author's elaboration, 2018.

2. Methodology

In last years, the debate on the measurement of multidimensional phenomena has renewed interest. Measurement of the progress that societies have made in their developmental efforts has proven to be difficult but also very popular. It is a common awareness that a number of socio-economic phenomena cannot be measured by a single descriptive indicator and that, instead, they should be represented with multiple dimensions. Phenomena such as development, progress, poverty, social inequality, well-being, quality of life, provision of infrastructures, etc., require, to be measured, the 'combination' of different dimensions, to be considered together as the proxy of the phenomenon. It should be noted that evaluations have a significant quantitative character and concept of the given issues is in this sense rather statistical, respectively analytical and methodical, however, theoretical and conceptual aspects are included as background.

Therefore, it is important to emphasize that the theoretical part (definition of the phenomenon and selection of the indicators) is not separate from the statistical-methodological part. The most common quantitative methods convenient for a high number of multivariate measured variables can be identified as multivariate statistical methods. Multivariate analysis is an ever-expanding set of techniques for data analysis that encompasses a wide range of possible research situation. Collections of multivariate statistical methods include DEA and CA used in the article.

2.1. Data Envelopment Analysis

Performance management is one of the major sources of sustainable organisational efficiency, and a systematic understanding of the factors that affect productivity is very important. Measurement and analysis of efficiency change present a controversial topic enjoying a great deal of interest among researchers and practitioners. The primary problem in creating an evaluation of any system is establishing clear performance standards and priorities at the beginning of the performance cycle.

The early research work on this problem focused on separate measures of productivity, and there was a failure to combine the measurements of multiple inputs into any satisfactory measure of efficiency. These inadequate approaches included forming the average productivity for a single input (ignoring all the other inputs) and constructing an efficiency index in which a weighted average of the inputs is compared with the outputs.

Responding to these inadequacies of separate indices of labour productivity, capital productivity and so on, Farrell (1957) proposed an activity analysis approach that could deal more adequately with the problem. Farrell had already investigated the question of how to measure efficiency and highlighted its relevance for economic policymakers. Since that time, the techniques to measure efficiency have improved and investigations of efficiency have become more frequent. Twenty years after Farrell's model, and building on those ideas, Charnes, Cooper and Rhodes (1978), responding to the need for satisfactory procedures to assess the relative efficiencies of multi-input/multi-output production units, introduced a powerful methodology that has been titled as the Data Envelopment Analysis (DEA). The approach is based on the simple model of Farrell (1957) for measuring the efficiency of units with one input and one output initially expanded in 1978 by Charnes, Cooper and Rhodes (CCR model) assuming constant returns to scale (CRS), and later modified in 1984 by Banker, Charnes and Cooper (1984), in the form of BCC model assuming variable returns to scale (VRS). DEA approach also includes advanced additive models, such as Slacks-Based Model (SBM) introduced by Tone (2002) and Free Disposal Hull (FDH) and Free Replicability Hull (FRH) models, which were first formulated by Deprins, Simar and Tulkens (1984).

DEA is an approach for providing a relative efficiency assessment and evaluating the performance of a set of peer entities called decision-making units (DMUs), which convert multiple inputs into multiple outputs. DEA is thus a multi-criteria decision-making method for evaluating the efficiency of a group of DMUs. The definition of a DMU is generic and flexible. DEA is convenient for determining the efficiency of DMUs that are mutually comparable – using the same inputs and producing the same outputs but with different efficiencies. The efficiency score of DMU in the presence of multiple input and output factors is defined by formulation (1). DEA thus can categorise DMUs into two mutually exclusive sets: efficient and inefficient. Determining whether a DMU is efficient from the observed data is equivalent to testing whether the DMU is on the frontier of the production possibility set. A DMU is efficient if the observed data correspond to testing whether the DMU is on the imaginary production possibility frontier (Cooper, Seiford and Zhu 2004). All other DMUs are inefficient. The best-practice units are used as a reference for the evaluation of the other group units.

$$efficiency = \frac{weighted\ sum\ of\ outputs}{weighted\ sum\ of\ inputs} \tag{1}$$

In recent years, research effort has focused on the investigation of the causes of productivity change and its decomposition. The Malmquist Productivity Index (MPI) has become the standard approach in productivity measurement over time within the non-parametric research. MPI has been introduced firstly by Caves, Christensen and Diewert (1982). Färe *et al.* (1994a, b) defined and applied an input-oriented productivity index as the geometric mean of the two MPIs developed by Caves, Christensen and Diewert (1982). Although it was developed in a consumer context, MPI recently has enjoyed widespread use in a production context. In contrast to traditional DEA models which measure the efficiency of a DMU, MPI enables to measure productivity change of a DMU between two time periods, *t* and *t*+1. MPI is defined as the product of Catch-up and Frontier-shift terms. Catch-up or better Efficiency change term deals with the degree to which a DMU improves or worsens its efficiency – technical efficiency change. The frontier-shift term shows a change in efficient frontiers between two time periods – technological efficiency change. With respect to the article topic of competitiveness and orientation of policy-makers to objectives on this concept, output orientation of model is used, *i.e.* OO MPI measuring efficiency change in production units between successive periods *t* and *t*+1 is formulated via (2):

$$MPI_q\left(X_q^{t+1}, Y_q^{t+1}, X_q^t, Y_q^t\right) = E_q \cdot P_q \tag{2}$$

where: x_q represent inputs and y_q represent outputs of evaluated *DMU_q* in periods *t* and *t*+1; E_q is the change in relative efficiency of *DMU_q* in relation to other units (*i.e.* due to production possibility frontier) between time

periods t and t+1; P_q describes the change in the production possibility frontier as a result of the technology development between time periods t and t+1.

Components E_q and P_q are defined via (3) and (4) (Färe, Grosskopf and Margaritis 2011, 138-141):

$$E_q = \frac{\phi_q^{t+1}\left(x_q^{t+1}, y_q^{t+1}\right)}{\phi_q^t\left(x_q^t, y_q^t\right)},$$
(3)

$$P_q = \left[\frac{\phi_q^t\left(x_q^{t+1}, y_q^{t+1}\right)}{\phi_q^{t+1}\left(x_q^{t+1}, y_q^{t+1}\right)} \cdot \frac{\phi_q^t\left(x_q^t, y_q^t\right)}{\phi_q^{t+1}\left(x_q^t, y_q^t\right)}\right]^{\frac{1}{2}}$$
(4)

where: the optimum value of variable ϕ_q expresses the need for a proportional increase of outputs to achieve DMU_q efficiency in time t and t+1 corresponding to inputs x_q and outputs y_q of the given period. The function $\phi_q^t\left(x_q^t, y_q^t\right)$ represents the input-output relationship of DMU_q from period t and production function in time t. Function $\phi_q^{t+1}\left(x_q^t, y_q^t\right)$ expresses the input-output relationship of DMU_q from period t with production function in time t+1. The function $\phi_q^t\left(x_q^{t+1}, y_q^{t+1}\right)$ represents the input-output relationship of DMU_q from period t+1 with production function in period t. The function $\phi_q^{t+1}\left(x_q^{t+1}, y_q^{t+1}\right)$ represents the input-output relationship of DMU_q from period t+1 with production function in period t+1.

By modification of equations (3) and (4), following MPI_q equation (5) makes possible to measure the change in technical efficiency and movement of the frontier in terms of a specific DMU_q between periods t and t+1 (Färe, Grosskopf and Margaritis 2011, 138-141):

$$MPI_q = \frac{\phi_q^{t+1}\left(x_q^{t+1}, y_q^{t+1}\right)}{\phi_q^t\left(x_q^t, y_q^t\right)} \left[\frac{\phi_q^t\left(x_q^{t+1}, y_q^{t+1}\right)}{\phi_q^{t+1}\left(x_q^{t+1}, y_q^{t+1}\right)} \cdot \frac{\phi_q^t\left(x_q^t, y_q^t\right)}{\phi_q^{t+1}\left(x_q^t, y_q^t\right)}\right]^{\frac{1}{2}} = ECH_q \cdot FS_q.$$
(5)

The first term E_q on the right-hand side measures the magnitude of technical efficiency change (ECH) between time periods t and t+1. The second term P_q measures shift in possibility frontier, i.e. technological frontier shift (FS), between time periods t and t+1. As a result, $MPI_q < 1$ indicates a decrease in productivity of DMU_o from Period 1 to Period 2; the result of $MPI_q = 1$ remains unchanged in productivity and $MPI_q > 1$ shows progress in productivity (see Table 1).

Table 1. Trends of MPI, Catch-up and Frontier-shift

MPI score	Productivity	Catch-up score Frontier-shift score	Technical efficiency change (ECH) Technological frontier shift (FS)
> 1	Improving	> 1	Improving
= 1	Unchanging	= 1	Unchanging
< 1	Declining	< 1	Declining

Source: author's elaboration, 2018.

In a relatively short period, DEA has grown into a powerful quantitative, analytical tool for measuring and evaluating performance. DEA has been successfully applied to a host of different types of entities engaged in a wide variety of activities in many contexts worldwide, also in the territorial analysis (see *e.g.* Melecký 2018, Hančlová and Melecký 2016). DEA measures intended to be applicable to any productive organisation as well as to a whole economy. DEA has become a popular method for general business management because it has a number of advantages: it can evaluate a DMU's performance with multiple inputs and multiple outputs (what fulfil the criteria of the dataset, *i.e.* many input and output factors of competitiveness based on the number of multiple initial indicators); it allows the units of input and output variables to be different (again, this criterion meet the paper outline, dataset represent different aspects of competitiveness on both side of input and output indicators); and it is not necessary to know the type of production function in advance. However, DEA also has several limitations: the DMUs must be homogeneous (in our case, criterion of homogeneity represent 137 countries of the WTO, *i.e.*

evaluated countries are all members of one international organization); to obtain the best results, the number of DMUs must be at least twice the total number of input and output variables (as well as this condition is fulfilled as the following paragraph and equations explain); and isotonicity must exist, that is, the output must not decrease while the input increases (it has been met as the following paragraph confirms).

If a performance measure (input/output) is added or deleted from consideration, it will influence the relative efficiencies. Empirically, when the number of performance measures is high in comparison with the number of DMUs, then most of the DMUs are evaluated efficiently. Hence, the obtained results are not reliable. Suppose there are n DMUs which consume m inputs to produce s outputs. If a performance measure (input/output) is added or deleted from consideration, it will influence the relative efficiencies. Empirically, when the number of performance measures is high in the comparison with the number of DMUs, then most of the DMUs are evaluated efficiently. Hence, the obtained results are not reliable. There is a rough rule of thumb suggested by Cooper, Li, Seiford and Zhu (2004) which expresses the relation between the number of DMUs and the number of performance measures sufficient for DEA to be used, as follows (6), resp. in simplification (7):

$$n \geq \max\{m*s, 3(m+s)\} \tag{6}$$

$$n \geq 3(m+s). \tag{7}$$

The following section examines a real data set involving 137 WTO members (for each of the six inputs and six outputs) to validate the proposed approach. In the article, the rule of thumb is met in all the cases, *i.e.*

- 137 WTO members: 137 ≥ 3 (6 + 6), 137 ≥ 3 (12), 137 ≥ 36;
- 56 WTO members: 56 ≥ 3 (6 + 6), 56 ≥ 3 (12), 56 ≥ 36;
- 45 WTO members: 45 ≥ 3 (6 + 6), 45 ≥ 3 (12), 45 ≥ 36;
- 36 WTO members: 36 ≥ 3 (6 + 6), 36 ≥ 3 (12), 36 ≥ 36.

Input data for the DEA model must meet the isotonicity criteria, *i.e.* the level of outputs is at least the same, and do not fall when inputs increase. More specifically, the requirement that the relationship between inputs and outputs is not erratic. Increasing the value of any input while keeping other factors constant should not decrease any output but should instead lead to an increase in the value of at least one output. Most of the Pearson correlation coefficients (both for input and output factors) are estimated to be positive, indicating the explanatory power of the inputs and outputs in the model.

2.2. Cluster analysis

Cluster analysis (CA) is a group of the multivariate method whose primary purpose is to group objects based on the characteristics they possess. CA is a major technique for classifying large number of information into meaningful subgroups, called clusters that are more manageable than individual datum. CA classifies objects that are very similar to others in the cluster based on a set of selected characteristics. The resulting cluster of objects should exhibit high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity (Hair, Black *et al.* 2009). Objects in a specific cluster share many characteristics, but are very dissimilar to objects, not belonging to the cluster. The aim of CA is to minimize variability within clusters and maximize variability between clusters. There are several clustering procedures how to form the groups of objects. The most popular procedures represent the hierarchical methods and non-hierarchical methods. Each of the procedures follows a different approach to grouping the most similar objects into a cluster and to determining each object's cluster membership (Mooi and Sarstedt 2011).

The hierarchical CA (agglomerative or divisive) is one of the most obvious methods. It uses the dissimilarities such as distances between objects when forming the clusters. The distance is mostly defined as Euclidean distances or the Squared Euclidean distance suitable for categorical variables, but there are many other specialized measures, *e.g.* for binary variables. After the determination of the distance measure, the clustering algorithm has to be selected. There are many methods available, the criteria used differ and hence different classification may be obtained for the same data (Burns and Burns 2008). The most frequently used methods are nearest neighbour (single linkage); furthest neighbour (complete linkage); average linkage with (between) groups; Ward's method; centroid method; and median method. The last step of the CA is an interpretation of the results. The most important is to select the cluster solution that the best represent the data sample. To define the characteristics of the cluster, it is appropriate to analyse the profile of the cluster's variables.

It is necessary to take in account that the informative level of the acquired results of CA is always influenced by the characteristic of the data file (*e.g.* occurrence of the outliers, correlation of variables), by the selected number

and type of the indicators, as well as by the selected technique of the clustering, criterion of the distance and algorithm (method) of the clustering. On the other hand, multivariate statistical methods as a whole represent a specific tool that is eligible to concentrate the information and detect the relationship and coherence between them. Therefore, the multivariate statistical methods offer the great research´s potential.

2.3. Background of empirical analysis

In the article, research is interested in determining efficiency among various DMUs (*i.e.* 137 countries) within the chosen WTO group. Essentially, the DEA approach determines the productivity of each country by comparing its productivity with others in the group of WTO members, *i.e.* territorial aspects of empirical analysis. WTO consists of 164 members since 29 July 2016 (WTO 2016), but not all of these countries are part of the empirical analysis because of data non-availability with respect to selected approach for a database of indicators, *i.e.* WEF.

Territorial aspect of the analysis is thus dedicated to 137 countries divided into three groups depending on each economy's stage of development, as proxies by its GDP per capita and the share of exports represented by raw materials (WEF 2017a, 320). Although all of the GCI pillars described below will matter to a certain extent for all economies, it is clear that they affect different economies in different ways. In line with the well-known economic theory of stages of development, GCI assumes that, in the first stage, the economy is Factor-driven and countries compete based on their factor endowments (in this case primarily unskilled labour and natural resources).
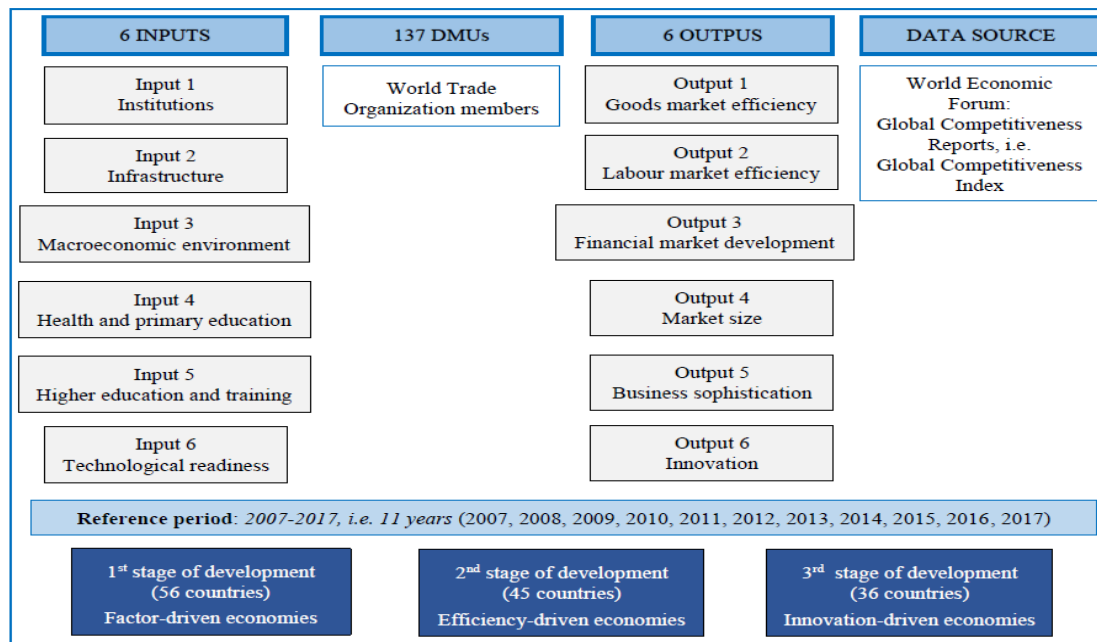
As a country becomes more competitive, productivity will increase and wages will rise with advancing development. Countries will then move into the Efficiency-driven stage of development when they must begin to develop more efficient production processes and increase product quality because wages have risen and they cannot increase prices. Finally, as countries move into the Innovation-driven stage, wages will have risen by so much that they are able to sustain those higher wages and the associated standard of living only if their businesses are able to compete using the most sophisticated production processes and by innovating new ones. Classification of countries into stages of development is as follows (for more information see WEF 2017a, 320; and the breakdown of countries into three stages of development is evident in Table 4):
- Factor-driven stage (56 countries): GDP per capita (USD) threshold <2.999;
- Efficiency-driven stage (45 countries): GDP per capita (USD) threshold 3.000–17.000;
- Innovation-driven stage (36 countries): GDP per capita (USD) threshold >17.000.

Indicators represent twelve GCI pillars are crucial for evaluation of productivity among WTO members by DEA approach. GCI pillars represent both sides of the required indicators, i.e. input and output size. Indicators come from WEF's database published within GCR in period 2007-2017 (WEF 2017b, 2018). Figure 2 includes division of twelve GCI pillars in six inputs and six outputs, in line with time-series of analysis, *i.e.* years within period 2007-2017. GCI pillars are thus grouped according to the different dimensions (input versus output aspects) of macroeconomic competitiveness they describe. The terms inputs and outputs are meant to classify pillars into those which describe driving forces of competitiveness, also in terms of long-term potentiality, and those which are direct or indirect outcomes of a competitive society and economy. For this purpose to input-output division, the appropriate classification is used which is based on Regional Competitiveness Index (RCI) – the European Union approach for measuring its competitiveness, because RCI was created partly in line with GCI construction (Annoni and Kozovska 2010), for details, see Figure 2. Although all of GCI pillars matter to a certain extent for all economies, it is clear that they affect different economies in different ways what confirms the importance on application different stage of development concept. It is important to keep in mind that GCI pillars are not independent: they tend to reinforce each other, and a weakness in one area often has a negative impact on others.

Input indicators (II) represent pillars of Institutions (II1), Infrastructure (II2), Macroeconomic environment (II3), Health and primary education (II4), Higher education and training (II5), and Technological readiness (II6). Output indicators (OI) represent pillars of Goods market efficiency (OI1), Labour market efficiency (OI2), Financial market development (OI3), Market size (OI4), Business sophistication (OI5), and Innovation (OI6). Importance of each of the pillars for the issue of competitiveness describes each GCR (WEF 2017a). Indicators within pillars of Institutions (II1), Infrastructure (II2), Macroeconomic environment (II3), Health and primary education (II4), represent Basic requirements, which are key especially for Factor-driven economies. Indicators within pillars of Higher education and training (II5), and Technological readiness (II6), Goods market efficiency (OI1), Labour market efficiency (OI2), Financial market development (OI3), Market size (OI4), present Efficiency enhancers, which are key primarily for Efficiency-driven economies. Indicators within pillars of Business sophistication (OI5) and Innovation (OI6) are the most crucial for Innovation-driven economies.

Figure 2. Background of empirical analysis

6 INPUTS	137 DMUs	6 OUTPUS	DATA SOURCE
Input 1 Institutions	World Trade Organization members	Output 1 Goods market efficiency	World Economic Forum: Global Competitiveness Reports, i.e. Global Competitiveness Index
Input 2 Infrastructure		Output 2 Labour market efficiency	
Input 3 Macroeconomic environment		Output 3 Financial market development	
Input 4 Health and primary education		Output 4 Market size	
Input 5 Higher education and training		Output 5 Business sophistication	
Input 6 Technological readiness		Output 6 Innovation	

Reference period: *2007-2017, i.e. 11 years* (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017)

1st stage of development (56 countries) Factor-driven economies	2nd stage of development (45 countries) Efficiency-driven economies	3rd stage of development (36 countries) Innovation-driven economies

Source: Author's elaboration, 2018.

3. Results and discussion

Changes in the global economy during the last quarter-century or so have intensified competition in the international and internal markets of developed and developing countries. Such changes have increased the need for government support and competitiveness is thus high on political agenda. Macroeconomic competitiveness of individual countries is considered by national governments to be important policy targets and, at the same time, for issues that need to be solved. For a number of years, government objectives have been set not only in terms of improving macroeconomic performance against other countries but also in terms of creating conditions to allow less productive countries to reduce the 'gap' between themselves and the most productive ones. At a time when countries have to deal with increased pressures on public balances, stemming from demographic trends and globalisation, the improvement of efficiency and effectiveness of public spending features high on the political agenda.

Both concepts, *i.e.* competitiveness and performance are thus high on political agenda and depends on a multiplicity of actions that can optimize the development potentials of countries and internal factor endowments. However, do all countries have the same opportunities in terms of competitiveness with respect to their development potential? Countries face very different challenges and priorities as they move from resource-based to knowledge-based stage of economic development, what influences their competitive advantages and as well as competitive disadvantages. All countries possess development opportunities – however, use these options must be efficient enough. Competitiveness and performance importantly affecting the world trade and international relations, especially nowadays, in view of the changing position of the world leaders and growth of new economic powers. This creates new threats and challenges in terms of drivers of the economy for all players. Based on presented interconnect among competitiveness, productivity and stage of development, does the development potential of the country necessary meet macroeconomic productivity?

The aim of evaluation of the areas' operation is correction, improvement and promotion of performance. Considering the increasing importance of economic growth in the society and presence in a competitive world, evaluation of the territorial performance has been remarkably considered and various measures are brought up as a criterion for evaluation of territorial performance. Evaluation and comparison the performance of similar units is an important part of the complex organisation' management. DEA is one of the power management techniques empowering to estimate territorial performance in comparison with other competitors and make the decision for a better future. The empirical strategy of measuring WTO members' productivity consists of a three-step procedure: first, in the processing phase, a database of relevant indicators is created and their descriptive statistics are analysed. Secondly, the application of DEA to assess the efficiency score of WTO members in use of six inputs for production of six outputs in the field of competitiveness. The second step consists of evaluating such rankings with

MPI in order to assess the relative importance of its main components too. Thirdly, CA is applied in order to DMUs can be sort into groups (clusters), so the degree of association is strong between members of the same cluster and weak between members of different clusters. Fourthly, the article focuses on using multivariate methods in the form DEA and CA for comparing the productivity level and efficiency changes of WTO members, and comparative analysis of gained results is processed. The procedure of empirical analysis processing is illustrated via Table 2. Applicability of evaluation is illustrated by a real dataset involving the factors of competitiveness based on the WEF approach in reference period 2007-2017 including all the years inside this range.

Table 2. The procedure of empirical measuring

Input data analysis
Pre-processing phase » Collection of indicators » Groups of indicators for input and output
DEA modelling (Software: DEA Frontier, IBM SPSS Statistics and ArcGIS)
A sample of 137/56/45/36 WTO members: OO MPI CRS model » Productivity evaluation » Efficiency changes evaluation
Cluster analysis (Software: IBM SPSS Statistics)
A sample of 137 WTO members: Hierarchical cluster analysis » Ward's method » Cluster description
Comparative analysis of DEA and CA results
Does the development potential of the country meet macroeconomic productivity?

Source: author's elaboration, 2018.

Performance is a major prerequisite for future development and success in broader comparison. In the article, a comparison of one dimension of performance is processed, *i.e.* productivity and its efficiency changes. Purpose of the article is to map competitive performance at a macroeconomic level for WTO members. The expected results are of great variation within the whole sample because countries with low levels of competitiveness locate among strongly competitive countries – a higher degree of heterogeneity is thus foreseen. Disparities are diminishing in the assessment of countries within stages of development, which operate as more homogeneous groups. From the main descriptive statistics of MPI and its two dimensions ECH and FS for the whole sample of 137 evaluated countries (see Table 3) is evident, that results for MPI and FS are very similar or identical in most cases. Higher variability – in comparison with MPI and FS descriptive statistics – is evident in the case of ECH, but overall, the results are balanced. According to the efficiency analysis and derived results from the solution of MPI, it emerges that the 2007-2017 efficiency ratios of 137 WTO countries range from 0.9017 to 1.0174. In the case of ECH, the efficiency ratios of 137 WTO countries range from 0.9757 to 1.0212. In the case of FS, the efficiency ratios of 137 WTO countries range from 0.9023 to 1.0154.

Table 3. Descriptive Statistics of MPI, ECH and FS of WTO Members in Period 2007-2017 (137 Countries)

Statistic	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
OO MPI CRS 2007-2017	0.9017	1.0174	136.5059	0.9964	0.0126	0.0000
ECH 2007-2017	0.9757	1.0212	137.0610	1.0004	0.0074	0.0000
FS 2007-2017	0.9023	1.0154	136.5092	0.9964	0.0108	0.0000

Source: author's elaboration based on the calculation in DEA Frontier, 2018.

Table 4 presents year-on-year efficiency changes for the whole sample of 137 evaluated countries gained in the form of national averages based on MPI scores for the whole reference period 2007-2017. Table 4 also presents MPI, ECH and FS (in the form of national averages) for countries divided into stages of development for the whole reference period. The results of MPI are highlighted by the traffic light method. The range of colours of this method changes from shadows of red colour, through middle shadows of orange-yellow to dark green. Countries with the highest and higher values of MPI (based on catch-up and frontier-shift) have a better level of efficiency and thus competitiveness is highlighted by the dark green colour – the higher the value, the darker the shadow of green. On the contrary, countries with the lowest and lower values of MPI based on its two dimensions (catch-up and frontier-shift) mean worse level of efficiency, whereby the levels of inefficiency are highlighted by dark shadows of red – the lower the value, the darker the shadow of red. Countries with values of MPI and its dimension between groups of efficient (dark-green shadows) and inefficient countries (dark-red shadows) are highlighted by shadows of orange-yellow.

Table 4 presents the overall average sample productivity of 137 evaluated countries and as well as for groups of countries based on the stage of development. Average sample productivity is gained in the form of national averages based on MPI scores for the whole reference period 2007-2017. The maximum value 0.9988 of average sample productivity was recorded in the case of the 1st stage of development (56 countries – marked by

bold in Table 4). The minimum value 0.9905 of average sample productivity was recorded in the case of the 3rd stage of development (36 countries – marked by italics in Table 4).

Table 4 also presents overall average time productivity in the form of averages based on MPI scores for all time comparison within the whole reference period 2007-2017. The maximum value 1.0047 of average time productivity was recorded in comparison of years 20015-2016 (marked by bold in Table 4). The minimum value 0.9743 of average time productivity was recorded in comparison of years 2009-2010 (marked by italics in Table 4). In the case of average sample productivity, results confirmed convergence trend of less developed or developing countries to more developed ones based on the theory of economic growth. This is also confirmed by Table 5 and results of MPI for a separate group of countries based on their belonging to the stage of development, *i.e.* the low stage of development, the higher MPI scores. In the case of average time productivity, results confirmed the best results in period 2015-2016, *i.e.* in post-crisis period when all groups of evaluated countries marked increasing trend of productivity. In period 2009-2010, *i.e.* presenting economic and financial crises years, all groups of evaluated countries marked decreasing trend of productivity and therefore the worst results.

Table 4. MPI average efficiency for year-on-year changes

WTO members	OO MPI CRS										Average sample productivity
Time series	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2007-2017
137 countries	0.9792	1.0017	0.9781	0.9946	1.0102	1.0042	1.0057	0.9902	1.0053	0.9948	0.9964
1st stage (56 countries)	0.9904	1.0097	0.9762	0.9864	1.0066	1.0071	1.0046	0.9923	1.0099	1.0052	**0.9988**
2nd stage (45 countries)	0.9880	0.9890	0.9564	0.9903	1.0068	1.0060	0.9921	0.9929	1.0045	0.9836	0.9910
3rd stage (36 countries)	0.9797	0.9838	0.9865	0.9825	0.9940	0.9967	1.0055	0.9950	0.9991	0.9817	*0.9905*
Average time productivity	0.9843	0.9961	*0.9743*	0.9885	1.0044	1.0035	1.0020	0.9926	1.0047	0.9913	/

Source: Author's elaboration based on the calculation in DEA Frontier, 2018.

Results show that productivity level recorded in most cases increasing trend. Overall, increasing trend prevails over the decreasing trend, as confirmed also in Figure 3 and results of each year-on-year change, as well as the trend line. Results show that the level of inputs and outputs has decreased and increased among the reference period. But what do these values mean with respect to MPI definition, or any of its elements? If MPI is less than one, it signifies productivity getting worse, while if MPI equals to one, it indicates unchanging productivity and if MPI is higher than one, it signifies productivity getting better. From this point of view, it´s necessary to say that increasing trend of MPI seems to be positive information, but in fact (based on mean values) it means that in comparison of annual changes within the reference period 2007-2017, the overall productivity of 137 WTO evaluated countries has recorded firstly decreasing trend, and after increasing trend and finally mostly decreasing trend at the end of reference period. Overall, increasing trend prevails over the decreasing trend, as confirmed by the columns for all groups of DMUs in each year-on-year change, as well as the trend line for all four groups of DMUs (see Figure 3). MPI score, the lighter blue colour shade.

Figure 3. Annual efficiency changes based on division of WTO members into four groups
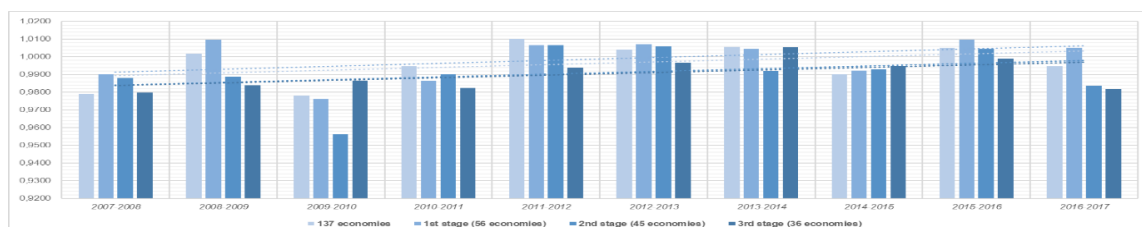
Source: author's elaboration based on the calculation in DEA Frontier, 2018

This is not surprising due to the nature of comparing years. In this context, DEA provides further evidence of a dualistic (centre vs. periphery, resp. developed vs. developing vs. less developed/underdeveloped countries) pattern in the national economic activities, with the most efficient territories located in the most central or economically strategic centres of the world economy. The application of the MPI shows that both the magnitude and the intrinsic features of the productivity dynamics are not so extremely differentiated across the evaluated countries. For a better illustration, Figure 4 visualizes MPI results in reference period 2007-2017. It illustrates MPI scores division among 137 countries based on colour range – the highest and higher MPI score, the darker blue colour shade; the lowest and lowers

Figure 4. Geographical distribution of MPI scores across WTO members

WTO Countries Productivity in Period 2007-2017

OO MPI CRS 2007-2017

- 0,9016 - 0,9017
- 0,9018 - 0,9853
- 0,9854 - 0,9963
- 0,9964 - 1,0048
- 1,0049 - 1,0174
- World countries

Countries with the highest and higher values of MPI mean better level of productivity
– the higher value, the darker shadow of blue colour.

Countries with the lowest and lower values of MPI mean worse level of productivity
– the lower value, the lighter shadow of blue colour.

Date: September 7, 2018
Data source: WEF's database (WEF, 2017b, 2018)
OO MPI CRS own calculation
ESRI ArcGIS user: Michaela Stanickova

Source: Author's visualization in ArcGIS, 2018

Broader aspects enter into the overall evaluation of economics and these aspects are unnoticeable for DEA, *i.e.* part of the qualitative evaluation in line with the evaluation of overall performance. Performance is linked with respect to competitiveness sense: a good performance in the Innovation group (Technological readiness, Business sophistication, Innovation) is expected to also be a good performance in the Efficiency group (Higher education and training, Goods market efficiency, Labour market efficiency, Financial market development, Market size) and the Basic group (Institutions, Infrastructure, Macroeconomic environment, Health and primary education) as they are instrumental to increasing levels of competitiveness.

The first Basic group represent the key basic drivers of all types of economies. As the economy develops, other factors enter into play for its advancement in competitiveness and are grouped in the second Efficiency group of pillars. At the most advanced stage of development of the economy, key drivers for improvement are pillars included in the third Innovation group. As countries move along the path of development, their socio-economic conditions change and different determinants become more important for the macroeconomic competitiveness, as subsequently explained by WEF (2017a) and as follows. As a result, the best way to improve the competitiveness of more developed countries will not necessarily coincide with the way to improve less developed countries. At low levels of development, economic growth is determined primarily by the mobilization of primary factors of production: land, primary commodities, and unskilled labour. As economies move from low- to middle-income status, global competitiveness becomes Investment-Driven, as economic growth is increasingly achieved by harnessing global technologies to local production.

Foreign direct investment, joint ventures, and outsourcing arrangements help to integrate the national economy into international production systems, thereby facilitating the improvement of technologies and the inflows of foreign capital and technologies that support economic growth. In most economies, the evolution from middle-income to high-income status involves the transition from a technology-importing economy to a technology-generating economy, one that innovates in at least some sectors at the global technological frontier.

For high-income economies at this Innovation–Driven stage of economic development, global competitiveness is critically linked to high rates of social learning (especially science-based learning) and the rapid ability to shift to new technologies. The principal factors that contribute to competitiveness, and thereby improve living standards, will, therefore, differ in economies at different levels of development. For some low-income economies, the main challenge is to get the basic factor markets – for land, labour, and capital – working properly. As countries advance, the basic challenge is to make connections with international production systems by attracting sufficient flows of Foreign Direct Investment. Once reaching high-income status, the basic challenge facing countries is to generate high rates of innovation and commercialization of new technologies.

Critical institutions in the country and its barriers to continued growth will differ depending on the country's position. These facts were also reflected in the results of the empirical analysis. Development potentials or development weakness are inherent in the national diversity that characterizes a sample of all 137 evaluated WTO members. Part of the explanation of efficiency results has to do with differences in competitiveness. An economic entity in the country with a low level of competitiveness may not have similar opportunities as an economic entity in the highly competitive country. This fact remains and can be confirmed. What does it mean for efficiency? DEA results in efficiency differ from GCI results in competitiveness. Why? Is a high level of competitiveness necessarily associated with a high level of efficiency and vice versa? It may not always be the case of evaluated countries based on specific results for individual countries (see Table 5).

Level of efficiency does not show extreme diversity and variability in the sample. Across stages of development, differences in MPI scores are not large both in the case of efficient and inefficient countries. In Table 5, results of MPI for of WTO members based on the stage of development are highlighted by the traffic light method. The range of colours of this method changes from shadows of red colour, through middle shadows of orange-yellow to dark green. Countries with the highest and higher values of MPI (based on catch-up and frontier-shift) have a better level of efficiency and thus competitiveness is highlighted by the dark green colour – the higher the value, the darker the shadow of green. On the contrary, countries with the lowest and lower values of MPI based on its two dimensions (catch-up and frontier-shift) mean worse level of efficiency, whereby the levels of inefficiency are highlighted by dark shadows of red – the lower the value, the darker the shadow of red. Countries with values of MPI and its dimension between groups of efficient (dark-green shadows) and inefficient countries (dark-red shadows) are highlighted by shadows of orange-yellow. In a follow-up analysis following the DEA method, CA was applied for finding a group of similar units, based on the value of productivity of MPI 2007-2017 for the sample of all evaluated 137 countries. The object is sorted into clusters so that the degree of association is strong between members of the same cluster and weak between members of different clusters. To determine the optimum solution, in the article is used the most common approach – method of hierarchical CA and the clustering algorithm is Ward's

method applying Squared Euclidean Distance as the distance or similarity measure. It helps to obtain the optimum number of clusters it should work with. On the basis of the Ward Linkage - Agglomeration schedule, the part Coefficients helped to decide how many clusters are optimal for representation of the data. The cluster formation should be stopped when the increase in Coefficients is large. In this case, the best interpretation of data ensures the five-cluster solution in the case of MPI 2007-2017. In Table 6, it is possible to see five clusters and membership of all evaluated countries, *i.e.* belonging of WTO members to each cluster.

Table. 5. MPI scores, ranks of WTO members based on stage of development

1st Stage of development (56 countries) Factor-driven economies					2nd Stage of development (45 countries) Efficiency-driven economies					3rd Stage of development (36 countries) Innovation-driven economies				
Rank	DMU	Country	Score	Category	Rank	DMU	Country	Score	Category	Rank	DMU	Country	Score	Category
1	SEN	Senegal	1.0156	Efficient	1	BRB	Barbados	1.0099	Efficient	1	KOR	Korea, Rep.	1.0016	Efficient
2	KAZ	Kazakhstan	1.0153		2	HUN	Hungary	1.0084		2	PRT	Portugal	0.9983	Inefficient
3	VEN	Venezuela	1.0149		3	EGY	Egypt	1.0049		3	SWE	Sweden	0.9980	
4	MLI	Mali	1.0136		4	ARG	Argentina	1.0043		4	SVN	Slovenia	0.9968	
5	MWI	Malawi	1.0135		5	GTM	Guatemala	1.0037		5	NOR	Norway	0.9965	
6	CMR	Cameroon	1.0121		6	TUR	Turkey	1.0016		6	FRA	France	0.9959	
7	YEM	Yemen	1.0120		6	MEX	Mexico	1.0016		7	CHE	Switzerland	0.9957	
8	NGA	Nigeria	1.0114		7	COL	Colombia	1.0009		8	LUX	Luxembourg	0.9956	
9	MDA	Moldova	1.0107		8	MYS	Malaysia	0.9998	Inefficient	9	USA	United States	0.9955	
10	MDG	Madagascar	1.0093		9	THA	Thailand	0.9992		10	BEL	Belgium	0.9942	
11	LBR	Liberia	1.0081		10	LTU	Lithuania	0.9991		11	NLD	Netherlands	0.9933	
12	GMB	Gambia	1.0071		11	MAR	Morocco	0.9990		12	ITA	Italy	0.9927	
13	GHA	Ghana	1.0070		12	SVK	Slovakia	0.9989		12	CAN	Canada	0.9927	
14	MRT	Mauritania	1.0051		13	PAN	Panama	0.9972		13	ARE	United Arab Emirates	0.9926	
15	SYC	Seychelles	1.0045		14	JAM	Jamaica	0.9970		14	JPN	Japan	0.9925	
16	NPL	Nepal	1.0041		15	JOR	Jordan	0.9966		15	ISL	Iceland	0.9922	
17	BEN	Benin	1.0034		16	LVA	Latvia	0.9959		16	AUT	Austria	0.9915	
17	GIN	Guinea	1.0034		17	CPV	Cape Verde	0.9958		17	CZE	Czech Republic	0.9912	
18	LAO	Lao PDR	1.0027		18	SLV	El Salvador	0.9952		17	SGP	Singapore	0.9912	
19	LSO	Lesotho	1.0026		19	DOM	Dominican Republic	0.9944		18	ESP	Spain	0.9911	Inefficient
20	TCD	Chad	1.0020		20	SAU	Saudi Arabia	0.9941		19	EST	Estonia	0.9909	
21	RWA	Rwanda	1.0016		21	CHL	Chile	0.9913		20	CYP	Cyprus	0.9894	
22	UKR	Ukraine	1.0009		22	NAM	Namibia	0.9912		21	GBR	United Kingdom	0.9890	
22	CIV	Côte d'Ivoire	1.0009		23	HRV	Croatia	0.9910		22	DEU	Germany	0.9884	
23	SUR	Suriname	1.0008		24	ZAF	South Africa	0.9907		23	ISR	Israel	0.9882	
24	MMR	Myanmar	1.0007		25	BGR	Bulgaria	0.9904		24	QAT	Qatar	0.9872	
25	MOZ	Mozambique	1.0004		26	MKD	Macedonia, FYR	0.9902	Inefficient	25	DNK	Denmark	0.9871	
26	GUY	Guyana	1.0000	Status Quo	27	LKA	Sri Lanka	0.9890		26	FIN	Finland	0.9870	
27	IND	India	0.9996		28	BRA	Brazil	0.9889		27	HKG	Hong Kong SAR	0.9869	
28	BRN	Brunei Darussalam	0.9989		29	MNE	Montenegro	0.9878		28	MLT	Malta	0.9861	
29	SWZ	Swaziland	0.9978		30	CHN	China	0.9863		29	IRL	Ireland	0.9847	
29	BOL	Bolivia	0.9978		31	MUS	Mauritius	0.9862		30	AUS	Australia	0.9845	
30	BFA	Burkina Faso	0.9976		32	URY	Uruguay	0.9857		31	BHR	Bahrain	0.9829	
31	MNG	Mongolia	0.9973		33	PER	Peru	0.9844		32	NZL	New Zealand	0.9807	
32	UGA	Uganda	0.9969		34	PRY	Paraguay	0.9832		33	GRC	Greece	0.9798	
33	BWA	Botswana	0.9965	Inefficient	35	OMN	Oman	0.9831		34	TTO	Trinidad and Tobago	0.9742	
33	TJK	Tajikistan	0.9965		36	GEO	Georgia	0.9829						
34	KHM	Cambodia	0.9961		37	ECU	Ecuador	0.9818						
35	AGO	Angola	0.9955		38	ALB	Albania	0.9812						
36	VNM	Vietnam	0.9953		39	IDN	Indonesia	0.9805						
37	PHL	Philippines	0.9934		40	TUN	Tunisia	0.9803						
38	NIC	Nicaragua	0.9932		41	ARM	Armenia	0.9780						
39	ZMB	Zambia	0.9925		42	ROU	Romania	0.9775						
40	KGZ	Kyrgyzstan	0.9920		43	CRI	Costa Rica	0.9760						

1st Stage of development (56 countries) Factor-driven economies					2nd Stage of development (45 countries) Efficiency-driven economies					3rd Stage of development (36 countries) Innovation-driven economies				
Rank	DMU	Country	Score	Category	Rank	DMU	Country	Score	Category	Rank	DMU	Country	Score	Category
41	PAK	Pakistan	0.9912		44	POL	Poland	0.9746						
42	KWT	Kuwait	0.9898											
43	HTI	Haiti	0.9897											
44	BDI	Burundi	0.9889											
45	GAB	Gabon	0.9876											
46	RUS	Russian Federation	0.9874											
47	TZA	Tanzania	0.9867											
47	KEN	Kenya	0.9867											
48	HND	Honduras	0.9841											
49	BGD	Bangladesh	0.9832											
50	SLE	Sierra Leone	0.9819											
51	ZWE	Zimbabwe	0.9558											
Average MPI			0.9988	/	Average MPI			0.9918	/	Average MPI			0,9904	/

Source: author's elaboration based on the calculation in DEA Frontier, 2018.

Table. 6. Classification of WTO members based on MPI results by cluster analysis

Cluster 1 (28 countries)			Cluster 2 (58 countries)			Cluster 3 (34 countries)			Cluster 4 (16 countries)			Cluster 5 (1 country)		
SoD	Code	Score	SoD	Code	Score	SoD	Code	Score	SoD	Code	Score	SoD	Code	Score
2	EGY	1.0174	1	BEN	1.0035	2	PAN	0.9943	1	SLE	0.9853	1	GHA	0.9017
1	MWI	1.0154	1	MRT	1.0035	2	URY	0.9942	3	GRC	0.9850			
1	LSO	1.0147	2	JOR	1.0033	2	ALB	0.9940	2	TUN	0.9845			
1	MOZ	1.0144	3	ARE	1.0030	3	UKR	0.9939	1	KGZ	0.9842			
3	PRT	1.0125	3	LUX	1.0029	2	MAR	0.9938	2	IDN	0.9839			
3	QAT	1.0124	3	FRA	1.0028	2	BRA	0.9937	2	GEO	0.9837			
3	SVN	1.0120	1	SYC	1.0027	3	NZL	0.9936	2	NAM	0.9836			
1	YEM	1.0120	1	MDA	1.0026	3	CZE	0.9936	1	BGD	0.9835			
1	CMR	1.0118	1	GIN	1.0025	3	MLT	0.9935	1	RUS	0.9830			
1	NGA	1.0115	3	NLD	1.0024	3	AUS	0.9934	2	JAM	0.9830			
2	HUN	1.0113	2	GTM	1.0021	2	ARG	0.9933	2	CRI	0.9807			
1	VEN	1.0090	2	LVA	1.0020	2	ZAF	0.9932	2	CHL	0.9795			
2	SLV	1.0090	1	TCD	1.0017	3	CAN	0.9930	3	ISL	0.9781			
3	ESP	1.0088	2	SVK	1.0016	2	ROU	0.9928	1	BWA	0.9740			
1	MLI	1.0084	2	MYS	1.0016	3	DEU	0.9923	2	OMN	0.9703			
3	KOR	1.0083	2	PER	1.0015	1	VNM	0.9921	1	ZWE	0.9527			
2	MEX	1.0083	3	NOR	1.0013	1	KAZ	0.9918						
2	COL	1.0082	2	LTU	1.0012	3	HKG	0.9913						
1	LBR	1.0081	2	BGR	1.0011	3	TTO	0.9912						
2	BRB	1.0079	2	MNE	1.0009	2	SAU	0.9910						
1	MDG	1.0079	1	MMR	1.0007	2	ARM	0.9907						
2	DOM	1.0065	3	AUT	1.0006	2	LKA	0.9899						
2	CPV	1.0062	1	RWA	1.0006	3	SGP	0.9898						
1	GMB	1.0059	3	SWE	1.0004	1	PHL	0.9894						
1	SEN	1.0057	1	SUR	1.0002	1	HTI	0.9894						
2	THA	1.0056	3	BHR	1.0000	2	ECU	0.9894						
3	CYP	1.0056	3	GBR	1.0000	3	DNK	0.9893						
3	ITA	1.0048	2	POL	0.9996	1	NIC	0.9890						
			1	BOL	0.9994	1	ZMB	0.9888						
			1	GUY	0.9989	1	KEN	0.9887						
			1	LAO	0.9988	3	FIN	0.9885						
			2	MKD	0.9987	1	KWT	0.9879						
			1	HND	0.9985	1	NPL	0.9875						
			2	HRV	0.9984	2	CHN	0.9873						
			2	TUR	0.9984									
			1	PAK	0.9983									

Cluster 1 (28 countries)			Cluster 2 (58 countries)			Cluster 3 (34 countries)			Cluster 4 (16 countries)			Cluster 5 (1 country)		
SoD	Code	Score	SoD	Code	Score	SoD	Code	Score	SoD	Code	Score	SoD	Code	Score
			1	IND	0.9981									
			1	BFA	0.9981									
			3	USA	0.9980									
			3	BEL	0.9979									
			1	SWZ	0.9977									
			1	CIV	0.9974									
			2	MUS	0.9970									
			1	UGA	0.9968									
			1	GAB	0.9963									
			1	BDI	0.9961									
			1	MNG	0.9961									
			1	KHM	0.9958									
			3	IRL	0.9957									
			1	TJK	0.9956									
			3	CHE	0.9953									
			1	AGO	0.9953									
			1	BRN	0.9952									
			2	PRY	0.9951									
			3	JPN	0.9951									
			3	ISR	0.9951									
			1	TZA	0.9950									
			3	EST	0.9950									
Min		1.0056	Min		0.9950	Min		0.9873	Min		0.9527	Min		0.9017
Max		1.0174	Max		1.0035	Max		0.9943	Max		0.9853	Max		0.9017
No in 1st stage		12	No in 1st stage		27	No in 1st stage		9	No in 1st stage		6	No in 1st stage		1
No in 2nd stage		9	No in 2nd stage		15	No in 2nd stage		13	No in 2nd stage		8	No in 2nd stage		0
No in 3rd stage		7	No in 3rd stage		16	No in 3rd stage		12	No in 3rd stage		2	No in 3rd stage		0

Note: SoD = Stage of Development of economies (1st: Factor, 2nd: Efficiency, 3rd: Innovation); No = Number of Countries
Source: author's elaboration based on the calculation in DEA Frontier and IBM SPSS Statistics, 2018.

According to membership of countries into stages of economic development, it is possible to say that the clusters are created by heterogeneous countries, *i.e.* countries from a different stage of development but often with the predominant group of countries in the same development group. Cluster 1, forming a group of 28 countries with increasing productivity levels, present predominantly countries from the 1st stage of development followed by countries from the 2nd and 3rd stage of development. Cluster 2 is the biggest one and forms a group of 58 countries with increasing or decreasing productivity levels, respectively countries moving on the status quo, *i.e.* zero productivity changes. As in the case of Cluster 1, Cluster 2 presents predominantly countries from the 1st stage of development followed by countries from the 3rd and 2nd stage of development. Cluster 3, forming a group of 34 countries with decreasing productivity levels, present predominantly countries from the 2nd stage of development followed by countries from the 3rd and 1st stage of development. Very similar results to Cluster 3 shows Cluster 4, which is made up of 16 countries with declining productivity trends and belonging to 2nd, then 1st and lastly 3rd stage of development.

The last Cluster 5 is made up of only one country with a declining level of productivity and belonging to the 1st stage of development. Based on the character of these five clusters, in the case of classification of WTO members based on average productivity by CA, results confirmed convergence trend of less developed or developing countries to more developed ones based on the theory of economic growth.

In Table 6, this fact is confirmed by results of clustering for countries as a whole sample – based on MPI scores, the whole sample of 137 countries was grouped into five clusters. In most cases, the same conclusions are obvious as in the case of productivity results for separate group of countries based on stage of development (Table 5), *i.e.* the lower stage of development, the higher MPI scores and therefore, the higher level of productivity within clusters, the more countries in the lower stage of development fall into it. The results show that growth is starting to recover, but still is not yet sufficient to provide the foundations needed for continued reductions in poverty and broad-based improvements in the quality of life of the many. With emerging markets having a greater participation

in global production and growth, progress in competitiveness among the large growing economies of Asia, Africa, and Latin America will be fundamental to the ability to provide a new boost to global growth.

Why some developing or emerging economies grow faster than advanced economies? Why are some advanced economies growing and others stagnating? It seems to be a natural proof of the so-called catching effect when the poorer countries that started to develop later are catching up with those richer who have their best years of growth behind. But how about the fact that while some advanced countries still grow relatively satisfactorily, others are already in a state of stagnation? Thus stagnation is not an inevitable destiny of advanced states. But what is the difference between the countries that are approaching it and those that are not? The advanced economies are in retreat. Their positions are pushing the emerging countries. Less than a decade since the beginning of the financial crisis, it has been enough for the power ratio to change again on the chessboard of global economic growth. In the coming decades, the weight of the world's most advanced countries will drop from the current 35% to less than a fifth. By contrast, prize-winners from the emerging economy group will take over half of the global economic output in 2050.

Large-scale cleaning in the Euro-American world after a painful slump in financial business has sparked a gap in the growth rates of advanced economies and the rest of the world, with the lead of the former economic superpower falling year on year. The International Monetary Fund (IMF), for the next thirty of the world's fastest-growing economies for the next years, has not included a single European economy, from the American continent, it is the only country: Panama owed its strategic position for its growth. While the original hegemony of economic power has been cruelly hit by the global financial crisis, economically less advanced, but economically stabilized countries have only touched the crisis. The phenomenon of economic domination of the West is declining quite rapidly. What we now see is the return of the world economy to a greater balance between growth centres. The global economic transformation phenomenon will be the declining weight of today's most advanced G7 economies in favour of expanding rivals from the E7, the world's most prominent emerging markets. Turnover in power ratios reflects the profound chronical difference in economic development rates between advanced and emerging countries of the world that economists expect for the next decade. By the end of the twentieth century, both groups of countries had grown at about the same rate for a long time, nowadays the emerging economies are growing at around twice the pace of developed economies. While so advanced G7 countries have an average growth of 1.6% a year over the next thirty years, the pace for emerging economies will be between 3% and 5%. The weight of seven of the most advanced countries in the world economy will drop from the current 35% to less than a fifth by 2050. E7 premieres, on the other hand, take care of almost half of global economic output. The European Union's share will then fall by a third, from the current fifteen to less than 10%. The Eurozone as a whole lost much of its reputation during the euro crisis.

Growth reins should soon take over Asia. The IMF, in its global growth top ten for the next year, appoints eight Asian and two African economies. Expansion of Asia will greatly help the growing position of the region on the world financial map. Since the outbreak of the financial crisis, there has been strong regulation of bankers' remuneration and the size of risk exposures by European banks, but also in the United States. Many financiers have found a place on the Asian market. Complications for Asian growth may, however, be the power ambitions of local economic leaders. One of the factors that can disrupt the economic prosperity of the region is China's military potential, which has helped to boost its economy. Beijing is increasingly assertive in foreign policy and other countries are more motivated to increase their own military spending. But, China's miracle alternates with India. Burma, Ethiopia, Cote d'Ivoire, or Libya, which are countries that may be dragging the primacy of the fastest-growing economic growth across the blue planet over the next five years, according to the IMF. They grow even faster than 10% a year. But China and India are the most affected by the world economy, at least for the next few years, the winners of these two gigantic economic rivals are decided, Delhi will go ahead faster.

The recent acceleration of India's growth in recent years has contributed to the cheaper commodity imports since 2014, a new government that has been pushing for a growth-enhancing stimulus policy. Based on the long-term global model, India could replace the US as the world's second-largest economy by 2050 if it could hold the impetus for investment in infrastructure and education. India's economy will grow steadily only slightly below 8% in the next five years, with Delhi totally overshadowing China's pace of growth, with the IMF expecting a slightly downward trend that will fall below 6% in 2020. The ageing population will be blamed, but the Chinese economy will grow roughly twice as fast as the rest of the world. There are more countries in the mix of the market economy planned to hear more, the 7% annual expansion to be owned by Vietnam and Laos. Under 2%, on the contrary, the economic growth of the current drivers of the Euro-American economy will stabilize in the coming years, whether it be the United States, Germany or France. However, Europe's position does not greatly improve even the

countries of Central and Eastern Europe reaching the Union standard of living standards, the pace of the region should stagnate only slightly above the 2% growth rates in the next few years.

Conclusion

Over the past several years, a worldwide consensus has emerged on the need for a more inclusive approach to generating economic growth. However, inclusive growth and development remain primarily an aspiration. No systemic framework has emerged to guide policy and practice. The world is undergoing a new round of major development, great change and profound readjustment. The mankind still faces growing uncertainties and destabilizing factors. Surging tides of anti-globalization in recent years, coupled with rising protectionism and unilateralism, have posed severe challenges to the multilateral trading system with WTO at its core. Wider and deeper cross-border economic integration has contributed greatly to overall peace and stability since World War II. It has increased individuals' freedom to produce and consume in daily life, widening the life choices and chances of large numbers of ordinary people. However, openness and the links between trade and competitiveness have fallen off the agenda in recent years.

Since the economic crisis, policymakers have been in fire-fighting mode, focusing on fiscal and monetary macroeconomic stimulus and financial reregulation. This has arguably come at the expense of supply-side issues and structural reforms needed to address sluggish productivity growth. Supply-side constraints to growth – distortions in product and factor markets, education, skills, and infrastructure – have not been sufficiently addressed; if anything, market distortions have increased since the crisis, undermining competitiveness. And although protectionism has not surged, there is evidence of creeping protectionism, especially with increasing non-tariff barriers to trade. Global trade growth is weaker than at any time in the last two decades. Strengthening both global openness and domestic competitiveness has never been more important. To revive sluggish productivity and tap new sources of growth, innovation, job creation, and development, a trade-and-competitiveness agenda should be a priority for policymakers around the world. Major economies should undertake a coordinated effort to boost global growth by identifying and implementing the demand- and supply-side structural reforms that are most needed to activate more fully the virtuous circle of inclusive growth in their economies. International organizations should embrace this reformulation and reprioritization of structural economic policy in their public signalling, country advice, and development cooperation programs. By virtue of their public profile and intimate relationship with the economic ministries of governments, the major international economic organizations have a vital role to play in the establishment and scale application of this new and more inclusive growth model.

The dynamics of economic, social, political and cultural change in the contemporary world are increasingly shaped by the pursuit and promotion of competitiveness. The economy's entry into globalisation phase has radically altered the nature of competition. Numerous new actors from every market in the world are simultaneously in competition on every market. This new competition has accentuated the interdependence of the different levels of globalisation. The world economy is changing in the face of growing competition as a consequence of globalisation processes. These processes result in changing the position of global economic powers, the emergence of new powers, and thus in a new distribution of global forces. As WEF states (WEF 2015, 5), these developments have also intensified competition in global markets, which, in turn, implies a greater need to be competitive to generate additional market opportunities and economic links in the presence of many more participants vying for the same space.

Globalisation has obliged all countries to raise their standards of economic efficiency, hence the growing interest in and concern about competitiveness: nations, regions and cities have no option but to strive to be competitive in order to survive in the new global marketplace and the 'new competition' being forged by the new information or knowledge-driven economy. The evaluation of a country's performance is crucial to the country's efforts to improve its international competitiveness. Strengthening both global openness and domestic competitiveness has never been more important. Policy-makers at all levels have been swept up in this competitiveness fever too. This growing interest may perhaps be partly attributable to their awareness of the fact that all countries having to contend with raised standards of economic efficiency as a result of the globalisation of goods and factor markets. The economy may be competitive but if the society and the environment suffer too much the country will face major difficulties and vice versa. Policies oriented to solve the main economic and social problems of their citizens may then not focus only on the improvement of indicators of competitiveness but also on the reduction of differences in competitiveness compared to other players in the world economy. Many of differences in economic growth and quality of life within a country may be explained by differences in competitiveness and the growth possibilities of the economy on the basis of its endowments.

Methodological framework of the article evaluates the macroeconomic competitiveness of WTO members based on GCI pillars, this article thus closely followed the methodology proposed by WEF. Determinants of competitiveness – pillars were distinguished into input and output size which measure different aspects of transformation processes of economic activities. Using efficiency analysis through DEA approach – the method aimed to identify the efficient and inefficient countries of WTO and to estimate the relative efficiency of each country within the evaluated sample. Does it evolve the question: why measuring macroeconomic competitiveness is so important? Because 'if you cannot measure it, you cannot improve it' (Lord Kelvin, resp. an Irish mathematical physicist William Thomson). A quantitative score of competitiveness will facilitate WTO members in identifying possible weaknesses together with factors mainly driving these weaknesses. This, in turn, will assist countries in the catching up the process. In reality, every pillar may not play an equal role in the competitiveness of every country what is logical, and therefore the concept of different stages of economic development was applied.

Therefore, follow-up research will thus orientate on regional relations and linkages across individual continents, *i.e.* comparison of world regions such as East Asia and Pacific, Eurasia, Europe and North America, Latin America and Caribe, Middle East and North Africa, South Asia, and Sub-Saharan Africa. Evaluation will be based on driven forces of competitiveness relevant to each stage of development and the added value of regions' links to the competitiveness of WTO members. In the context of the global challenges, understanding the determinants and priorities at a regional level is a necessity for striving for faster global convergence toward higher incomes and greater well-being. Making globalization work for all requires making progress in all the pillars of competitiveness across regions. Emerging economies need to close the gaps with advanced economies in order to benefit from the possibilities of international trade and mobility of labour and capital as well as the latest technological developments available worldwide. On the other hand, advanced economies need to prioritize competitiveness-enhancing reforms. In particular, in the current rapidly changing and still challenging socioeconomic context, inaction will undermine future prosperity.

Acknowledgement

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Social Inertia as a Destructive Factor in the Development of the Innovative Economic System in the Russian Federation

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Abstract:

In the conditions of limited financial resources, tough competition and social transformation of society, the development of an innovative economic system in the Russian Federation (RF) is subject to the destructive impact of non-economic factors. In view of this, the issue of identifying social inertia as a deterrent to innovative transformations in the economy is of increasing significance.

The purpose of the article is to evaluate and analyze the force and factors of social inertia on the part of the population regarding regional economy modernization in Russia. As part of study, the essence of the sociological category of "social inertia" was clarified. By means of a sociological survey of residents of the Russian regions, the quantitative value of integral indices of the power of social inertia towards innovative transformations in the national economy is determined. The levels of the force of social inertia have been developed and substantiated. Time lags of social actors' lability for each of the regions are calculated. Classification of Russia's regions according to the level of inertia and temporal lag is performed. The regional features of the presence of social inertia towards the modernization of economic processes are grounded. Factors of the development of social inertia in the Russian economy are argued.

A set of practical recommendations was developed on the reduction of the level of social inertia in regions in order to reach an adequate consensus between social actors and the management system within the framework of the development of the innovative economic system. This approach contributes to the establishment of a balance between the urge for profits and the social responsibility of business as the basis for boosting innovation and the formation of an appropriate social environment for its development in Russia.

Keywords social; inertia; economic system; system; lability; power of social inertia; innovation; innovative economy

JEL Classification: D71; P00; P10; P19; O3; O35; O39

Introduction

Russian society is developing under the conditions of reproduction and transformation of sociality, when the functional trends of dominant social actors, social behavior practices, traditional elements of the system, established types of mass consciousness resist innovations to a large extent, impede the assimilation of innovations and the establishment of modern social institutions (Stål 2015). In other words, the phenomenon of social inertia plays an essential role in the framework of sociocultural transformations and it is impossible to create a general theory of reforms in the state without its profound study (Beumer, Figge and Elliott 2018).

The relevance of the research topic is conditioned by the Russian Federation's transition to the path of innovative economic development as non-alternative to overcome the current crisis situation, increase the competitiveness of the national economic system within the global economy; and there upon – to accelerate economic growth rates and ensure a decent standard of living for people, which is reflected as a priority in the Strategy for Innovative Development of the Russian Federation (On the Strategy for Innovative Development of the Russian Federation until 2020, 2011). At the same time, in the conditions of severe competition, limited financial resources, the search for non-economic factors of innovative development becomes crucial. In this context, the analysis of social inertia as a deterrent is decisive, and taking into account the multinational population of Russia and the differentiated economic development of regions, the identification of social inertia becomes a priority within the modernization of the national economy (Gnatyuk 2017).

Identification and regard to inertia by social actors under the impact on economic processes affects the pace and consistency of reforms in the country. Within this context, the aim of the study is to determine the level of the power of social inertia towards innovative changes in the economic system of the Russian Federation in terms of regions. Within the framework of the research, the following issues of scientific search were formulated and resolved: clarification of the content of the concept of "social inertia" as a sociological category; classification of RF regions by the level of power of social inertia and lability of social actors; substantiation of reasons for social inertia to the process of modernization of the Russian economy; justification of a set of measures to reduce the level of force of social inertia in regions.

1. Materials and methods

The methodology of assessing social inertia to innovative changes in the economic system of the Russian Federation in terms of the regions presupposes a sociological telephone-based poll aimed at determining the regions' inertial properties in the Russian Federation.

The representativeness of the sociological survey was estimated by the sampling adequacy index (Reid 2015)

$$SS = \frac{Z(\alpha)^2 \cdot p \cdot (1-p)}{\varepsilon^2},$$
(1)

where SS is the sample size, sufficient to ensure the representativeness of the survey results; Z (α) is the standard deviation; α is the confidential probability; p is the sample variance; ε - acceptable error level.

Special indices of social inertia are determined on the basis of the results of a sociological poll by formula (Daily All-Russia Poll SPUTNIK 2018):

$$I_k = S_{na}(\%) - S_{pa}(\%),$$
(2)

where: I_k is the value of the k-th social inertia index; $S_{na}(\%)$– the sum of negative answers to the question, in%; $S_{pa}(\%)$ – the sum of positive answers to the question, in%; $I \in [-100; +100]$, where "– 100" is the absence of inertia on account of this characteristic, "+100' – the presence of strong inertia.

The index of social inertia to innovative transformations in the economic system is an integral index combining special social indices:

$$ISI = f(I_1; I_2; ...; I_k),$$
(3)

where: ISI is integral index of social inertia to innovative transformations; $I_1; I_2; ...; I_k$ – special indices of social inertia, which are defined by formula (2).

The value of the integral index of social inertia is calculated using the taxonomic analysis described by the system of formulas (4) (7) (Fox & Alptekin 2018):

$$ISI_j = 1 - \frac{d_j}{d_0},$$
(4)

$$d_j = \sum_{i=1}^{k}(\acute{I}_{kj} - I_{k0}^{'})^2,$$
(5)

$$d_0 = \bar{d} + 2 \cdot \sigma_d,$$
(6)

$$\acute{I}_{kj} = \frac{(I_{kj} - \overline{I_{kj}})}{\sigma_{I_{kj}}},$$
(7)

where: I_{kj} is the actual value of the k-th index for the j-th region for the i-th period; $\overline{I_{kj}}$ – the average value of the k-th index for the j-th region; $\sigma_{I_{kj}}$ – the root-mean-square deviation of the values of the k-th index for the j-th region; $\acute{I}_{kj}$ – the standardized value of the k-th index for the j-th region for the i-th period; $\acute{I}_{k0}$ – the reference value of the k-th index ($\acute{I}_{k0}$=100); d_j – the Euclidean distance of the i-th region during the i-th period to the reference value of the index; $\bar{d}$ – the average value of the Euclidean distances of the region for the i-th period to the reference value of the index; σ_d – root-mean-square deviation of the values of the Euclidean distances of the region for the i-th period to the reference value of the index; ISI_j – the value of the integral index of social inertia to innovative transformations in the economic system of the j-th region for the i-th period. $ISI \in [0;1]$, where "0" is absence of social inertia in the region, "1" – the presence of maximum inertia, at which innovative transformations in the region are not perceived.

The levels of the integral index of social inertia are determined by the "three-sigma rule", according to which the indicator value is checked for the normal distribution (formula 8) (Kissell and Poserina 2017). If the normal distribution is not confirmed, the skewness is calculated: the right-skewed distribution by formula (9), the left-skewed by formula (10) (Kissell and Poserina 2017). The numerical limits of the levels of social inertia with the right-skewed distribution are determined by formula (11), with left-hand skewness– by formula (12) (Kissell and Poserina 2017).

$$A_s = \frac{\overline{ISI} - M_e}{\sigma}, \tag{8}$$

$$k = \frac{M_e - M_o}{M_e \cdot n}, \tag{9}$$

$$k = \frac{M_o - M_e}{M_o \cdot n}, \tag{10}$$

$$\begin{cases} (ISI_{min}; \ \overline{ISI} - 3 \cdot \sigma \cdot k] - low\ index\ level, \\ (\overline{ISI} - 3 \cdot \sigma \cdot k; \ \overline{ISI} + 3 \cdot \sigma \cdot (k+1)] - average\ level, \\ (\overline{ISI} + 3 \cdot \sigma \cdot (k+1); \ \ ISI_{max}) - high\ level, \end{cases} \tag{11}$$

$$\begin{cases} (ISI_{min}; \ \overline{ISI} - 3 \cdot \sigma \cdot (k+1)] - low\ index\ level, \\ (\overline{ISI} - 3 \cdot \sigma \cdot (k+1); \ \overline{ISI} + 3 \cdot \sigma \cdot k] - average\ level, \\ (ISI + 3 \cdot \sigma \cdot k; \ \ ISI_{max}) - high\ index\ level,, \end{cases} \quad ....(12)$$

where: A_s is skewness. The sign of the skewness indicates the direction of skew, so the positive skew indicates the right-tailed skewness, the negative skew indicates the left- tailed skewness; $\overline{ISI}$ – the mean value of the variation series – the index of social inertia for all regions for the entire period; σ – root-mean-square deviation of the social inertia index; M_e – median of the variational series; M_o mode of the variational series; k – adjustment factor; n – the number of scale divisions located on the left and on the right of the median; ISI_{min} – the minimum value of the index of social inertia ($ISI_{min} = 0$); ISI_{max}– the maximum value of the index of social inertia ($ISI_{min} = 1$).

The basis for assessing the lability of social actors in the regions of the Russian Federation is the definition of the time lag – the time of the society's reaction to innovative transformations in the economic system, which was determined by finding correlation coefficients between the level of intensive economic growth of the region and the social index of the effectiveness of innovation activity (determined during the sociological survey) without a temporary lag and with a lag of 1-5 months.

The level of intensive economic growth of the region was determined by formula (13) (Thompson 2018):

$$K_i = 1 - \frac{1 + K_g}{1 + K_{GRP}}, \tag{13}$$

where: K_i is the level of intensive economic growth of the region; K_g – the growth rate of the region's extensive factors (the number of employees, the value of fixed assets, investments in fixed assets); K_{GRP} – growth rate of the gross regional product.

To calculate the correlation coefficients between the level of intensive economic growth of the region and the social index of innovation performance, formula (14) is applied (Potekhina et al., 2016):

$$r_{xy} = \frac{\sum_{t=1}^{m}(x_t - \bar{x})(y_t - \bar{y})}{\sqrt{\sum_{t=1}^{m}(x_t - \bar{x})^2 \cdot \sum_{t=1}^{m}(y_t - \bar{y})^2}}, \quad ....(14)$$

where: r_{xy} is the correlation coefficient between the level of intensive economic growth of the region and the social index for assessing the effectiveness of innovation activities; x_t – the value of the indicator of the level of intensive economic growth in the region for the period t; y_t – the value of the innovation activity efficiency index for the period t, (t+1), (t+2), (t+3), (t+4), (t+5); $\bar{x}$, $\bar{y}$ – average values of indicators of the level of intensive economic growth and the index of effectiveness of innovation activity, respectively, for the period under investigation; m – number of periods.

The correlation coefficient in the range [-1; +1] is measured. The value of the correlation coefficient <0 indicates the reverse character of the connection, the value of the correlation coefficient > 0 is about the direct one. For a qualitative assessment of the strength of relationship, the Cheddock scale was used, according to which the strength of the weak relationship corresponds to the value of the correlation coefficient | 0.1 | - | 0.3 |; | 0.3 | - | 0.5 | – moderate; | 0.5 | - | 0,7 | – notable; | 0,7 | - | 0.9 | – high (strong); | 0.9 | - | 1 | – very high.

2. Results

In the traditional sense, social inertia is a process that, as a rule, is compared to negative tendencies and is in fact identified with stagnation (Gnatyuk 2017 "Theoretical and methodological construct ...", Kim 2017). This scientific position is grounded on the fact that inertia is often associated with resistance to changes and delay in the implementation of innovations and the destruction of organizational culture. But any resistance, including the resistance of the social subject, can be not only destructive, but also constructive (Gnatyuk 2017, Beumer, Figge and Elliott 2018). The subjects' resistance can be an indicator of the reasonable unpreparedness of the social system to structural changes and the negative social consequences of these changes, and can form a basis for improving plans for their implementation, and thus can be factors of more successful implementation and achievement of additional social and economic benefits.

Social inertia is inextricably linked with the manifestation of the social actor's free will. Therefore, if the individual's personality is formed in isolation from the inertia of the external environment, if the pressure of the social environment levels the boundaries of the social actor's self-identity, contradicts or does not coincide with the personality value system, if the imposed system of values of the social system outpaces the opportunities for personal adaptation, *etc.*, in these cases, inertia emerges as a deterrent to the development and integrity of the social system.

Most scientists consider the social inertia as the ability of the properties of the social system to maintain the stability of its development and integrity. This approach reflects only the properties of inertia as a physical phenomenon leveling the properties of a social system that functions and develops by the formation of social relations and relationships, forming a social object (Stål 2015, Sautua 2017, Doyle *et al.* 2016, Kim, Maurer and Mitchell 2016).

Inertial processes in the social system are determined by the nature of the interaction of social actors and are specified by the ratio of the presence of traditional and innovative in the value system and the subject's behavior, which expresses its properties of connection with the social environment (Beumer, Figge and Elliott 2018).

From the formal standpoint, the social system, represented by the management system in relation to the subject creates conditions that enhance the social actor's desire to reproduction, since the community size is one of the factors of its weight in the external environment; increases the intra-system status of subjects, since the status of the community is determined by a set of statuses; defines goals and objectives for social actors and coordinates them, if necessary, with their personal goals and opportunities; establishes the rules of conduct, the so-called restricted areas related to subjects (areas of rights and freedoms, duties, *etc.*) and coordinates with their personal goals and opportunities; carries out measures to protect the subject from the negative impact of the external environment; takes measures to preserve or multiply the results of social actors' activities; implements measures, by means of propaganda, initiation, imprinting and others in order to let the subjects perceive themselves as members of the economic community.

Formalizing the duties of a social subject as regards the system, one can single out the following ones: to promote the reproduction and preservation of society; increase their system status; be in line with directives and keep to the boundaries of the area of restrictions; awareness belonging to an economic society in the personality system.

To ensure the sustainability of the social system development as a relationship between the subject and its social environment, the following law must be implemented: the goals of the subject and the social environment lie beyond their boundaries. For a social subject, its vital activity must consist in the understanding that it is the cause of environmental changes, since the subject is a system-forming element of any community. Subjects personally

provide the functioning of society and subordinate systems, and the existence of a cognitive system in them allows realizing that each of them is the source of their community existence. The social subject is more stable, when it is better able to take into account the impact of the social environment, its change, without losing the essence and direction of development. Inertia assumes the social subject's activity in the use of the social environment. Whereas in order to maintain its stability and integrity, the social system must be both subjective and inertial due to the fact that in the economic system the social actor is formed and his personal capabilities are enormously less than the accumulated experience of the external environment.

Consequently, understanding the essence of the social system inertia is only possible through an understanding of the consistency and contradiction of the degree of individual and social subjectivity, traditional and innovative in the individual's value system, performing vital activity in certain historical conditions in the social system in which he acts as a social subject.

With reference to the foregoing, within the framework of this research, social inertia is understood as a qualitative characteristic of the forms of interaction between the individual's subjectivity and the development of the social system with a view to preserving its integrity through the reproduction of functions and structure.

In conditions of increasing global competition, the problem of economic safety of production and economic activities becomes a priority for the Russian Federation. The crossroad of 2013-2014 became the beginning of regress in the Russian economy (Federal State Statistics Service 2018). The collapse of world prices for hydrocarbon fuels and other Russian raw materials exports led to the Russian ruble depreciation and increasing inflation rates (The Central Bank of the Russian Federation, 2018). The Russian economy continues its decline, if in 2013, Russia ranked the 58th in the world ranking by GDP per capita – $14,469, then in 2018, it took the 65th place at $ 11,947 per person (World Development Indicators: Gross National Incomeper Capita 2018). The growth in real GDP in 2018 as regard to 2013 was reduced by 6% (Federal State Statistics Service 2018). The current situation is usually provoked by systemic external factors in the global economy. But nevertheless, it would be incorrect to enlarge the role of external impacts and shocks. With all their strong influence, the internal mechanisms of hindering being inherent in the Russian model of economic growth lie in the foundation of those socio-economic difficulties that Russia encounters at the present stage. One of the key internal structural imbalances and the problematic macroeconomic component is that industrial growth in Russia occurs largely on an old reproduction base, by means of assets that were formed back in the Soviet times, and with the use of equipment produced in the last century. So, according to the Center for Strategic Research, 42% of the production capacities of the Russian chemical industry were put into operation more than 15 years ago, and there are more than 53% of obsolete production facilities in the metallurgy (Centre for Strategic Developments(CSD) estimated the productive capacity of the manufacturing industry, 2017). The prevailing number of processing enterprises in the Russian Federation are immune to innovation and modernization. As a consequence, they substantially lag behind foreign competitors in terms of labor productivity and competitiveness in international markets (Figure 1) (Yakovlev 2017).

Figure 1. Labor productivity level at enterprises of the world's leading companies
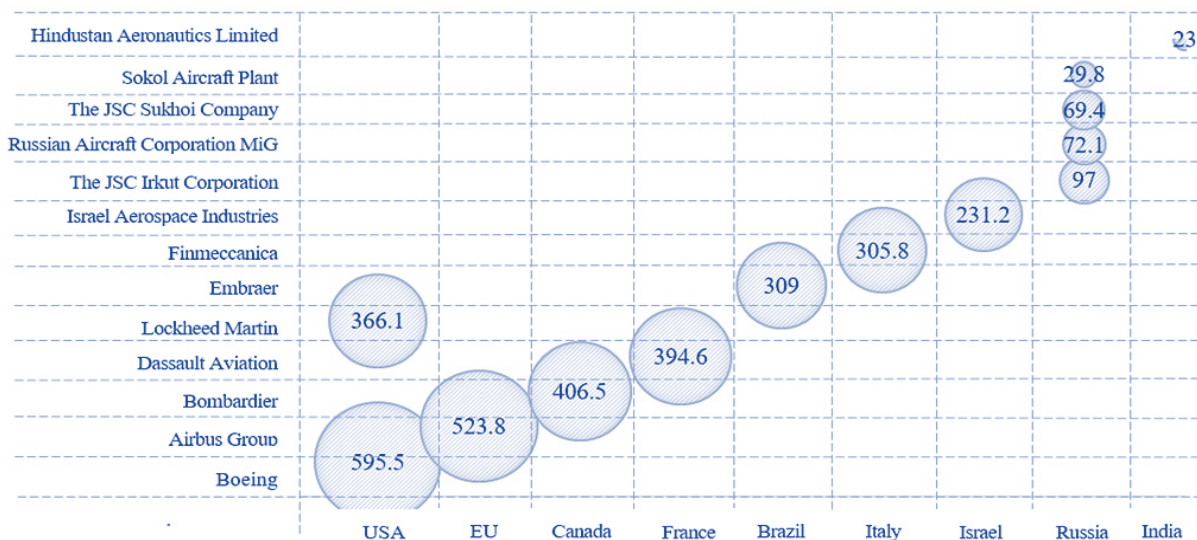
In addition, there is a fairly low level of the systemic reaction of the national economy to the challenges of the fourth technological revolution and industry 4.0. (La robolución ya es imparable, 2017). On the one hand, the

Russian industry maintains significant scientific and technical and technological potential in key sectors such as nuclear power, armament production, space exploration, software, nanotechnology, etc. On the other hand, the Russian economy has a significant gap with foreign production of high-tech goods, where its share is only 0.3% while Germany's corresponding figure equals to 16%, Japan's similar indicator– 30%, that of the United States – 39% (Yakovlev 2017). According to reliable estimates of the Federal Service for Intellectual Property (Rospatent), Russian imports of intellectual property currently exceed exports by 11 times (Rospatent 2018),while the increase in the number of patent applications contributes to steady positive dynamics of economic development and GDP growth rate in any economic system.

That is, it can be argued that the Russian economy is characterized by the predominance of quantitative development over the qualitative one, which in its turn does not have any effect of investment and generates deterrents in the development of equipment and technology.

The current situation is largely due to the existing past stable stereotypes of people's behavior and thinking, as well as past stable preferences, habits and predilections having formed in the past as economic agents, as well as steady and conservative views on what is happening, persistent attitudes and false beliefs, prejudices and myths with the negative impact on people's consciousness, perception, preferences, opinions and moods and being a serious obstacle to the emergence of a new modernized economy. That is, one can testify to the presence of social inertia as a traditional social force in a person's individuality manifested in the ability to withstand the impacts of a dynamically changing type of economic system. In that context, within this research, an assessment and analysis of the power of social inertia towards innovative transformations in the economic system of the Russian Federation was carried out.

Since Russia is characterized by the territorial immensity and ethno-social differentiation of regions that have different innovative and financial potential, the level of cooperation ties and awareness of new technologies, cultural traditions and established preferences, habits and choices, it seems reasonable to estimate the force of social inertia in the regional context.

According to Newton's laws, the inertial force of a physical body is determined by multiplying the body mass (m) by its acceleration (a) (Millis 2017). In sociology, it is not possible to apply the concept of mass in measuring the force of inertia, but some similar pattern should be noted. In a natural system, the acceleration of a body under the influence of external forces is less and inversely proportional to its mass. In a similar way, in a social system, the less the acceleration of a social subject, the greater its individual and social forces. Consequently, strong social subjects are more resistant to the pressure of the social environment, ignore certain external manifestations, balance their strength and reproduce on their own traditional basis, critically sorting out innovations for their development. In other words, if we draw an analogy between a physical body and a society, then the force of social inertia must be determined by taking into account some characteristic crucial for the inertial properties (in physics, the mass of the body) and the force of the impact giving acceleration.

It is advisable to take social stability, the ability of the social system to maintain equilibrium, as a feature determining the inertial properties (Stål 2015). The more stable the system is, the higher it possesses inertial properties – the ability to maintain equilibrium.

The stability of the social system is determined by its mood, sensitivity to changes in society. Since this is entirely subjective characteristic, a sociological survey was used to measure it. The second component of the inertia force – acceleration – characterizes the external impact on the system, in this case the influence of economic factors on the stability of the social system. In physics there is a direct dependence of the body's inertia on acceleration, which acts on it, as it is reflected in a formula ($F = m * a$) (Millis 2017).

Social inertia is the ability of the social system to maintain established forms of functioning in a changing situation, as reflected in this study. Therefore, relating to the social system, it is necessary to make a clarification: to estimate the inertia force, it is essential to use not the actual value of acceleration, but the ultimate maximum value at which the social system is on the verge of exit from an equilibrium state. Using the ultimate acceleration will determine the ability of the social system to counteract external (economic) influences. It is possible to take the growth rates of key economic indicators as such an acceleration.

Within the framework of this research, in order to determine the force of social inertia in the economic system, a sociological survey was held. The sociological survey was based on the methodology of the Russian Public Opinion Research Center (VTsIOM) – a research institute in the social, political, economic sphere, which activities are aimed at researching public opinion, social development, mass consciousness and the population behavior (VTsIOM, 2018).

To study the social inertia in the dynamics the survey was conducted every month during 2017 and the first half of 2018. Social research was held through a telephone-based survey of residents in all regions of Russia,

selected at random. Three hundred people took part in each survey (with a sufficient sample level of 273 persons, determined by formula 1). The sufficiency of the sample and the random character of its formation testify to the representativeness of the research findings.

Respondents were asked to give answers to 2 groups of questions. The first group included questions concerning the sustainability of the social system (population of the region):

- What do you think of social changes?
- What do you think of the reforms in the country?
- Are you able to support innovative transformations in the country?

The first question reflects the social actors' attitude to certain changes in the Russian economy. For instance, a decrease or increase in oil production, a reduction or growth in the production of consumer goods, an increase or decrease in GDP growth rates and so on. In other words, those factors are implied that can cause changes in social communication and stratification, in public attitude, *etc.*, but formed by certain regularities of economic development.

The task of the second question was to identify the relationship of social actors to the process of reforming the country's economic system, namely, to radical changes in the national economy: changes in the management of the economy and in the forms of state and market management, modification of methods for implementing the state's economic policy and so on. That is to say, these changes form strict zones of restrictions for the subjects of the social system.

The third issue of the sociological survey helped identify the relationship of social actors to the ability and desire to carry out scientific, technological, organizational, financial and commercial activities aimed at innovative projects accomplishment, as well as creating an innovative infrastructure and ensuring its performance. That means people's attitude to generating new knowledge, mastering new technologies, striving to be competitive and constantly keep abreast of the latest trends.

The second group consisted of questions that allowed determining the ultimate acceleration shifting the social system's balance – a reaction to the introduction of innovations into production and commercial activities. The list of questions to determine the threshold acceleration which causes the impairment of the equilibrium condition of the social system comprises the following ones:

- Do you think that the change in the level of innovation activity by 1% will significantly affect the country's economic condition and living standards?
- Do you think that the change in the level of innovation activity by 5% will significantly affect the country's economic condition and living standards?
- Do you think that the change in the level of innovation activity by 10% will significantly affect the country's economic condition and living standards?
- Do you think that the change in the level of innovation activity by 15% will significantly affect the country's economic condition and living standards?

For questions 1-2, the following options were suggested: "very good", "good", "rather good", "very bad", "bad", "rather bad". Along with this, it does not matter whether these changes are positive or negative, because the purpose of the survey is to assess the population's susceptibility to innovations, their readiness for their perception and use. As for questions 3-7, the options are: "yes", "rather yes than no", "rather no than yes", "no", "cannot say". In a telephone-based survey it is advisable to use a small number of questions (5-8) to ensure respondents' maximum concentration (VTsIOM SPUTNIK, 2018). The possibility of a numerical analysis of the results, their processing and interpretation is provided by the fact that a corresponding index was calculated for each question. According to the VTsIOM methodology, indices are calculated as the difference between the answers "very good", "good", "rather good" and "very bad", "bad", "rather bad", expressed as a percentage (VTsIOM SPUTNIK, 2018).

For all indices, there is a feedback with the inertia of the social system. The more positive answers to these questions, the less extent of the quality of inertia is possessed by the social system. For this reason, these indices are calculated as the difference between the percentage of responses "very bad", "bad", "rather bad" and "very good", "good", "rather good" (for indices "What do you think of social changes?", "What do you think of the reforms in the country?"); as the difference between the percentages of answers "no", "rather no than yes", and "yes", "rather yes than no", (for indices "Are you able to support innovative transformations in the country?", "Do you think that the change in the level of innovation activity by 1% will significantly affect the country's economic condition and living standards?", "... 5% ...", "... 10% ... ", "... 15% ...") (formula 2). The use in the survey of different rates of change in the index of innovation activity allows more accurate and in-depth assessment of the inertia of the social system at different levels of acceleration.

Indices are measured in the range from "-100 to +100", where "-100" indicates a lack of inertia in the region, "+100" bears witness to the presence of strong social inertia in the economic system. Grounded on the values of the calculated social indices, an integral indicator is determined that characterizes the force of inertia in the regions of the Russian Federation to innovative changes in the economic system.

The integral index is calculated by the method of taxonomic analysis (formula 3). Since indices have different number of dimensions (in spite of the fact that the indices are calculated similarly, their values can be positive and negative and have different place values: ones, tens, hundreds), the standardization of the indices values for calculating the integral index for social inertia was performed to bring them into commensurate form (formula 7).

Taxonomic analysis provides for the selection of the standard vector. The maximum possible value of the index (+100), corresponding to the presence of a strong inertia of the social system, is taken in the capacity of a standard. The calculation of the integral index is based on finding the distance between the actual state of the system and the standard one (formula 5). The smaller this distance, the higher the value of the integral indicator. The integral indicator is measured in the range from "0" to "1", where "0" shows the absence of inertia of the social system, and "1" indicates the presence of strong inertia.

The values of the social inertia index of the Russian Federation regions calculated according to formulas (4) - (7) are shown in Figure 2.

Figure 2. Dynamic trend of the russian federation regions' integral index of social inertia to innovative transformations in economic system
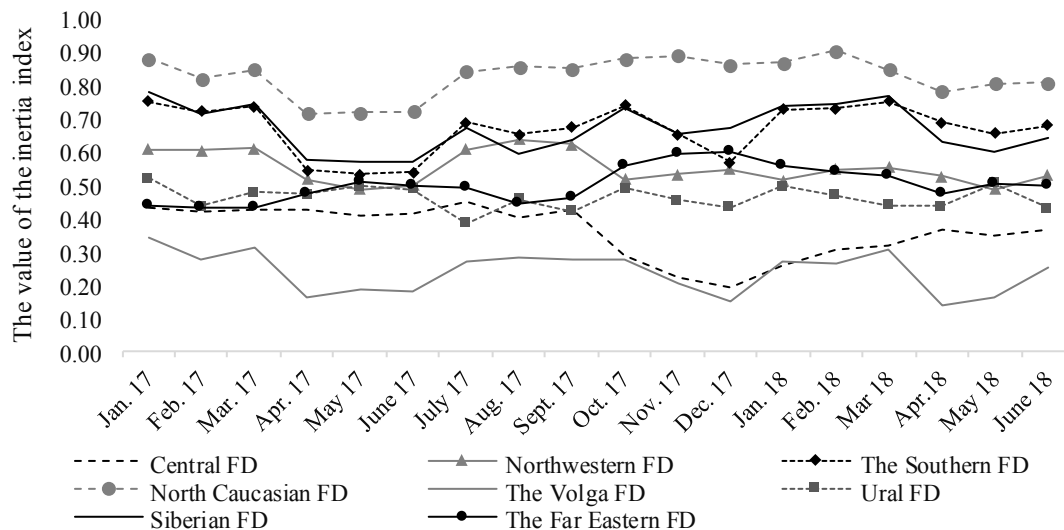
The establishment of the integral index levels within the framework of the study was carried out using the "three sigma" scaling method (Kissell and Poserina 2017). For this purpose, statistical characteristics of the variation series of the integral index of social inertia are calculated and, the correspondence between the distribution of values of the integral index to the normal distribution is determined by formula 8 (Table 1).

Table 1. Statistical characteristics of the variation series of the integral index of social inertia to innovative transformations in the economic system of the Russian Federation

Index	Value
Mean	0.46
Median	0.45
Mode	0.43
Standard deviation	0.09
Coefficient of skewness	0.11
Type of skewness	Right-skewed
Adjustment factor	0.02

Based on the statistical characteristics (Table 1), the levels of the integral index of social inertia are defined, applying formulas (8) - (12): low– [0; 0.45); average – [0.45; 0.74); high – [0.74; 1]. The values of the integral index of social inertia to innovative transformations in the Russian economy by regions are presented in Table 2.

Table 2. Levels of the integral index of social inertia to innovative transformations in the economic system of Russia during 2017-1 – 1st half of 2018

RF Region	January 17		February 17		March 17		April 17	
	Value	Level	Value	Level	Value	Level	Value	Level
Central Federal District	0.43	Low	0.42	Low	0.43	Low	0.43	Low
Northwestern Federal District	0.61	Average	0.61	Average	0.61	Average	0.52	Average
The Southern Federal District	0.75	High	0.72	Average	0.74	High	0.54	Average
North Caucasian Federal District	0.88	High	0.82	High	0.85	High	0.72	Average
The Volga Federal District	0.34	Low	0.28	Low	0.31	Low	0.16	Low
Ural Federal District	0.52	Average	0.44	Low	0.48	Average	0.47	Average
Siberian Federal District	0.78	High	0.72	Average	0.75	High	0.58	Average
The Far Eastern Federal District	0.44	Low	0.43	Low	0.43	Low	0.47	Average
RF Region	May17		June 17		July17		Aug.17	
	Value	Level	Value	Level	Value	Level	Value	Level
Central Federal District	0.41	Low	0.42	Low	0.45	Average	0.40	Low
Northwestern Federal District	0.49	Average	0.50	Average	0.61	Average	0.64	Average
The Southern Federal District	0.53	Average	0.54	Average	0.69	Average	0.65	Average
North Caucasian Federal District	0.72	Average	0.72	Average	0.84	High	0.86	High
The Volga Federal District	0.19	Low	0.18	Low	0.27	Low	0.28	Low
Ural Federal District	0.50	Average	0.49	Average	0.39	Low	0.46	Average
Siberian Federal District	0.57	Average	0.57	Average	0.67	Average	0.60	Average
The Far Eastern Federal District	0.51	Average	0.50	Average	0.49	Average	0.45	Low
RF Region	Sept.17		Oct.17		Nov.17		Dec.17	
	Value	Level	Value	Level	Value	Level	Value	Level
Central Federal District	0.42	Low	0.29	Low	0.22	Low	0.19	Low
Northwestern Federal District	0.62	Average	0.52	Average	0.53	Average	0.55	Average
The Southern Federal District	0.67	Average	0.74	High	0.65	Average	0.57	Average
North Caucasian Federal District	0.85	High	0.88	High	0.89	High	0.86	High
The Volga Federal District	0.28	Low	0.28	Low	0.20	Low	0.15	Low
Ural Federal District	0.42	Low	0.49	Average	0.45	Average	0.43	Low
Siberian Federal District	0.64	Average	0.73	Average	0.65	Average	0.67	Average
The Far Eastern Federal District	0.46	Average	0.56	Average	0.60	Average	0.60	Average
RF Region	Jan.18		Feb.18		March18		Aprl18	
	Value	Level	Value	Level	Value	Level	Value	Level
Central Federal District	0.26	Low	0.31	Low	0.32	Low	0.37	Low
Northwestern Federal District	0.51	Average	0.55	Average	0.56	Average	0.53	Average
The Southern Federal District	0.73	Average	0.73	Average	0.75	High	0.69	Average

North Caucasian Federal District	0.87	High	0.91	High	0.85	High	0.78	High
The Volga Federal District	0.27	Low	0.27	Low	0.31	Low	0.14	Low
Ural Federal District	0.50	Average	0.47	Average	0.44	Low	0.44	Low
Siberian Federal District	0.74	High	0.75	High	0.77	High	0.63	Average
The Far Eastern Federal District	0.56	Average	0.54	Average	0.53	Average	0.48	Average

RF Region	May 18		June 18	
	Value	Level	Value	Level
Central Federal District	0.35	Low	0.37	Low
Northwestern Federal District	0.49	Average	0.53	Average
The Southern Federal District	0.66	Average	0.68	Average
North Caucasian Federal District	0.81	High	0.81	High
The Volga Federal District	0.16	Low	0.25	Low
Ural Federal District	0.51	Average	0.43	Low
Siberian Federal District	0.60	Average	0.64	Average
The Far Eastern Federal District	0.50	Average	0.50	Average

Based on the data in Figure 2 and Table 2, it can be concluded that the North Caucasian Federal District has the highest level of the force of social inertia to innovative transformations in the economic system of Russia. The integral value of the level of the force of social inertia for the period under investigation within the proposed graduation was in the range of [0.72-89]. In addition, the Index "Are you able to support innovative transformations in the country?" is characterized by the highest level of social actors' resistance in the integral index of inertial force– 92% of respondents answered negatively.

The average level of social inertia is distinctive for such regions as: Ural FD – interval of values of inertia force is [0,39-0,52], Siberian Federal District – [0,58-0,78]; Northwestern FD– [0,49-0,62]; the Southern FD – [0.53-0.75] and the Far Eastern FD – [0.43-0.60]. The results of the sociological survey also testified to the largest percentage of social actors' negative responses in the Index "Are you able to support innovative transformations in the country?" – from 79% to 88% by regions.

The low level of social inertia to innovative changes in the economic system of Russia during 2017 – the 1st half of 2018 is specific for the Central Federal District, where the inertia force level was [0.19-0.45] and for the Volga Federal District – [0.14-0.34]. But regardless of the lowest level of inertia in these regions, they are also characterized by a significant level of negative responses to the Index "Are you able to support innovative transformations in the country?"; 77% and 74% of respondents, respectively, are unable to support innovative development in the national economic system.

In support of the obtained results of the study of the social inertia in the regions of the Russian Federation to innovative transformations, the social lability of the regional subjects was estimated. It seems typical that the higher the community's lability, the shorter the response time of social actors to the environmental impacts (Silin 2018). This phenomenon was assessed by calculating the time delay of the social system reaction to innovative changes (time lag) in the economic system. The longer the response time of the social system, the less its lability properties.

To calculate the time lag, we used the indicator of the intensity of economic growth and the Index "How do you assess the effectiveness of innovation activity in your region?" The goal of innovation activity in the economic system is the economic growth in the region. Economic growth, in addition to the innovation factor, which is a factor of intensive development, is also provided by an increase in the means of production (an extensive factor). Therefore, in order to assess the impact of innovations on the economic situation in the region, it is necessary to exclude the influence of extensive factors: increasing the number of employees, the growth of the value of fixed assets, and increasing investment in fixed assets (formula 13) (Thompson 2018).

The indicator of the level of intensity of economic growth is calculated on the basis of monthly data on: the growth rates of the gross regional product (GRP), the growth rates of the number of employees, the growth rates

of fixed assets and the rate of expansion of investment in fixed assets by regions in the Russian Federation during 2017 - 4 months in 2018.

The values of the indicator of the level of intensity of economic growth are given in Table 3.

Table 3. Level of Intensity of Economic Growth by Regions in the Russian Federation

RF Region	Jan. 17	Feb. 17	March 17	April 17	May 17	June 17	July 17	August 17	Sept. 17	Oct. 17	Nov. 17	Dec. 17	Jan.18	Feb. 18	March18	April18	Mean
Central Federal District	0.037	0.032	0.035	0.024	0.024	0.031	0.040	0.024	0.026	0.027	0.038	0.022	0.034	0.029	0.035	0.037	0.031
Northwestern Federal District	0.033	0.037	0.038	0.021	0.024	0.024	0.018	0.031	0.013	0.024	0.019	0.019	0.020	0.028	0.022	0.016	0.024
Southern Federal District	0.017	0.020	0.025	0.026	0.019	0.010	0.014	0.014	0.024	0.029	0.010	0.016	0.010	0.013	0.016	0.006	0.017
North Caucasian Federal District	0.015	0.018	0.015	0.024	0.019	0.008	0.014	0.014	0.023	0.003	0.011	0.026	0.008	0.018	0.018	0.014	0.015
Volga Federal District	0.073	0.056	0.067	0.074	0.063	0.053	0.040	0.041	0.050	0.062	0.067	0.057	0.069	0.058	0.053	0.038	0.058
Ural Federal District	0.024	0.025	0.020	0.027	0.027	0.028	0.029	0.030	0.028	0.032	0.034	0.034	0.037	0.029	0.043	0.034	0.030
Siberian Federal District	0.014	0.025	0.023	0.026	0.030	0.024	0.028	0.005	0.019	0.012	0.027	0.023	0.024	0.036	0.020	0.033	0.023
Far Eastern Federal District	0.037	0.032	0.023	0.029	0.031	0.027	0.009	0.004	0.008	0.005	0.026	0.025	0.043	0.039	0.048	0.047	0.027

The level of intensity of economic growth reflects the growth percentage of the GRP, due to the social actors' innovative activity. According to data in Table 3, we can conclude that the most innovatively active region is the Volga Federal District, for which the contribution of innovation to economic growth amounts to 5.8%. As for the Central Federal District, it is 3.1%, Ural Federal District – 3%, The Far Eastern Federal District– 2.7%, Northwestern Federal District– 2.4%, Siberian Federal District– 2.3%. The least innovative-active regions are the Southern FD, for which the mean of the intensity of economic growth for the period under study is 1.7%, and North Caucasian Federal District– 1.5%.

Another indicator for assessing social lability within the research was the Index "How do you assess the effectiveness of innovation in your region?", as it closely correlates with the indicator of the intensity of economic growth and reflects the effectiveness of innovation activity in the region in respondents' opinion.

The question "How do you estimate the effectiveness of the innovation activity in your region?" was additionally included in the list in a telephone-based survey of social actors. This question suggests such options for the answer: "positively", "rather positively", "rather negatively", "negatively", "not sure". The index is calculated

as the difference between the answers "positively", "rather positively" and "rather negatively", "negatively". The time of the social system response (an hour interval between changes in the economic system and the awareness of these changes by society) is determined by formula 14 by calculating the correlation coefficients between the indicators mentioned above. The index "How do you estimate the effectiveness of innovation in your region?" was used: without delay (t); with a lag of 1 month (t + 1); with a lag of 2 months (t + 2); with a lag of 3 months (t + 3); with a lag of 4 months (t + 4); with a lag of 5 months (t + 5). The results of calculations are presented in Table 4.

Table 4. the values of correlation coefficients between the intensity of economic growth in the federal districts of the Russian Federation and the Index "How do You Estimate the Effectiveness of Innovation in Your Region?"

RF Region	Time lag					
	t	(t+1)	(t+2)	(t+3)	(t+4)	(t+5)
Central Federal District	0.40	0.69	0.72	0.47	0.16	0.02
Northwestern Federal District	0.30	0.57	0.66	0.75	0.40	0.13
The Southern Federal District	0.21	0.43	0.53	0.83	0.33	0.11
North Caucasian Federal District	0.15	0.27	0.48	0.62	0.79	0.16
The Volga Federal District	0.41	0.72	0.51	0.40	0.19	0.07
Ural Federal District	0.02	0.18	0.55	0.73	0.26	0.09
Siberian Federal District	0.09	0.21	0.69	0.73	0.46	0.01
The Far Eastern Federal District	0.05	0.13	0.55	0.77	0.31	0.16

Data in Table 4 demonstrate that there is a close relationship between the level of economic growth in the region and the Index "How do you estimate the effectiveness of innovation in your region?", since at least for one of the time lags (t; t + 1; t + 2; t + 3; t + 4; t + 5), the values of the correlation coefficients exceed | 0,7 |. The least time lag between economic changes and the awareness of these changes by social subjects in the Volga Federal District is 1 month. This region is characterized by high lability and low inertia [0.14; 0.34]. Time lag of 2 months is observed in the Central FD, which has a predominantly low level of inertia – [0.19; 0.45].

Northwestern, Southern, Ural, Siberian, and Far Eastern FDs have an average level of social inertia and a low level of lability (a time lag of 3 months). The largest inertia is observed in the North Caucasian Federal District: the integral index of inertia [0.72; 0.91] and the time lag of 4 months. In evaluating the lability in the study, the correlation coefficients with a longer time lag were not calculated, since at (t + 5) there is practically no correlation between the investigated indicators, hence, with an increase in the time lag, it will decrease.

On the basis of the above, the classification of regions according to the level of the force of social inertia and the lability of social subjects to innovative transformations in the economic system of the Russian Federation during 2017 - the first half of 2018 is presented in Figure 3.

Figure 3. Indicators of levels of social inertia to innovative changes in economic system in regions of the Russian Federation
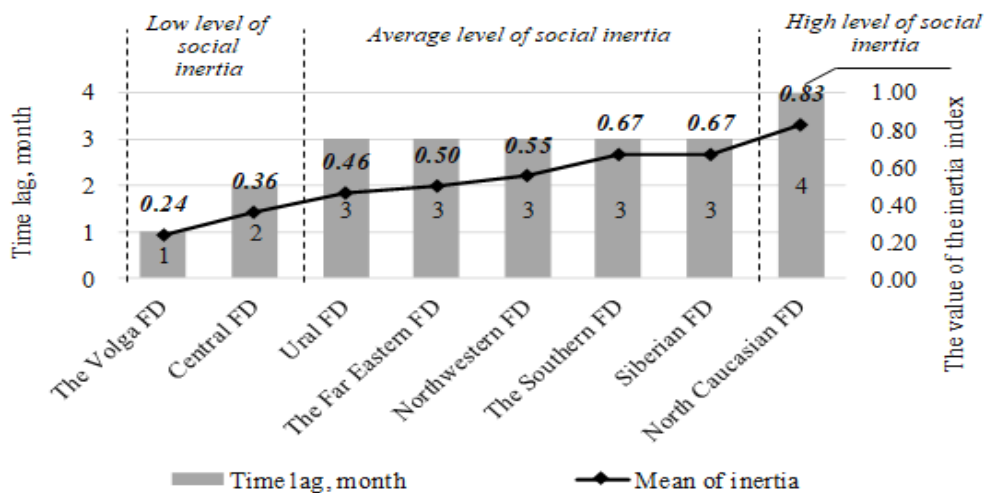
The low social inertia for the modernization of the national economic system in Russia is specific for: Volga FD, where the mean of inertial force for the investigation period is 0.24, and the lability of social subjects amounts to a lag of 1 month; Central Federal District – the mean of inertia force level: 0.36 and lability with a lag of 2 months.

The average level of social inertia force is typical to: Ural FD – the mean of inertia level 0.46; Far Eastern FD – 0.50; Northwestern FD – 0.55; Southern and Siberian FDs– 0.67. The time lag for the social actors' lability to innovative transformations in these regions amounts to 3 months. A high level of resistance to economic modernization is specific for social subjects in the North Caucasian FD, where the level of inertia power was 0.83 with a maximum lag of lability of 4 months.

3. Discussion

Thus, the clarification of the content of the concept of "social inertia" from the point of view of interaction between the subjectivism of the social actor and the process of development of the social system made it possible to analyze the level of the force of social inertia to innovative transformations in the economic system of Russia in the regional context.

As the research has shown, the North Caucasian FD is characterized by the highest level of force of social inertia. At the same time, the tendency towards the oppositional perception of the national economy modernization is quite stable over the period under investigation, which is due, first of all, to the low level of innovation activity and culture of the region. In the North Caucasian FD, the main focus is on the development of areas related to the resource base: the agro-industrial complex, sanatorium and resort areas, and the efficiency of the use of natural resources. The existing capabilities of the R & D sphere and the structure of scientific and technological reserves do not correspond to the demand from business in the federal district, on the one hand, and on the other hand, the low wages of the population, which is the reason for the extremely limited domestic demand for scientific and technical achievements and potential of the region for its economic development. In addition, the scientific sphere in the district is not sufficiently funded by both state bodies and business structures. In the conditions of the North Caucasus, it is unproductive to focus on business to address this issue, due to the fact that there are no large companies on the territory that could invest in innovative developments.

The average level of the force of social inertia to the development of the innovative economy covers the Northwestern, Southern, Ural, Siberian and Far Eastern Federal Districts. Upon that these regions during the period under investigation practically have a stable average level of social inertia towards the modernization of the national economy, that is, a stable average level of perception of innovation by social actors.

The average level of power of social inertia is characterized as transitional between the weak and strong levels of deterrence of the innovative development in the Russian economy. Thus, the social subjects of the Siberian and Southern FDs are characterized by the highest level of resistance as regions with the lowest innovation activity relative to the districts of this category. There are no fundamental technological changes in the economy, nor signs of intensive mass implementation of research and development results. The level of innovation activity, insufficient in general in these regions, is exacerbated by the extremely low return on innovations. The effectiveness of innovation activity lags far behind the average level in the country (Innovative Development Ranking among the Subjects of the Russian Federation, 2017).

A characteristic feature of the Northwestern, Ural and Far Eastern Federal Districts is the focus of innovations on solving problems of saving material costs and fuel and energy resources. In regions, the intensity of current and capital expenditures for the development and implementation of new or improved products and production processes is quite high. The greatest share of costs for technological innovation in the total volume of sales of industrial products in 2017 was noted in the Samara and Yaroslavl regions – 4.3%, which is almost 2.5 times higher than the average Russian one. In terms of the intensity of costs for technological innovation, the Sakhalin Oblast is singled out: in it, the share of such expenditures in the total volume of shipped goods (works, services) in 2017 reached the maximum among the Russian regions – 8% (Innovative Development Ranking among the Subjects of the Russian Federation, 2017).

The Central and Volga Federal Districts are characterized by a low and stable level of the force of social inertia and are distinguished by the highest intensity of innovative processes. These regions are singled out by the organizations' initiative in the independent innovative development. This is confirmed by a significant share of enterprises developing technological innovations on their own – almost 1.5 times higher than the national average. The Lipetsk, Penza regions and Moscow are particularly distinguished. Non-technological organizational, managerial and marketing innovations are quite developed and widespread, especially in St. Petersburg and the Perm region. Here the share of enterprises that carried out them is 7.5-7.7%, which is almost double the average

for the Russian Federation (Innovative Development Ranking among the Subjects of the Russian Federation, 2017).

The presented classification of the regions of Russia in terms of the power of social inertia to the innovative transformation in the economy as a social system will allow developing and adopting more economically effective economies to correct the inertia. Or it will determine the correct time of initiating the transformation development or to force fully suspend it. This approach will lead to these actions with maximum efficiency.

Despite the differentiated level of the force of social inertia in the regions of Russia, as the survey showed, the prevailing number of respondents in the sociological survey do not support innovative transformations in the economy. Systemic barriers as factors that generate social inertia in the regions can be argued by the presence of the following key factors:

- Low level of ability to innovation of professional groups, on knowledge and applications of which the success of modernization of the economic system depends. The highest level of ability to develop and implement innovations is characteristic of only participants of innovative activity – scientific personnel of a technical profile and highly skilled engineers;
- The lack of interest of large business in Russia in the introduction of innovations and their concentration in the sphere of raw material extraction, processing and commercial activities;
- Unwillingness of the government staff to break established bureaucratic management schemes, since innovative development requires constant updating of legislation and its continuous improvement;
- Mass poverty of the country's population, which has acquired a chronic form, especially in the North Caucasians Federal District. The presence of significant groups of the population in the social structure who do not have the necessary means to maintain their ability to participate fully in the innovative development of society. About 20% of the population in Russia has an income below the minimum subsistence level. According to the available expert estimates, currently every fourth worker in Russia is below the poverty line (according to very questionable Russian criteria, not by international criteria accepted in all developed and many developing countries) (Kuvshinova 2017) Insufficient funds to meet the necessary requirements significantly limit the acquisition of innovative goods, and also do not provide the opportunity to constantly update the knowledge necessary for raising the professional level and self-development;
- Social actors' poorness is often accompanied by oppression, apathy, indifference to making their future, which also becomes a psychological brake for the constant updating of knowledge and the cause of a pessimistic attitude to life in general.
- The expected risk of unemployment by social actors connected with the active introduction of technologies and innovations into the economy.

The introduction of new technologies and machines in production eliminates hazardous work, reducing the gap between low-skilled and highly skilled workers. But at the same time it leads to the release of a large number of workers who can join the ranks of the unemployed if they are not retrained and are in demand in modernized production.

Given the presence of social inertia in economic development, such factor as the formed structure of social actors' personal preferences is differentiated depending on living conditions. In connection with this, the governance system and its other institutions are faced with the task of creating an attractive perception of the image of modernization of the national economy by the subjects. As practice reveals, beliefs, explanations and orders are not always effective and predictable. In our opinion, to minimize the destructive impact on the development of innovations, the most acceptable tool is the ideological approach of the management system as a way of introducing the public goal into the personality structure of each subject with its further actualization.

Within the research, it seems advisable to introduce the following general conceptual recommendations for neutralizing social inertia towards economic modernization on behalf of the management system:

- Search and creation of a social idea of "Innovation is everyone's personal success", its active popularization in the public, which could unite people in the development of innovation and neutralization of such existing factors of consolidation as "dissatisfaction with power" or "the common difficulties of life";
- The creation of prerequisites for the formation of the subjects' personality structure in childhood, for instance, at school at the lessons "Innovation and my future", etc. Being fixed in the structure of the individual, these slogans will work at the level of reflection in the adulthood;
- Ensuring the conditions for the growth of social trust in Russian society as the basis for social cooperation;

- Convincing initiation of national projects of innovative economic development by the state. Adoption by the government of a realistic and nationally relevant program for the widespread implementation of innovations;
- The introduction of effective social norms depending on the innovative potential of the region, which can reduce the consequences of deviant nature, harmful to others, or vice versa – to use the consequences of deviant actions that may prove useful to everyone;
- The creation of special internal structures in research establishments aimed at accelerating the development of social capital in the following areas: ensuring internal control and self-discipline; audit of humanitarian factors; organization of an innovative system of staff selection and training; formation of intellectual capital flows and so on.

Conclusion

Based on the research findings, the following conclusions are made:

1. The content of the concept of "social inertia" is clarified from the point of view of the forms of interaction between the individual's subjectivity and the process of development of the social system with a view to ensuring its sustainability. This approach allowed analyzing empirically the level of the force of social inertia to the modernization of the economic system of the Russian Federation in current conditions.

2. The distinguished levels of the force of social inertia based on the determining the social subjects' perception in Russia and finding out the time lag for their lability led to the possibility of classifying regions by their inertia to modernization of the national economy: the Volga Federal District and the Central Federal District are regions with a low level of inertia; Urals, Far Eastern, Northwestern, Southern and Siberian FDs are regions with an average social inertia; North Caucasian FD is a region with a high level of social inertia in Northwestern Federal District. The presented classification of the Russian regions will allow developing and adopting more effective mechanisms for correcting the inertia of the economy, determining timely initiation of the transformation development or its urgently required suspension on behalf of the management system. It will allow implementing these actions with maximum efficiency.

Substantiated reasons for social inertia to innovative changes in the economic system of the Russian Federation permitted developing a set of measures to eliminate its destructive nature. The presented system of measures is of practical nature, based on the ideological principle and will promote the growth of social trust in the state in Russian society as the basis of social cooperation on an innovative basis.

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Acceptance of e-Government Services by Business Users: The Case of Slovakia

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Abstract:

The provision of services of public administration authorities using information and communication technologies constitutes the e-Government with the purpose to grant more effective use of these services to any potential user. Multiple research works examined the acceptance of e-Government services globally detecting spectrum of factors influencing their acceptance. This study employs modified Technology Acceptance Model for investigation of the business users' acceptance of e-Government services in the conditions of Slovakia. Data for testing of the proposed model was gathered by electronic questionnaire survey administered among business in Slovakia potentially using e-Government services. The factor analysis was employed to test the model hypotheses. The results show significant influence of perceived usefulness, amount of information about e-Government, perceived quality of services, perceived security and trust in e-Government on acceptance of e-Government services by business users.

Keywords: electronic services; public administration; e-government; business users; technology acceptance model

JEL Classification: G28; L86; H83

Introduction

Central and Eastern European countries went through substantial transformations since the 1990s. The transformation was very severe also in the area of managing the public administration. Services of public administration authorities provided to citizens have undergone severe changes, including the ways of their provision. New information and communication technologies (ICT) allowed to the public administration authorities to provide their services to public in the form of electronic communication. Electronic government (eGovernment or e-Government) was defined by United Nations Division for Public Economics and Public Administration (2001) as using the Internet and the World Wide Web for delivering government information and services to citizens. Management of public administration developed even more forms of providing e-Government services to citizens (G2C level), businesses (G2B level) or to other public administration authorities (G2G level).

The most of authorities managing the public services now provide them using information and communication technologies. Public administration has struggled in recent decades to develop and deploy many of its services at transactional level of provision, but in addition to problems with the deployment of e-Government services, the problem of accepting these service by its potential users emerged.

1. Literature review

Electronic services provided in the area of public administration are possible thanks to the development of advanced information and communication technologies in recent decades. However, many obstacles must be countered when introducing services of e-Government independently of level ICT infrastructure in given country (Colesca 2009). With aim successfully implementing e-Government in form of integrated services it is necessary to employ project management, analytical, technical information and knowledge management skills (Ajilian and Crameri 2011). Jorgenson and Cable (2002) investigated differences between e-commerce and e-Government detecting significant difference in access to the services, while the e-Government agencies provide access of their services to the entire eligible population, whereas e-commerce businesses might choose their customers.

Significant hindrance of e-Government deployment and its further successful management might invoke concerns about insecurity and privacy violation by its potential users. Eynon (2007) adduced that such concerns can be a major barrier to the user acceptance of e-Government services and any failures in this area might promote distrust in administrative ability of involved authorities to manage public services. On the other hand, Moon (2002) stated that electronic public services might help increasing trust in government by preventing inefficiency and

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corruption. Bertot *et al.* (2010) adduced that e-Government can help to promote culture of transparency in societies. However, inequality in access and usage of ICT (called digital divide) might also influence the acceptance of e-Government services (Carter and Weerakkody 2008). The provision of computer education to disadvantaged groups by governments was suggested by Reffat (2003) as tool for overcoming the digital divide.

Multiple studies investigated acceptance of e-Government services using various approaches. Acceptance of technologies by its users is often investigated using models based on theoretical frameworks of theory of planned behavior introduced by Ajzen (1991). Alaa-Aldin and Al Athmay (2013) detected that demographic characteristics (namely age, gender, education, employment and nationality) are significant determinants of users' attitude towards e-governance. Ozkan and Kanat (2011) using theory of planned behavior detected perceived behavioral control and trust as important factors influencing the intention to use services of e-Government. Hung *et al.* (2006) used theory of planned behavior to detect significant factors of user acceptance of the e-Government services in Taiwan, mainly online tax declaration and payment. Indicated influencing factors included also trust, perceived risk, perceived usefulness, perceived ease of use, and compatibility.

Besides the theory of planned behavior also the technology acceptance model (TAM) developed by Davis (1989) is often used for the studies of technology acceptance. TAM identifies as baseline factors of technology acceptance perceived usefulness, perceived ease of use and awareness of given technology. The technology acceptance model is further developed (e.g. Davis *et al.* 1989, Venkatesh and Davis 2000) and provides accurate predictions on technology acceptance (Pavlou 2003).

Technology acceptance model is used in modelling acceptance of various electronic services. Grandon and Pearson (2004) used TAM for investigating electronic commerce adoption by small and medium sized businesses in USA. Geetha and Malarvizhi (2011) adduced that increasing level of security supports the adoption of electronic banking services. Schierz *et al.* (2010) detected that perceived compatibility significantly influences the mobile payments acceptance. Alsajjan and Dennis (2010) ascertained the trust and perception of electronic payments as safe and easy to have influence on electronic payments adoption. Building the trust in internet banking services by using reliable security policy was detected as crucial by Simpson (2002).

Technology acceptance model is successfully used also in modelling the acceptance of electronic government services. Gilbert *et al.* (2004) using TAM detected trust, security, quality of information and time as significant factors affecting the usage of e-Government services using attitudinal technology adoption model. Shareef et al. (2011) adjusted acceptance model for e-Government ascertaining differences in e-Government acceptance at various maturity levels. Their results also showed the trade-off between the user-friendliness and the complexity of security solution in e-Government. Rehman *et al.* (2012) using own model based on TAM detected the information quality as important factor in e-Government system besides other factors of perceived ease of use, service quality and transaction security. Bélanger and Carter (2008) investigated disposition to trust with result that it positively influences users' trust in government and further their intentions to accept e-Government services. Horst *et al.* (2007) found that trust is the main variable influencing the perceived usefulness of e-Government services.

Many studies conducted use technology acceptance models to investigate the acceptance of e-Government services by individual users and to detect its important factors in multiple countries around the world, *e.g.* in USA (Carter and Bélanger 2005), Taiwan (Hung *et al.* 2006), Netherlands (Horst *et al.* 2007), Romania (Colesca and Dobrica 2008), Malaysia (Lean *et al.* 2009), Gambia (Lin *et al.* 2011), Pakistan (Rehman *et al.* 2012) and other countries. Also in Slovakia, the study of e-Government adoption was conducted (Vejačka 2016). However, all these studies aimed at investigation of e-Government acceptance by individuals, *i.e.* G2C level of e-Government.

Acceptance of e-Government services by businesses (G2B) and business users' motivation behind adopting e-Government services has received little attention in literature. Lee *et al.* (2011) studied adoption of e-government services by business users using service quality factors without inclusion of other factors proposed by Technology Acceptance Model. They examined the motivation for investigating adoption of e-Government by businesses, stating that private businesses are key economic actors in liberal economies and they are very important customers of public services and at the same time critical source of government revenue. Business and citizen users have common reason for the adoption of e-Government services (*e.g.* costs saving, increasing reliability and accuracy, *etc.*), but their relationships with the government are different. Citizens are political constituents to whom the government is accountable unlike businesses. Furthermore, citizen users might rely on the perceived benefits and risks influenced by their personal experience, beliefs, and general attitudes. On the other hand, business users' acceptance decisions may be more complex because those decisions have collective character.

The aim of this research will be to further develop e-Government acceptance model, adjust it to the acceptance by business users and study this acceptance of e-Government services in conditions of Slovak

economy. The area of our focus is the field of e-Government services in Slovakia, while its local conditions are familiar to us. The report of European Commission (2018) showed that e-Government services in Slovakia are slightly lagging behind the EU average even if the broadband connectivity infrastructure is at high level. Specifically, e-Government services for businesses battle with problems and time delays in development and implementation in multiple cases.

2. Methodology

As indicated, this this study will use technology acceptance model as basis to develop model of e-Government services acceptance by business users in the conditions of Slovakia. Technology acceptance model was developed by Davis (1989) and originally it contained perceived usefulness, perceived ease of use and perceived enjoyment as factors influencing acceptance of given technology. TAM models are often adjusted and used for investigation of e-Government acceptance (e.g. Colesca 2009, Shareef *et al.* 2011, Rehman *et al.* 2012). Our e-Government services acceptance model is development of the model used by Vejačka (2016), further adjusted for business users and the findings of Lee *et al.* (2011) and other studies mentioned in literature review.

Figure 1. The research model of e-Government acceptance
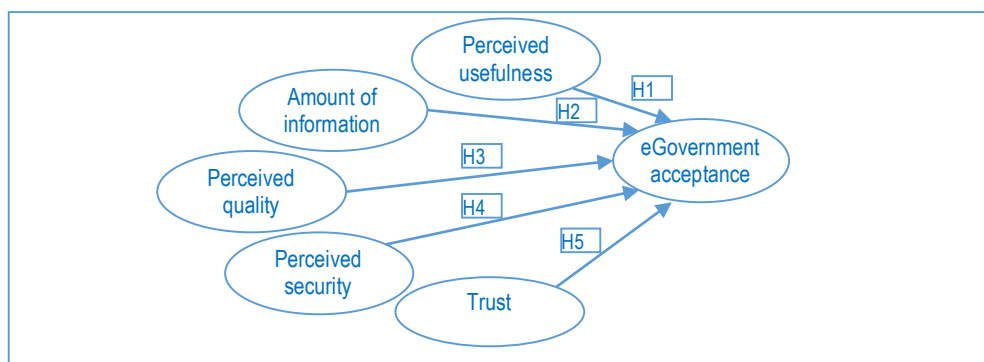
Source: own processing

This model is modified classical TAM model developed by Davis (1989) with adjustments present in latter studies. The factors of perceived ease of use and perceived enjoyment were excluded while they were not detected as significant in other e-Government acceptance studies (*e.g.* Colesca 2009, Vejačka 2016). The factor of trust in e-Government services was incorporated based on results of Horst *et al.* (2007) and Warkentin *et al.* (2002). Perceived quality of service was included on the basis of results of Lee *et al.* (2011). Based on the results of Bélanger and Carter (2008), potential factors of trust and perceived security were encompassed. Finally, our adjusted model of e-Government services acceptance by business users allowed to formulate following research hypotheses:

H1: Perceived usefulness of e-Government services has a positive impact on acceptance of e-Government by business users.

H2: The amount of information about e-Government services has a positive impact on acceptance of e-Government by business users.

H3: Perceived quality of e-Government services has a positive impact on acceptance of e-Government by business users.

H4: Perceived security of e-Government services has a positive impact on acceptance of e-Government by business users.

H5: Trust in e-Government has a positive impact on acceptance of e-Government by business users.

The electronic questionnaire survey was conducted to gather data for testing our model and its hypotheses. It was performed during June 2018 in Slovakia among potential business users of e-Government. Questionnaire was distributed in electronic form and respondents were sampled using consecutive sampling method. Total number of 208 usable answered surveys were gathered and included into sample. The questionnaire comprised of basic information part for gathering characteristics of given business and the part for gathering data for testing model hypotheses. The statements in second part of survey were constructed to represent factors potentially influencing the acceptance of e-Government services by business users included in proposed model. Seven-point

Likert scale was used to measure rate of agreement with all statements in questionnaire. Gathered data was further analyzed by regression analysis, correlation analysis and factor analysis.

3. Results

The survey sample composition of represented approximately the economy composition of Slovakia. Over 10% of responding businesses were in the business less than 5 years (21 respondents), one quarter of respondents were firms with 5 to 10 years of business history (52 respondents), over 21% of respondents (45 respondents) were in business for 11 to 15 years and between 16 to 20 years of business history reported over 25% of responding firms (53 respondents). Longest business history over 20 years was adduced by almost 18% responding firms (37 respondents).

Over 56% of businesses in our sample were small firms below 10 employees (117 respondents). Medium enterprises with over 10 up to 50 employees formed over 33% of our sample (70 respondents). The businesses sized between 51 and 100 employees framed less than 9% of sample (18 respondents) and large businesses with more than 100 employees formed only lightly more than 1% of our sample (3 respondents).

The most represented general field of business in our sample were services with over 71% in our sample (149 respondents), followed by industry with more than 21% (44 responding businesses) and agricultural firms forming around 7% of our sample (15 respondents).

When considering the annual turnover of businesses in our sample, the smallest annual turnover below 50 thousand EUR had 12.5% of businesses (26 respondents). The annual turnover between 50 and 200 thousand EUR adduced almost 32% of responding businesses (66 respondents) and turnover between 200 thousand and 1 million of EUR was reported by almost 47% of firms (97 respondents) in our sample. The annual turnover above 1 million EUR was stated by more than 9% of responding businesses (19 respondents). The overview of survey sample composition data of responding business is provided in following Table 1.

Table 1. The survey sample composition

Characteristic	Value	Frequency	Percentage
Years in business	Less than 5	21	10.10
	5-10	52	25.00
	11–15	45	21.63
	16-20	53	25.48
	Over 20 years	37	17.79
	Total	208	100.00
Number of employees	Less than 10	117	56.25
	10-50	70	33.65
	51-100	18	8.65
	Over 100	3	1.44
	Total	208	100.00
General field of business	Services	149	71.63
	Industry	44	21.15
	Agriculture	15	7.21
	Total	208	100.00
Annual turnover	Less than 50 000 EUR	26	12.50
	50 001 EUR to 200 000 EUR	66	31.73
	200 001 EUR to 1 mil. EUR	97	46.63
	Over 1 mil. EUR	19	9.13
	Total	208	100.00

Source: own processing of gathered data

Further, the actual use of e-Government services by responding firms was investigated. Over 97 % of respondents (203 respondents from 208) adduced at least one use of e-Government on informational level. This high level of e-Government usage is understandable in the conditions of mandatory electronic communication of public administration authorities in many cases of businesses activities in Slovak conditions. Over 81% (169 respondents) of responding businesses used any e-Government service in Slovakia on transactional level, thus actively sent filled forms to public authorities using e-Government services. In comparison with results of European Commission (2018) are these results higher. This might be caused by a composition and a relatively smaller size of our sample and the focus only on business users. Further, the frequency of e-Government services usage by

business users was investigated. Over 47% of them used any e-Government service in Slovakia for less than ten times before. Over 26% of respondents in our sample indicated usage of e-Government services roughly on monthly basis. Less than 24% use e-Government services approximately weekly or more frequently.

Our model of e-Government services acceptance by business users was verified by the data gathered in the second part of the survey. Five groups of statements (see Table 2) represented each one of the variables present in our research model (*i.e.* perceived usefulness, amount of information about e-Government, perceived quality of service, perceived security and trust in e-Government).

Table 2. The results of factor analysis of e-Government services acceptance

Variables	Perceived usefulness	Amount of information	Perceived quality	Perceived security	Trust
Using e-Government services saves time	0.891				
Using e-Government services is simpler	0.794				
Using e-Government services brings us advantages	0.856				
Overall, We consider using e-Government services to be advantageous	0.877				
We have enough information about e-Government services		0.711			
We have enough information about the benefits of e-Government services		0.703			
Using e-Government services improves service quality			0.823		
e-Government services are of good quality			0.714		
Overall, We perceive e-Government services as of a good quality			0.737		
We use e-Government services securely				0.695	
Our sensitive data are safe when using e-Government services				0.701	
Overall, using e-Government services is secure				0.725	
We trust in effectiveness of e-Government					0.824
We trust in safety of e-Government					0.755
Overall, We trust in e-Government					0.786
Percentage of variance explained	19.774	14.016	13.464	10.607	16.480

Source: Own processing of gathered data

The respondents expressed a level of agreement with the statements on seven point Likert-type scale from "strongly agree" to "strongly disagree". The employee responsible for communication with public administration authority should respond to the questionnaire for each responding business as representative of whole firm in this case, while statements had collective character.

The data were analyzed using IBM SPSS statistics software, specifically by confirmatory factor analysis with principal axis factoring. Varimax rotation and Kaiser normalization were applied to process data, as they are standardly used in research based on TAM models (*e.g.* Colesca 2009, Rehman *et al.* 2012).

Kaiser-Meyer-Olkin measure of sampling adequacy was detected at 0.781, what is above the minimum level of 0.60 required for reliability. Bartlett's test of sphericity confirmed factorability at level below 0.001 indicating that confirmatory factor analysis is appropriate method. Afterwards the Cronbach's alpha test was performed to test the reliability of all factors included in model with results of surpassing the minimum level of reliability at the value of 0.70.

The factor of perceived usefulness had four variables and Cronbach's alpha at level of 0.852. The amount of information about e-Government services as second factor had two variables and Cronbach's alpha at 0.724. The third factor of perceived quality of e-Government service had three variables with Cronbach's alpha at 0.803. The factor of perceived security with three variables had value of Cronbach's alpha at level of 0.795. The fifth factor of trust in e-Government consisted of three variables and had value of Cronbach's alpha at level of 0.816.

All factors together explained 74.34% of variance with the total reliability of the factor analysis indicated at 0.78. The dependent value in our model was actual use of e-Government services by business. The factor of perceived usefulness explained the most of variance (19.77%). The perceived usefulness of e-Government services had a significant influence when businesses made the decision whether to use e-Government. Responding firms reported the lack of information about the e-Government at times. Similarly, multiple concerns about security of their data were detected. Multiple cases of malfunctioning services and delayed development in Slovak e-

Government during last periods might have evoked doubts about its quality and disrupted the trust in e-Government among business.

Consequently, the regression analysis was performed to investigate the influence of factors on the use of e-Government service. Its results are presented in following Table 3.

Table 3. The results of regression analysis

Regression	Beta	t	Significance
Perceived usefulness	0.227	2.77	0.013
Amount of information	0.135	1.86	0.048
Perceived quality	0.124	1.94	0.046
Perceived security	0.206	2.56	0.014
Trust	0.164	1.93	0.021

Source: own processing of gathered data

The regression analysis showed the statistical significance of our identified factors indicating all factors as significant at significance level of 0.05. Furthermore, our hypotheses were tested by correlation analysis of data gathered. Its results showed that perceived usefulness, amount of information, perceived quality, perceived security and trust have positive impact on the actual use of e-Government services by business users in Slovakia. The overall model was statistically significant ($R^2 = 0.744$, $p < 0.05$). Table 4 indicates correlations of all factors with the actual use of e-Government services.

Table 4. The results of correlation analysis

Factors	Use	Perceived usefulness	Amount of information	Perceived quality	Perceived security	Trust
Pearson Correlation	1	0.210	0.179	0.131	0.201	0.168
Significance		0.010	0.045	0.039	0.019	0.026

Source: Own processing of gathered data

Our results indicated that perceived usefulness, amount of information, perceived quality, perceived security and trust have a positive influence on the actual use of e-Government services by business users in Slovakia. All of our model hypotheses were supported by the data.

Conclusion

The aim of the study was to investigate the acceptance of e-Government services by business users in Slovakia. The novelty of research resides in the focusing examination on the business users (G2B level of e-Government). The model based on the Technology Acceptance Model (TAM) was proposed to model the acceptance. The proposed model was based from results of Colesca (2009), Vejačka (2016) and multiple other studies investigating the acceptance of various electronic services. The model was adjusted for aiming at business users. Our model of e-Government adoption contained factors of perceived usefulness, amount of information on e-Government, perceived quality of e-Government services, perceived security of e-Government and business users trust in e-Government. The model of e-Government acceptance was further tested on data gathered via questionnaire survey. The factor analysis detected the significance of perceived usefulness, amount of information, perceived quality of services, perceived security and trust. Further the regression and correlation analyzes were performed to verify the significance of factors.

The results can be compared only with results of studies of individual acceptance, as long as investigation of e-Government acceptance based on TAM modelling are missing. The results showed perceived usefulness and perceived security as factors with positive influence on the acceptance of e-Government services. These results correspond results of other studies (e.g. Horst *et al.* 2007, Colesca 2009). The factor of perceived quality was also detected as significant predictor of e-Government services use by business users in accord with findings of Lee *et al.* (2011). Also factor of amount of information on e-Government services was detected as significant corresponding to the findings of Rehman (2012). The factor of trust in e-Government was also detected as significant in accord with results of Lean *et al.* (2009) or Bélanger and Carter (2008). Thus, the developed model combines the factors of multiple studies to better reflect the reality of e-Government acceptance specifically by business users.

The results of study bring practical implications for management of e-Government services provision. For business users of e-Government services it is necessary to perceive their usefulness and security, even if their use might be set as mandatory, while businesses sensitively perceive any detected disturbance of security. The public

administration authorities should also provide clear information on e-Government services provided as it supports their usage. The provision of information about e-Government services available and emphasization of their usefulness will increase awareness of business users and might promote the usage. Public administration authorities should also be particular about quality of services provided to the business users. The quality of service is often an issue in reality of e-Government in Slovakia. Multiple causes of services' partial dysfunctionality or delayed development and deployment hinder the process of trust building in e-Government by both individual and business users.

The study aimed to develop the model of e-Government services acceptance by business users reflecting the specifics of conditions in Slovakia. The fact that all factors included in the model were detected as significant suggests that proposed model well represents the e-Government services acceptance by business users in the case of Slovakia. The limitations of the research lay in the lower extent of survey sample. More extensive survey might better confirm the power of acceptance predictions by the model. In addition, the relationships among the factors might be investigated to detect endogenous effects. The study can also be extended and aimed at particular e-Government services currently implemented in Slovakia. Furthermore, the developed model can be tested in the conditions of other countries. Finally, the proposed model can be further developed to provide more accurate predictions on e-Government services acceptance by business users.

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The Impact of the Recent Economic Crisis on the Flow and Nature of Migration and Development: Evidence from Egypt

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Abstract:

This paper focuses on the impact of the recent economic crisis on the flow and nature of migration and development in Egypt. Migration has various effects on development in both home and host countries. It is concluded that, the more the diversity in migration destinations, the more resilient are remittances. Moreover, the lower the barriers to labor mobility, the stronger is the link between remittances and economic cycles. Regarding the case study of Egyptians in Italy, Greece, and United Arab Emirates (UAE), the regression analysis shows that, the monthly income variable has a positive significant effect on the remittances in all specified countries (Italy, Greece and UAE). The variable of duration of stay in destination is significant in the case of Italy and Italy and Greece. On another hand, it is insignificant in the case of UAE. Furthermore, the results prove that there is no effect of the financial economic crisis on the remittances except for the case of UAE, in which there is a negative significant effect of the financial economic crisis on the remittances.

Keywords: economic crisis; migration; remittances; Egypt

JEL Classification: F22, F24, G01, O15

Introduction

This paper focuses on the impact of the recent economic crisis on the flow and nature of migration and development in Egypt. Migration is a powerful force of social change and cultural interaction in involved countries, but it is subject to restrictive legislative frameworks, which have been strengthened due to the financial economic crisis *i.e.* labor mobility between countries remains constrained by restrictive rules and policies. Moreover, migration has various effects on development in both home and host countries.

The recent economic crisis has deteriorated the situation of migrants. First, the crisis has implied a higher level of unemployment among migrants than among natives[65]. Furthermore, migrants are seen as rivals to natives in the search for jobs, or as an additional burden to public services. Second, undocumented migration increases as a result of considerable reductions in authorized migration quotas by some governments. Third, the crisis has also affected remittances, which declined in real terms in 2009 (Alonso 2011).

What is especially significant about this paper is the emphasis on the impact of migration on development under recent economic crisis. The main research questions that this paper aims to answer are: What are the causes of migration? What is the effect of the recent economic crisis on migration and development? And what is the effect of the recent economic crisis on remittances? The methodology of this paper is based on analyzing the topic of the impact of the recent economic crisis on the flow and nature of migration and development in Egypt by clarifying the determinants of migration, identifying the effects of migration on development, explaining the effects of the global financial crisis on migration and development and introducing a simple model to estimate remittances.

It can be said that, migration has an important role in minimizing international inequalities *i.e.* reducing international salary differences between host and home countries. From the individual point of view, migration has a vital impact on improving individual income, health, education and standard of living (Clemens 2010).

On the other hand, migration involves costs for both home and host countries, for example, breaking of family structure, waste of social capital in the origin country, the side effects resulting from differences in cultural environments and the negligence of productive activities in countries of origin of migrants because people plan their future on the basis of the opportunities of migration (Alonso 2011).

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[65] Higher level of unemployment among migrants may be attributed to the instability of migrant work. Moreover, due to the nature and duration of their contracts, migrants tend to have a lower level of social protection when they become unemployed.

The structure of this paper is as follows: Section one presents the literature review that is related to the determinants of flow and nature of migration. Section two analyzes the effects of the global financial crisis on migration and development. Section three tackles the theoretical model and the empirical specification of remitting behavior of migration: case study of Egyptians in Italy, Greece, and UAE. Section four concludes.

1. Determinants of flow and nature of migration: Literature review

Migration has several advantages for societies and migrants as well. On the other hand, migration is considered as a serious challenge on governmental and administrative levels, for example, issues related to safe migration, integration and displacement (IOM 2017). The number of global migrants increased to 258 million in 2017, from 172 million in 2000. Moreover, the share of international migrants in the world's total population rose to 3.4% in 2017, from 2.8% in 2000. Around 75% of the increased migration during this period was to high-income countries (World Bank 2018).

Migration determinants can be defined as factors at macro and micro levels, which affect decisions to migrate or not. The lack of a widespread framework of migratory patterns represents a strong limitation to the full knowledge of the determinants of migration (De Haas 2011).

Studies that explore empirically the migration process often focus on the micro level and do not capture structural migration determinants. For example, some theories describe migration as a response to global economic inequality and explain migration as a utility maximizing decision made by rational individuals making cost-benefit analyses. Alternatively, the New Economics of Labor Migration theory illustrates migration as a collective household strategy to increase income and overcome market constraints. Many theoretical and empirical studies do not describe how migration flows are structured and developed over time and often do not illustrate migration dynamics through incorporating different economic and non-economic factors of the origin country.

It can be said that, the impacts of migration in origin and destination countries affect the conditions that force migration. For example, remittances help in fostering a culture of migration and create a positive view of migration in the origin countries. On the other hand, the negative impacts of migration on receiving countries create more restrictive migration laws (De Haas 2011).

Poverty generates a lack of development, higher population growth rates make pressure on resources and employment and a lack of democratic rights cause inequity and violence. Accordingly, the most important determinants of migration are development, demographics and democracy. During the last few decades, democracy has spread all over the world and the attention was given to human rights. Moreover, variations in demographic factors have also increased, for example, the population growth rate of sub-Saharan Africa is five times that of the European Union (2.7% compared with 0.5%). As a result, the disparities in demographic conditions are considered significant factors in determining migration. This stems from the fact that, developing countries confront the problem of educating large number of population and integrating them in the labor market. On the other hand, developed countries face the opposite problem *i.e.* providing sufficient population who can motivate economic growth and economic development and welfare (Alonso, 2011).

In addition, it can be said that, the greater the international inequality of income and standards of living among different countries and the lower the barriers of mobility, the greater the flow of migration and vice versa. This implies that, globalization and international inequality of income are considered the most important factors that affect migration. Migration allows balancing of the difference in wages among different countries through the labor flows from lower income countries to higher income countries. According to UNDP (2009), about 80% of the migrants of developing countries choose developed countries as host communities. Clemens *et al.* (2008) compared data of 1.5 million workers in 42 developing countries with individuals from the same developing countries who work in the United States and they found that an average additional income of a worker (aged 35) from a developing country, with 9-12 years of education is 10,000-15,000 dollars a year in the United States.

Nevertheless, migration does not necessarily derive from the poorest countries to the richest countries. Some studies found that, there is no significant linear relationship between per capita income of the host country and the rate of migration. While, the size of a country affects the rate of migration i.e. there is a bias towards the smaller countries, moreover, the size of the diasporas influences migration because it reduces the costs of migration.

There are some other factors, which have an effect on the migration decision. For example, individuals in extremely unstable environments can consider migration a useful strategy to avoid risk. The migration of a family man is an appropriate strategy to reduce the levels of risk of the whole family (Katz and Stark 1984). Barham and Boucher (1998) and Stark and Bloom (1985) confirmed that the decision of migration is cooperative choice of the

whole family and is based on the family commitment such as the degree of communication between migrant and his/ her family, the family networks between countries of origin and destination and the value of remittances.

On the other hand, the level of inequality in the country of origin has a vital impact on the decision of migration. According to Stark and Yizhaki (1988), there is a direct relationship between inequality and migration process i.e. the higher the level of inequality in home countries, the greater the motivation to migration. Furthermore, there is a strong relationship between poverty and migration. Faini and Venturini (1994) studied the case of migration from Southern Europe and they confirmed that there is a negative effect of poverty on the migration rate. Hatton and Williamson (2003) argued that migration rate is not the highest among the poorest individuals in a certain country. Migration requires a minimum amount of money to cover the costs of the journey and for survival until the migrant finds work. Other factors that might affect migration are the offers presented by some countries to migrants to perform some certain jobs such as, caring for children (baby sitters) or sick persons. These kinds of tasks have created an important market in these countries. The last factor that can be mentioned in that context is the effect of climate change and other environmental damages on international migration i.e. migration can be considered as a consequence of the harsh deterioration of environmental conditions. To sum up, the accumulated wealth of the family, the age and educational level of the migrants and the social communication networks are significant variables in the migration decision (Stark and Taylor 1991, Barham and Boucher 1998).

Czaika *et al.* (2017) and Flahaux and De Haas (2016) argued that African migration rates have been decreased because of some restrictive immigration rules. More specifically, the data demonstrated that numerous African nations sustain some of the most prohibitive visa procedures.

2. The effects of the global financial crisis on migration and development

The global financial crisis has harsh implications and has led to a dramatic rise in the number of households living below the poverty line. On the other hand, the World Bank reported that, in 2009 the Arab countries were the fewer categories which affected by the financial crisis. This fact stems from the good balance of payments positions, alternative sources of finance, for example, remittances, foreign direct investment and foreign aid. This implies that, these countries are in the best position to absorb the economic crises (Elnaggar 2009).

There is little evidence of return migration (R_t) as a result of the financial crisis in Europe and the United States. Green and Winters (2012) argue that migrants are unwilling to return to their countries of origin, fearing that they may not be able to reenter once they leave because of severe migration laws. Moreover, the refusal of returning home reflects the higher incomes that migrants earn in the destination countries in spite of the crisis.

The trends in global migration and remittance flows in 2009 appear to have been influenced by various factors, for example, effects of the economic crisis on migrant stocks, diversification of migration destinations and the link between barriers to labor mobility and the impact of economic cycles on remittances (Mohapatra and Ratha, 2010).

The financial economic crisis that began in 2007 in the United States financial markets is highly affecting the evolution of the international economy. One consequence of the crisis has been its harsh impact on growth and employment, especially in the developed countries. The other consequences of the crisis that affect both advanced economies and some other emerging and developing countries are: the fall in production, the rise in unemployment rates and the increase in debt levels. In general, it can be said that, developed countries have been much worse affected by the crisis than other emerging economies and developing countries (Alonso 2011).

More specifically, the global financial crisis has reduced employment opportunities throughout the world in both developed and developing countries. Thus, for the first time since the 1980s, remittances to developing countries are declined in 2009. In developing countries, the remittances represent larger amount of foreign currency inflow than the foreign aid. In the last years, flows of remittances to South Asia raised while the flows were weaker in Latin America, the Middle East, North Africa, and Europe (Sirkeci *et al.* 2012).

In Egypt, it can be said that, the global economic crisis is one of the factors that affect unemployment rates despite that there is no evidence to relate the increase of unemployment rates to return migration and the declining job opportunities. The data shows that the unemployment rate in Egypt increased from 8.8% in 2008 to 9.2% in 2009 (CAPMAS 2010).

Remittance flows are determined by some factors, for example, the migrant stocks in destination countries and the income of migrants in the different migrant destination countries. The size of migrant stocks is the most important determinant of remittances (Freund and Spatafora 2008). The income level of the migrant and the needs of the family at the origin country play an important role in influencing both the level and changes in remittances. Several studies, for example, Frankel (2009) and Ruiz and Vargas-Silva (2010) have documented that remittances

respond positively to an increase in the value of the GDP of the host country and negatively to the economic downturns, financial crises, and natural disasters.

Moreover, remittance costs also play a role in influencing remittance flows. Freund and Spatafora (2008) report that recorded remittances depend negatively on transfer costs and the parallel market premium because migrants may prefer to send money through informal channels when transfer costs are high or when the official exchange rate is unattractive. On the other hand, Adams (2009) and Faini (2007)[66] found that countries that have a larger proportion of high skilled migrants receive less remittance flows, possibly because these migrants are more likely to settle in the host countries and bring back together with their families.

There are three reasons that explain the fact that remittances are less affected by this crisis. First, remittances are sent by the migrant population accumulated over time, and not just by those who have recently settled in host countries. Second, not all of the businesses where migrants were mainly employed were equally hit by the crisis. Third, even when migrant returns are limited, those who return take along their accumulated savings, which are counted as remittances (Mohapatra and Ratha 2010).

Similarly, Sirkeci *et al.* (2012) argue that remittances tend to be relatively flexible to the crisis. They explain this case of resilience by many factors. First, the more diversified the destinations and the labor markets for migrants, the more resilient the remittances sent by migrants. Second, remittances are sent by the stock *i.e.* the cumulative flows of migrants, not only by the recent arrivals. Although it is true that in some countries new migration flows declined by 40% to 60% in 2009 compared with 2008 butt the flow did not become negative. Therefore, the size of the stock of migrants continued to grow in destination countries but at a slower rate, which affects the remittance flows in some countries.

However, the effect on remittances has not been the same across countries. The regions that are most affected by the crisis were Latin America, Eastern Europe and Central Asia, which suffered falls in remittances in 2009 of 12% and 22.7%, respectively. Declines in the Middle East and Northern and Sub-Saharan Africa were smaller at 6.3% and 3.7%, respectively (Alonso 2011). To sum up, it can be said that, in Egypt, in spite of any negative impacts of the financial economic crisis, the economic development can be increased through the skills, knowledge and accumulated savings of the migrants who returned home.

3. Empirical specification of remitting behavior of migration: case study of Egyptians in Italy, Greece, and United Arab Emirates

3.1 Data description

The total number of observations is 481 *i.e.* there are 481 Egyptians interviewed abroad; 80 Egyptian migrants in Greece, 200 in Italy, and 201 Egyptian migrants in the United Arab Emirates (UAE). The three countries are considered the most countries affected by the global economic crisis. More specifically, the interviews took place in Milan in Italy, Athens in Greece and Dubai in the UAE. Interviews took place in the coffee shops, workplaces, the Egyptian clubs and associations, and houses of respondents in the destination countries.

The data used in the analysis is based on the questionnaire done by the research team assigned from Cairo University in cooperation with IRD. The questionnaire includes questions related to background information (Age, education, marital status, work and income and family size), the migration process (Country of migration, reasons behind migration, source of information regarding destination, initial cost of migration and duration to cover the initial cost of migration), relation with origin and host country (Frequency of visiting Egypt, plans of return and registration in the Egyptian embassies/consulates), the global economic crisis (Knowledge about the global economic crisis and the its impacts), remittances (Sending remittances and use of remittances) and skill acquisition and transfer.

3.2 Socioeconomic and demographic characteristics

Table (1) shows the socioeconomic and demographic characteristics of the study population. With respect to the age of respondents, the data indicate that the age of respondents ranges from 15 to 63 years with a mean age of 37.0 years old with a slight difference between Egyptians in Greece and Italy and Egyptians in the UAE (37.8 for

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[66] Adams (2009) and Faini (2007) used cross country data in order to figure out these results. However, studies based on micro level survey data find the opposite result. Mohapatra and Ratha (2010) confirmed that remittances have been noted to be stable and have tended to rise in times of financial crises and natural disasters because migrants living abroad send more money to help their families. For example, remittance inflows increased to Mexico following the country's financial crisis in 1995 and to the Philippines and Thailand after the Asian crash in 1997.

Egyptians in Greece and Italy versus 35.9 for Egyptians in the UAE) which means that Egyptians in the UAE are younger than their counterparts in Greece and Italy.

As for the marital status of respondents, the results of the filed survey indicate that 68.1% of respondents are married while 30% are single. The percent of divorced and widowed respondents is only 1.7%. The educational profile of respondents indicates a higher educational level for Egyptians in the UAE compared to Egyptians in Greece and Italy. The percentage of Egyptians in the UAE who have university degree represent 57.5% compared to 19.7% only for Egyptians in Greece and Italy. Egyptians in Greece and Italy who have less than university degree represent 78.9%, compared to 41% for Egyptians in the UAE.

Table 1. Background characteristics of respondents

	Greece & Italy	UAE	Total
Age of respondents			
-20	17	0	17
	6.1%	0.0%	3.5%
20-29	48	40	88
	17.2%	19.9%	18.3%
30-39	94	103	197
	33.7%	51.2%	41.0%
40-49	73	53	126
	26.2%	26.4%	26.2%
50-59	45	5	50
	16.1%	2.5%	10.4%
60+	2	0	2
	0.7%	0.0%	0.4%
TOTAL	279	201	480
	100.0%	100.0%	100.0%
Mean Age (in years)	37.8	35.9	37.0
Sex			
Male	265	193	458
	94.6%	96.0%	95.2%
Female	15	8	23
	5.4%	4.0%	4.8%
TOTAL	280	201	481
	100.0%	100.0%	100.0%
Marital status			
Single/Engaged	84	60	144
	30.0%	30.0%	30.0%
Married	190	137	327
	67.9%	68.5%	68.1%
Divorced/Widowed	5	3	8
	1.8%	1.5%	1.7%
TOTAL	279	200	479
	100.0%	100.0%	100.0%
Education			
LT University	220	82	302
	78.9%	41.0%	63.0%
University	55	115	170
	19.7%	57.5%	35.5%
Masters/Doctorate	3	3	6
	1.1%	1.5%	1.3%
TOTAL	278	200	478
	100.0%	100.0%	100.0%

Source: Done based on the questionnaire.

Table 2. Background characteristics of respondents by destination

	Greece & Italy	UAE	Total
Work Status			
Working	248	200	448
	89.2%	99.5%	93.5%
Not working	30	1	31
	10.8%	0.5%	6.5%
TOTAL	278	201	479
	100.0%	100.0%	100.0%
Monthly Income (LE Equivalent)			
-5,000	8	59	67
	3.4%	29.9%	15.4%
5,000-	95	21	116
	40.1%	10.7%	26.7%
10,000-	47	45	92
	19.8%	22.8%	21.2%
15,000	39	30	69
	16.5%	15.2%	15.9%
20,000-	21	16	37
	8.9%	8.1%	8.5%
25,000-	7	1	8
	3.0%	0.5%	1.8%
30,000-	20	25	45
	8.4%	12.7%	10.4%
TOTAL	237	197	434
	100.0%	100.0%	100.0%
Mean (LE)	13,911	16,691	15,173
Family Size			
-4	70	86	156
	26.0%	42.8%	33.2%
4-6	153	115	268
	56.9%	57.2%	57.0%
7+	46	0	46
	17.1%	0.0%	9.8%
TOTAL	269	201	470
	100.0%	100.0%	100.0%
Mean (Persons)	4.8	3.6	4.3

Source: Done based on the questionnaire.

The questionnaire includes a variety of variables describing the migration plan of migrants. Migrants are questioned about their estimated duration of stay in destination, another question is added about the "intend to remain in destination permanently", or "the plans regarding return to Egypt".

Moreover, the questionnaire covers the remittances and the share of remittances provided for relatives in the home country. Migrants are asked to give detailed information about "financial support to relatives or other persons in the home country?" To cover individual characteristics of migrants, the questionnaire contains information on age, sex, years since migration, educational attainment level, number of family members, existence of family in the destination, the effects of the global economic crisis, the monthly income, as well as marital and employment status.

The impact of these characteristics on the amount of remittances is estimated using the following equation:

R= f (Age, Sex, Marital Status, Education, Number of Family Members, Employment Status, Monthly Income, Duration of Stay in Destination, Family Existence, Return Plans, Financial Crisis Effects)   (1)

R= f (A, S, MS, Edu, FN, ES, I, DD, FE, RP, CE)   (2)

R= f (I, DD, CE)   (3)

The main interest is in determining how the level of remittances is affected by some household characteristics, and by global economic crisis. So, the following regression is estimated:

$$R_i = B_0 + B_1I_i + B_2DD_i + B_3CE_i + u_i. \hspace{4cm} (4)$$

Hereby, *R* measures the remittances of migrants and *I* denote the monthly income in Egyptian pounds. The variable "DD" signifies the duration of stay in destination. The variable "CE" is one of the main variables of interest, it represents the crisis effects. It is specified as a dummy variable which takes the value one if an individual is affected by the global economic crisis and zero otherwise. With this dummy variable, it is easy to determine the effects of the economic crisis on the amount of remittances.

3.3 Results

In the following tables, all descriptive statistics by destination (Italy, Greece and UAE) is presented. The data shows that, the average age of migrants is 37 in Italy, 40 in Greece and 36 in UAE. Moreover, about 99%, 84% and 96% of migrants are males in Italy, Greece and UAE, respectively.

Table 3. Descriptive statistics of the variables (Italy)

Variable	Obs	Mean	Std. Dev.	Min	Max
R	158	61526.02	44236.33	2002	220220
A	198	36.99495	11.09786	16	63
S	200	.99	.0997484	0	1
MS	200	.63	.4840159	0	1
Edu	199	.2211055	.4728559	0	3
FN	189	5.275132	1.800847	2	12
ES	199	.8844221	.3205244	0	1
I	166	15195.61	9992.127	1452	60060
DD	191	12.75393	8.612547	1	42
FE	198	.3585859	.480801	0	1
RP	196	.5714286	.4961389	0	1
FE	198	.3585859	.480801	0	1
RP	196	.5714286	.4961389	0	1
CE	153	.8888889	.3153018	0	1

Source: Author's Calculations based on the data of the questionnaire.

Table 4. Descriptive statistics of the variables (Greece)

Variable	Obs	Mean	Std. Dev.	Min	Max
R	51	41826.1	17036.2	10010	90090
A	80	39.925	7.447326	16	56
S	80	.8375	.3712364	0	1
MS	80	.8	.4025237	0	1
Edu	80	.2375	.4568397	0	2
FN	80	3.675	1.300195	1	8
ES	79	.9113924	.2859924	0	1
I	71	10908.79	10804.03	5005	60060
DD	79	9.278481	6.774645	1	28
FE	79	.4683544	.5021861	0	1
RP	79	.5696203	.4982931	0	1
CE	29	.8275862	.3844259	0	1

Source: Author's Calculations based on the data of the questionnaire.

It is recorded that, 63%, 80% and 68.5% of migrants are married in Italy, Greece and UAE, respectively. Furthermore, the average monthly income is 15196 L.E. in Italy, 10909 L.E. in Greece and 16691 in UAE. Regarding the family existence in the host country, it is observed that 36%, 47% and 20% of migrants in Italy, Greece and UAE, respectively live with their families.

Table 5. Descriptive statistics of the variables (UAE)

Variable	Obs	Mean	Std. Dev.	Min	Max
R	175	56281.66	68033.91	3630	484000
A	201	35.89055	6.368513	25	53
S	201	.960199	.1959795	0	1
MS	200	.685	.4656815	0	1

Variable	Obs	Mean	Std. Dev.	Min	Max
Edu	200	.605	.5199295	0	2
FN	201	3.626866	.7382917	2	5
ES	201	.9950249	.0705346	0	1
I	197	16690.63	15899.77	2420	72600
DD	200	5.76	3.919081	1	15
FE	201	.2039801	.4039605	0	1
RP	198	.1414141	.3493315	0	1
CE	84	.8571429	.3520288	0	1

Source: Author's Calculations based on the data of the questionnaire.

It is clear that the higher amount of remittances is coming from UAE with maximum value of 484000 Egyptian pounds and a minimum value of 2002 Egyptian pounds from Italy during the last 12 months of the interview. Another row distinguishes between households where the head has a permanent or temporary migration intention (return plans). The data shows that, approximately 57% of Egyptian migrants in Italy and Greece have temporary migration intention versus 14% in UAE.

Table 6. Regression analysis (Italy)

R	Coef.	Std. Err.	t	P> t
I	1.555005	.4341374	3.58	0.001
DD	1166.534	586.8611	1.99	0.050
CE	-4377.385	10942.23	-0.40	0.690
_cons	23593.08	12227.33	1.93	0.056

Source: Author's Calculations based on the data of the questionnaire.

Table 7. Regression analysis, no constant (Italy and Greece)

R	Coef.	Std. Err.	t	P>t
I	1.899996	.3937737	4.83	0.000
DD	1230.254	478.072	2.57	0.011
CE	11073.1	6386.046	1.73	0.086

Source: Author's Calculations based on the data of the questionnaire.

The regression analysis of equation (4) shows that, the monthly income variable has a positive significant effect on the remittances in all specified countries (Italy, Greece and UAE). The variable of duration of stay in destination is significant in the case of Italy and Italy and Greece. On another hand, it is insignificant in the case of UAE. Furthermore, the results prove that there is no effect of the financial economic crisis on the remittances except for the case of UAE, in which there is a negative significant effect of the financial economic crisis on the remittances.

Table 8. Regression analysis (Italy and Greece)

R	Coef.	Std. Err.	T	P>t
I	1.808548	.3900515	4.64	0.000
DD	765.6144	518.4623	1.48	0.143
CE	-5321.977	9917.692	-0.54	0.593
_cons	24092.43	11270.89	2.14	0.035

Source: Author's Calculations based on the data of the questionnaire.

Table 9. Regression analysis (UAE)

R	Coef.	Std. Err.	T	P>t
I	1.632357	.5314825	3.07	0.003
DD	-2816.845	1970.24	-1.43	0.158
CE	-5077.56	22826.42	-2.21	0.031
_cons	69771.04	27381.7	2.55	0.013

Source: Author's calculations based on the data of the questionnaire.

Conclusion

Migration is a significant factor in the development process for both the origin and the destination countries and provides significant opportunities for the migrants. Actually, migrants are the ones who gain from the process of migration. The reasons stem from the fact that, when people are able to choose their place of residence with fewer restrictions, their human freedoms are increased and then they have better living conditions. On the other

hand, migration may involve costs, which need to be considered and minimized but in general migration is an important factor in the development of people and their societies. The governments in the migrant-receiving countries and the migrant-sending countries must utilize the positive impacts of migration and diminish its negative consequences.

The remittances sent by migrants represent an important source of financing that is useful to the process of development in the origin countries. There are many ways to improve the impact of this source of financing, for example, reducing the transaction costs of remittance transfers, facilitating access by migrants to formal financial channels and increasing the competition in those markets and defining public incentive to encourage more productive use of remittances for development purposes.

As mentioned above, the global financial crisis has multiple effects on migration in many countries, including Egypt. For instance, it has increased the unemployment rate among migrants due to their concentration on certain sectors of business, such as construction or some other services, which were hit badly by the crisis. In addition, the social costs of the crisis are higher for the migrants due to the nature and duration of migrant contracts i.e. migrants tend to have less social protection in the case of losing their jobs. Moreover, the crisis affects the labor conditions in destination countries, which urges different governments to adopt more restrictive migration laws. The migrants are seen as rivals to residents in searching for jobs or as an additional burden to the public services, such perceptions have been translated into a more restrictive migration rules and into a greater presence of discrimination and dislike of foreigners. Furthermore, the crisis has also affected remittances, which fell in volume in year 2009. Officially, in Egypt, recorded remittance flows reached US$7.8 billion in 2009, with a decline of 10% from 2008 (IOM, 2010).

It is concluded that, the more the diversity in migration destinations, the more resilient are remittances. Moreover, the lower the barriers to labor mobility, the stronger is the link between remittances and economic cycles. To sum up, it can be said that, there is an enormous variation among destination and origin countries in terms of their patterns of migration and levels of development. Accordingly, there is no single policy response can be appropriate. However, partnerships between the origin and destination countries may be appropriate in order to coordinate the management of migration more successfully. Moreover, countries should consider the impact of the decline in the flow of migration in their ongoing development work and in their planned future partnerships.

Regarding the case study of Egyptians in Italy, Greece, and UAE, the regression analysis shows that, the monthly income variable has a positive significant effect on the remittances in all specified countries (Italy, Greece and UAE). The variable of duration of stay in destination is significant in the case of Italy and Italy and Greece. On another hand, it is insignificant in the case of UAE. Furthermore, the results prove that there is no effect of the financial economic crisis on the remittances except for the case of UAE, in which there is a negative significant effect of the financial economic crisis on the remittances.

Acknowledgement

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Selected Aspects of Personal Income Tax in the Czech Republic

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Abstract:

This article deals with the assessment of selected indicators of personal income tax with a focus on the taxation of employment in terms of the Czech Republic. Indicators examined are tax income, the effective tax rate, tax allowances and tax credits. The aim of this article is to determine by means of selected methods whether there are dependences between the development of values of mentioned indicators. The personal income tax is a part of the tax system of the Czech Republic since its formation in 1993. During this time, the law governing the taxation of incomes have been amended many times. There was a gradual transition from moving progressive tax rate to a linear rate. Due to the existence of items reducing either the tax base or tax liability, the tax remains progressive though in most cases. The methods of regression and correlation analysis, methods for time-series analysis, methods of analysis and comparison are used in this article.

Keywords correlation analysis; personal income tax; tax allowances; tax credits; tax reform

JEL Classification: C50; H20; H24; K34

Introduction

Tax policy affects macroeconomic and microeconomic processes in the economy. The role of taxes is to ensure public revenues and enable the implementation of planned fiscal policy (Bird and Zolt 2004). Determination of the size of the tax burden is not easy, but on the contrary, it is very sensitive issue. Crowding-out effect of the market mechanism can cause underrating of public finances area. Through right selected tax policy, it can be possible to affect the employment or capital inflows from abroad. One of the most important taxes of the tax system is the personal income tax. Legislative amendments of personal income tax regulating or changing the parameters for calculating this tax induce changes in the scope of taxation by this tax on individual taxpayers.

This article aims to provide an assessment of selected aspects of personal income tax in the Czech Republic in the context of changes in the law since 1993 to the present. The introduction first explains the significance and role of taxes. Another section summarizes the results of already carried out studies. In the practical part of the article, there are evaluated selected dependences that are summarized in the last part of this article.

1. Literature review

One of the characteristic features of personal income tax is its progressiveness. A field of personal income tax and analysis of factors causing its progressivity was dealt with in the research carried out in 15 European countries by Verbist and Figari (2014) or Wagstaff and Doorslaer (2001). General aspects of progressivity measurement are stated, *e.g.* by Jakobsson (1978), Kakwani (1977), Suits (1977) or Kiefer (1984). A progressive tax system serves as a partial substitute for enhances an equal distribution of economic welfare (Conesa and Kreuger 2006). Results of analysis by Sorensesn (1998) found that If labour markets are highly distorted for non-tax reasons, tax progressivity may be a second-best means of counteracting the tendency of the market to generate excessive unemployment. A progressive personal income tax is often seen as a key element of automatic stabilizers (Krajewski and Pilat 2017), they are often designed to collect a proportion of income from the rich relative to the poor (Duncan and Peter 2016).

In Europe many countries have gone through major or minor personal income tax reforms over the past years, which may also change their capacity to reduce inequality (Verbist and Figari 2014). Široký, Kovářová and Randová (2012) mentions that there is a gradual reduction in the tax burden by direct taxes in favor of indirect taxes. Though the tax burden of direct taxes is declining, according to the conclusions of Andrlík (2014) tax on income of natural persons represents a significant part of the public budget revenue.

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Changes in the legislative framework regulating the field of direct taxation in the context of personal income tax in terms of the Czech Republic were dealt by Tepperová and Pavel (2016). Their conclusions state that in past twenty years, there have been several reforms in taxation. In the case of reforms that decrease the tax burden, it seems that the impact on the public revenues will not be so important. On the other side, in the case of reforms that increase the tax burden, it may lead to underestimation of the restrictive impact on the demand side of the economy.

An assessment of selected aspects of the planned reform of direct taxes as for 1st January 2015 was made in the study by Dušek, Kalíšková and Munich (2014). It should be noted that the proposed changes in the field of direct taxes were eventually not accepted. It was suggested that the tax base should be constituted by gross salary, rather than by super-gross salary. The nominal tax rate should have been increased by 4 percentage points up to 19%. There also should have been a restriction in the use of tax credits for a taxpayer in case of taxpayers with incomes 48 times higher than the average wage. In this case the model revealed that the adoption of these amendments would result, in most cases, in a decrease of the tax burden by personal income taxes.

One of the reasons for the reform of the laws is a conformity with European law. Suhányiová and Korečko (2014) examined the harmonization of direct taxes in the European Union context. James (2002) states that tax harmonization is understood as a process of adjusting of tax systems of different jurisdictions in the pursuit of a common policy objective. Results of Bittmannová (2016) show that the personal income tax is not yet covered by common rules at the level of the European Union.

The issue of effective tax rate and its progressiveness was covered by Široký and Maková, (2009) and Friedrich, Maková and Široký (2012). They found that there is no interconnection between the efficient tax rate and the tax progressiveness. The tax progressiveness may be influenced – besides the tax brackets and tax rates – by deductibles and tax allowances. Benefits of existence of a progressive tax are stated by Diamond and Saez (2011) or Kakwani (1977).

It is very difficult to establish whether is optimal to have one band or more tax bands (Zee, 2005). This can be one of the reason why many European Union countries still use gliding progressive tax rates. Even outside Europe, this fact is not sporadic, e.g. China or Canada (Shi and Xiaozhong, 2012). It is necessary to say that the tax harmonization is an essential part of the European integration. For this reason, as well, accession of the Czech Republic into the European Union meant a significant change in tax legislation, especially in value added tax policy. While the process of harmonization of indirect taxes in the European Union is a very advanced, this statement is not applicable to direct taxes and their harmonization is made mainly through the case-laws of the Court of Justice of the European Union (Nerudová and David 2008 or Wasserfallen 2014).

2. Methodology

To achieve the objective of the paper, the author used standard positivist economic methodology which also included the scientific methods of description, deduction, comparison, as well as study of legal sources and finally synthesizing methods. For specific analysis of dependency between the examined factors, the correlation and regression analysis and time-series analysis were used.

Study of the dependence between two or among more statistical features is dealt with by the field of regression and correlation analysis. A principle of regression is in seeking of a regression function in the form (1),

$$\tilde{y} = c_1 f_1(x) + c_2 f_2(x) + \cdots + c_m f_m(x) \tag{1}$$

i.e. linear combination of selected functions $f_1(x)$, $f_2(x)$, ..., $f_m(x)$ with unknown parameters c_1, c_2, ..., c_m. The quality of the regression model is assessed with the coefficient of determination R^2 defined by (2),

$$R^2 = \frac{S_x}{S_y}, \tag{2}$$

where S_x is the variance of the values of character x and S_y is the variance of the values of character *y*.

Verification of the dependence of two or more selected values is carried out by correlation analysis. One of the most commonly used indicators is the Pearson correlation coefficient *r* (3) which reflects the linearity degree of dependence,

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}, \tag{3}$$

where $\tilde{x}$ and $\tilde{y}$ are sample average. For more details about Pearson correlation coefficient see Newbold (2013).

The relation between the characters *x* and *y* can be expressed graphically using regression lines. Both lines are passing through the central point, the angle between both of the lines can be defined by (4),

$$cotg\ \varphi = \frac{|r_{xy}|}{1-r_{xy}^2}\left(\frac{S_y}{S_x} + \frac{S_x}{S_y}\right), \tag{4}$$

where r_{xy} is an empirical correlation coefficient, S_x is the variance of values of character *x* and S_y is the variance of values of character *y*, (Barrow, 1988). Both regression lines (referred to as correlation shears) are variously open or closed according to the degree of dependence between the characters *x* and *y*.

To assess the size of the tax burden, the indicator of *ETR* determined by equation (8) is used,

$$ETR = \frac{T}{W_g}, \tag{5}$$

where *T* is a tax liability and W_g is gross wage.

For analysis of time series, there is a calculation of absolute increment in *AC* (6), relative increment *RC* (7) and the growth factor *CG* (8).

$$AC = y_t - y_{t-1}, \tag{6}$$

$$RC = \frac{y_t - y_{t-1}}{y_{t-1}}, \tag{7}$$

$$CG = \frac{y_t}{y_{t-1}}. \tag{8}$$

where y_t is the effective tax rate in year 1 and y_{t-1} is the effective tax rate in the year t-1.

3. Case studies

On 1 January 1993, the new tax system in the Czech Republic was created, the part of which was a personal income tax. This tax replaced the former population income tax, payroll tax and tax on income from literary and artistic activities. Personal income tax has been many times amended in the Czech Republic since its introduction in 1993.

The nominal rate of personal income tax was gradually decreasing. The original margin from 15% to 47% was decreased to 12% to 32% that was applied in 2007. The number of bands from 6 to 4 also decreased. Year 2008 saw the replacement of the rate of moving progressive rates by a linear rate of 15%. At the same time there was a change in a structure of the tax base, which was created by a gross wage increased by compulsory contributions (social insurance and health insurance contributions) paid by the employer. Vlachý (2008) states that one of the basic elements of a reform was the use of super-gross wage. By 2007, the tax base from employment was created by a gross wage minus the social and health insurance paid by an employee. On the one hand, in most cases since 2008 the tax rate has reduced, on the other hand, a tax base has increased. Changes of legislation were also made in other taxes as mentioned Široký, Krajčová and Hakalová (2016) or Vítek (2012).

In 2013, a second tax rate is added – so called solidarity tax increase in amount of 7%. Declining top rates of personal income tax in the past decades and more is one of the most common global occurrences in taxation (Nyamondo and Schoeman 2007). Significant changes took place in 2008 also in the field of indirect taxation, when there were introduced the energy taxes, this field is dealt with in more details by *e.g.* Zimmermannová and Čermák (2012).

3.1 Tax allowances and correlation analysis

An important part of the law regulating the personal income tax is the field of tax allowances. Personal allowances are example of the stimulus role of personal income tax. In addition to the tax reliefs, the important role is played also by tax rebates that reduce the actual tax liability, while tax reliefs reduce the tax base of the taxpayer. The existence of tax reliefs and rebates causes that together with a rise in income of a taxpayer, the tax also increases even in case when there is only one tax rate.

Development of values of deduction in the form of non-taxable part per taxpayer in the years 1993 – 2005 is presented in Table 1. As it can be seen from the Table 1, there was an increase of value in absolute amount each year. Year 2006 saw the replacement of the non-taxable part by the tax credit in the amount of 7 200 CZK. The public finance reform in 2008 changed the technique of calculating the tax liability, a basic rebate per tax payer since that year until the present (2018) is in the amount of 24 840 CZK (except for 2011, when this amount was reduced by 1 200 CZK).

Table 1. The development of tax allowance for taxpayer (in CZK)

Year	1993	1994	1995	1996	1997	1998	1999 - 2000	2001 - 2005
Amount	20 400	21 600	24 000	26 400	28 800	32 040	34 920	38 040

Source: Own processing according to Act. No. 586/1992 Coll.

There was also a change in the value of the non-taxable part for dependent children living together with a taxpayer in one household. The initial amount of 9 000 CZK, as shown in the Table 2, almost tripled up to 25 560 CZK in 2004. Since 2005, there has been a replacement of this amount by the tax advantage. This amount is, on the one hand, the tax credit, and in case when this tax benefit is higher than the tax liability before the rebate, the difference of these values is, on the other hand, the tax bonus.

Table 2. The development of tax allowance for children in from 1993 to 2004 CZK)

Year	1993	1994	1995	1996	1997	1998	1999 - 2000	2001 - 2003	2004
Amount	9 000	10 800	12 000	13 200	14 400	18 000	21 600	23 520	25 560

Source: Own processing according to Act. No. 586/1992 Coll.

While this amount of the tax rebate for taxpayer did not change (except the year 2011), the values of tax benefits, as shown in the Table 3, are undergoing major changes especially in recent years. Since 2015, the amount is graduated according to the number of children, for a first child the amount remains in comparison with 2014, at the same level, *i.e.* 13 404 CZK. In case of the second child the amount is higher, in 2015 it amounted to 15 804 CZK, currently this amount increased up to 19 404 CZK. For the third and each additional child the tax benefit amounted in 2015 to 17 004 CZK, at present the value of tax benefit is 24 404 CZK.

Table 3. The development of tax credit in CZK

Year	2005	2006-2007	2008-2009	2010	2011	2012-2014	2015	2016	2017	2018
1st child	6 000	6 000	10 680	11 604	11 604	13 404	13 404	13 404	13 404	15 204
2nd child	6 000	6 000	10 680	11 604	11 604	13 404	15 804	17 004	19 404	19 404
3rd child	6 000	6 000	10 680	11 604	11 604	13 404	17 004	20 604	24 204	24 204

Source: Own processing according to § 35 of the Act. No. 586/1992 Coll.

With data contained in the Tables 1, 2 and 3, there is observed dependence between the development of these values in combination with deduction for the taxpayer and dependent children in the household (one to three children). Results of the Pearson correlation coefficient *r* detected by (3) are presented in Table 4. All calculations are made at 0.01% level of significance.

Table 4. Correlation

		Taxpayer	1st child	2nd child	3rd child
taxpayer	Pearson Correlation	1	,939**	,894**	,802**
	Sig. (2-tailed)		,000	,000	,000
	N	25	25	25	25
1st child	Pearson Correlation	,939**	1	,959**	,867**
	Sig. (2-tailed)	,000		,000	,000
	N	25	25	25	25
2nd child	Pearson Correlation	,894**	,959**	1	,972**
	Sig. (2-tailed)	,000	,000		,000
	N	25	25	25	25
3rd child	Pearson Correlation	,802**	,867**	,972**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	25	25	25	25

Note: **. Correlation is significant at the 0.01 level (2-tailed).
Source: own processing

The results in the Tables 4 shows a high degree of dependence. With the growth of a non-taxable portion, and possibly tax credit for a taxpayer, there is an increase in the tax deduction for children living with the taxpayer in one household. According to Morris (2012), coefficient value close to 1 indicates a high degree of dependence. For the period 1993 - 2003, when the both deductions had a form of non-taxable tax base, it remains valid that if there was an increase in deduction for the taxpayer, there was, as well, the increase in deduction for children. This

fact did not occur in 2004, when there was an increase in an amount for dependent children. The year 2005 is excluded from the analysis in this case, because one of the pair of analyzed amounts was in the form of non-taxable portion, a second one in the form of tax advantage.

Since 2008 when the technology of calculation of income changed, the amount of tax credit per tax payer, except for one year, has not changed, while the tax benefit had a rising trend. Therefore, the results indicate that with increasing number of children the dependence gradually decreases. The reason is the gradual increasing of tax benefit for higher number of children since 2015. While the tax credit for a taxpayer and a tax benefit for the first child in the household stays unchanged, there is a progressive increase in the value of tax benefit for the second, third and each additional child in the same household. The amount of tax benefit causes that taxpayers with below-average incomes or taxpayers with more children receive a tax bonus, for more see *e.g.* Krajňák (2015). Using data for the entire period (except for 2004) to analyze the dependence does not reduce the usability of the results, or to reduce the ability of analysis, since both items have always unified character - either a discount or a non-taxable portion.

3.2 Analysis of dependencies of effective tax rates

To evaluate the tax burden indicator is used ETR. The input data on the average wages in the Czech Republic for the analyzed period 1993-2017 are given in Table 5. In 2017 the average wage was 4.99 times higher than in 1993.

Table 5. Average wage in Czech Republic from 1993 to 2017

Year	Wage	Year	Wage	Year	Wage	Year	Wage
1993	5 904	2000	13 219	2007	20 957	2014	25 768
1994	7 004	2001	14 378	2008	22 592	2015	26 591
1995	8 307	2002	15 524	2009	23 344	2016	27 764
1996	9 825	2003	16 430	2010	23 864	2017	29 496
1997	10 802	2004	17 466	2011	24 455		
1998	11 801	2005	18 344	2012	25 067		
1999	12 797	2006	19 546	2013	25 035		

Source: own processing

From the perspective of the state, the goal is to maximize tax revenue. Data on the percentage share of personal income tax on the total tax revenue and effective tax rates corresponding to the average wage of the given year in the Czech Republic are shown in Table 6. Effective tax rates are calculated using (5).

ETR_0 is the effective tax rate for the taxpayer in a model situation with the income level of the average wage in the Czech Republic in the year concerned, applying only deduction for the taxpayer, either in the form of non-taxable portion or tax credit under current legislation. ETR_1 expresses the same value the only difference being that a taxpayer with an average income deduction applies also for two dependent children in a household, ETR_2 for two dependent children and ETR_3 for three dependent children.

ETR changed for all income groups of taxpayers during the period indicated. An increasing trend of development can be observed from the beginning of the analyzed period until 2005. The first significant decrease in the ETR occurred in 2006, when the non-taxable part for the taxpayer was replaced by a tax credit. It is confirmed that taxpayers below-average incomes in particular have benefited from this legislation. Another reason is the reduction of the tax rate in the first bracket from 15% to 12%.

The most significant change in the trend occurred in 2008 in the context of public finance reform. The significant decrease was registered in case of taxpayer with lower incomes due to the increase of the most used tax credit for taxpayer, in case of people with higher incomes. It was due to the cancellation of progressive rate. Taxpayers with average income with no other deductions gained from this change the minimum. Despite the nominal rate of 15% (since 2008), the real tax rate for taxpayers with above-average incomes is above this value.

Table 6. Share of personal income tax, ETR_0, ETR_1, ETR_2 and ETR_3

Year	Share%	ETR_0	ETR_1	ETR_2	ETR_3	Year	Share%	ETR_0	ETR_1	ETR_2	ETR_3
1993	13,02	8,638	6,733	4,827	2,922	2006	21,72	9,936	7,377	4,819	2,261
1994	15,89	9,155	7,228	5,301	3,373	2007	21,90	10,423	8,037	5,651	3,265
1995	18,54	9,510	7,584	5,778	3,973	2008	18,98	11,082	7,143	3,204	-0,736
1996	20,25	9,758	8,079	6,399	4,720	2009	21,23	11,229	7,416	3,604	-0,209

Year	Share%	ETR$_0$	ETR$_1$	ETR$_2$	ETR$_3$	Year	Share%	ETR$_0$	ETR$_1$	ETR$_2$	ETR$_3$
1997	21,98	9,813	8,123	6,457	4,791	2010	20,39	11,424	7,372	3,320	-0,732
1998	21,85	9,736	7,817	5,911	4,004	2011	21,26	12,043	8,088	4,134	0,180
1999	20,99	9,709	7,599	5,490	3,380	2012	20,52	11,838	7,382	2,926	-1,530
2000	22,05	9,815	7,773	5,730	3,688	2013	20,65	11,828	7,367	2,905	-1,557
2001	21,58	9,923	7,772	5,721	3,677	2014	20,47	12,064	7,730	3,395	-0,940
2002	21,96	10,478	8,165	6,273	4,380	2015	20,31	12,416	8,271	3,385	-1,873
2003	22,35	10,864	8,480	6,649	4,862	2016	20,40	12,642	8,619	3,515	-2,669
2004	22,53	11,260	8,817	6,742	4,910	2017	21,51	13,078	9,291	3,809	-3,029
2005	21,37	11,557	8,831	6,106	3,380						

Source: own processing

For the combination of ETR$_0$ and ETR$_1$, ETR$_0$ and ETR$_2$, ETR$_0$ and ETR$_3$, the interdependence of the values by calculating the angle of the correlation shears of the respective pair of values is monitored for by the use of (4). The Pearson correlation coefficient *r* determined by (3) for the first pair of values (ETR$_0$ and ETR$_1$) rises to 0,52, which indicates the middle degree of dependence between the observed indicators,

$$cotg\ \varphi = \frac{|0{,}52156|}{1-0{,}2720}\left(\sqrt{\frac{0{,}01167}{0{,}00594}} + \sqrt{\frac{0{,}00594}{0{,}001167}}\right) = 33°42'.$$

The mentioned above is shown in graphic in Figure 1. Among the indicators analyzed, the direct dependency is valid, if there was an increase in ETR in the past for a taxpayer without dependent children, the tax burden on the taxpayer applying the deduction to 1 child generally increased. A more pronounced increase in margin has occurred since 2008, when the tax advantage for a dependent child in the household was increased.

Figure 1. Correlation shears
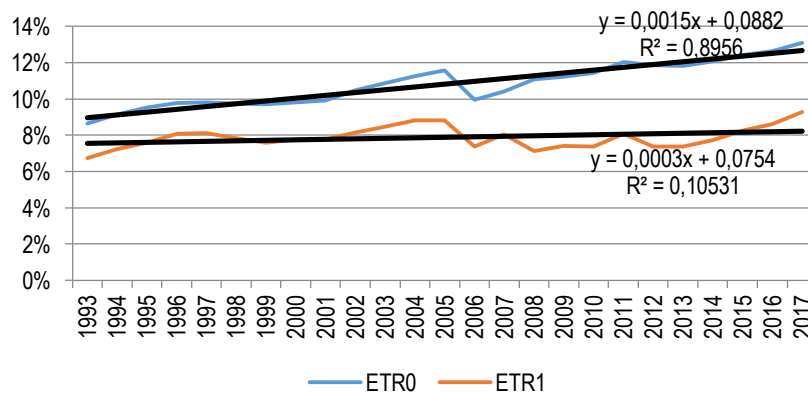
Source: own processing

Figure 2 presents the dependency between the pair of values ETR$_0$ and ETR$_2$, *i.e.* a taxpayer without deduction for children and a deduction for two children. The remaining assumptions remain the same, *i.e.* the analyzed period of years 1993-2017, the income at the level of an average wage of the given year.

$$cotg\ \varphi = \frac{|-0{,}61498|}{1-0{,}3782}\left(\sqrt{\frac{0{,}01167}{0{,}01294}} + \sqrt{\frac{0{,}01294}{0{,}01167}}\right) = 26°78'$$

The angle of the correlation shears has lower value of degrees in comparison to the previous situation. It confirms that the dependence between this pair of indicators is narrower, which is also evidenced by the Pearson correlation coefficient *r* (-0,615). A negative value *r* indicates that one of the quantities increases over time while the other decreases. The rising margin is the result of the growing deduction for children, as the deduction for a taxpayer has not increased in recent years. For that reason, the ETR grows for a taxpayer without a deduction for children, as the average wage increases and thus the real amount of the deduction without valorisation decreases.

Figure 2. Correlation shears
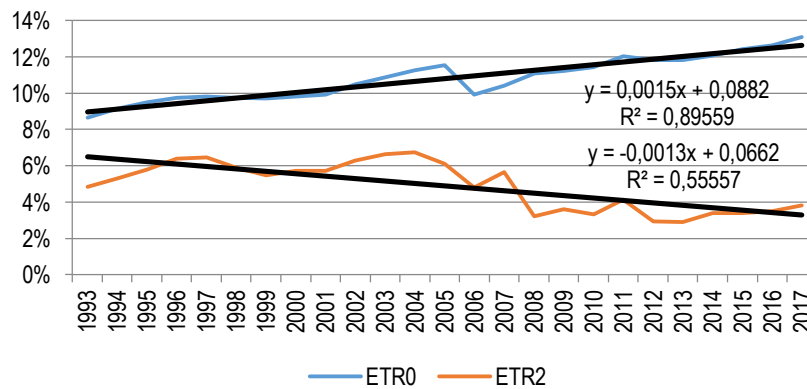
The last angle calculation takes as input data the ETR_0 and ETR_3 (taxpayer who applies the deduction for 3 children). The graphic representation is shown in Figure 3.

$$cotg\ \varphi = \frac{|-0,78606|}{1 - 0,61788}\left(\sqrt{\frac{0,01167}{0,02661}} + \sqrt{\frac{0,02661}{0,001167}}\right) = 12°61´.$$

Between this analyzed pair of the ETR, the indirect dependence is the highest. ETR_3 has been decreasing since 2007, while ETR_0 is showing a slight upward trend. That is why the dependence is indirect. The Increase in the deduction for children deepens the gap in the actual tax burden in favor of taxpayers with a higher number of dependents.

The comparison of the results of all three analyzed dependencies indicates that with an increase in the number of children there increases the deduction that a taxpayer may apply, which deepens the differences in a tax liability and the ETR. The graduation of the tax advantage according to the number of dependents is another reason why the indirect dependence reported in the coefficient r (-0.786) increases with an increasing number of children.

Figure 3. Correlation shears
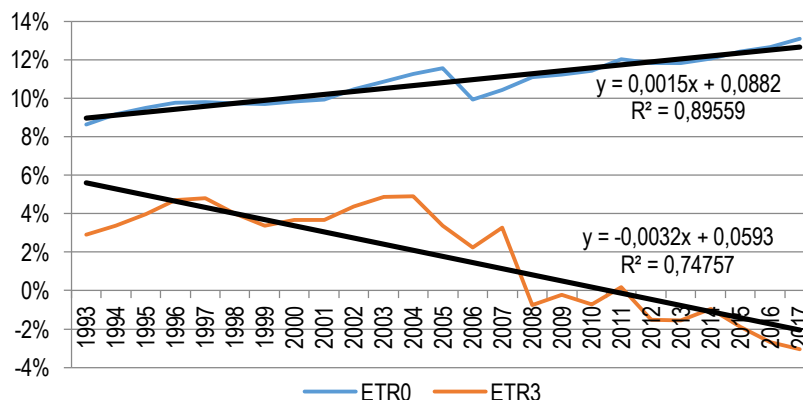
Absolute increments (*AC*), relative increment (*RC*) and growth factors (*CG*) for *ERT* were determined using (6), (7) and (8) (for more details for individual years see the annex Table A). The best way of presenting time series data is a time series plot (Buglear 2012). In Figure 4, there is a graphic presentation of the development of absolute increments. The analysis shows that the tax burden on taxpayers receiving income in the level of an average wage increased in the period 1994-1997, even though the deduction for both children and the taxpayer had increased in each of these years. The decrease in all the model situations analyzed occurred in 2006. The reason is the reduction of progressive tax rates in the first bracket from 15% to 12% and the replacement of allowances by tax

credits. Taxpayers with children experienced the reduction to tax liability in 2008, when a large-scale public finance reform has taken place. The reason for this is the increase of the amount of tax benefit to children in comparison to the value in 2007. In most cases, there were reductions in the tax rate, but on the other hand, tax base was increased, because in case of income from employment, it is not gross salary after deduction of premiums, but super-gross wage.

The increase of the tax benefit for children is the reason for the decrease of the tax burden in 2012. In addition, this year the taxpayer's discount increased by 1,200 CZK compared to the amount valid in 2011. Since 2012, the amount of the taxpayer's tax credit has not changed, which is the reason for the increasing trend of the tax burden for the taxpayer who does not apply the deduction to children. In spite of gradual increases in the amounts of tax benefit, the taxpayers with average income show a growing trend of tax liability from 2013 until the last analyzed year 2017, this is not the case for a taxpayer with a deduction for three children. This is due to the fact that the amounts of tax advantage are graduated according to the number of children.

Figure 4. Absolute increments
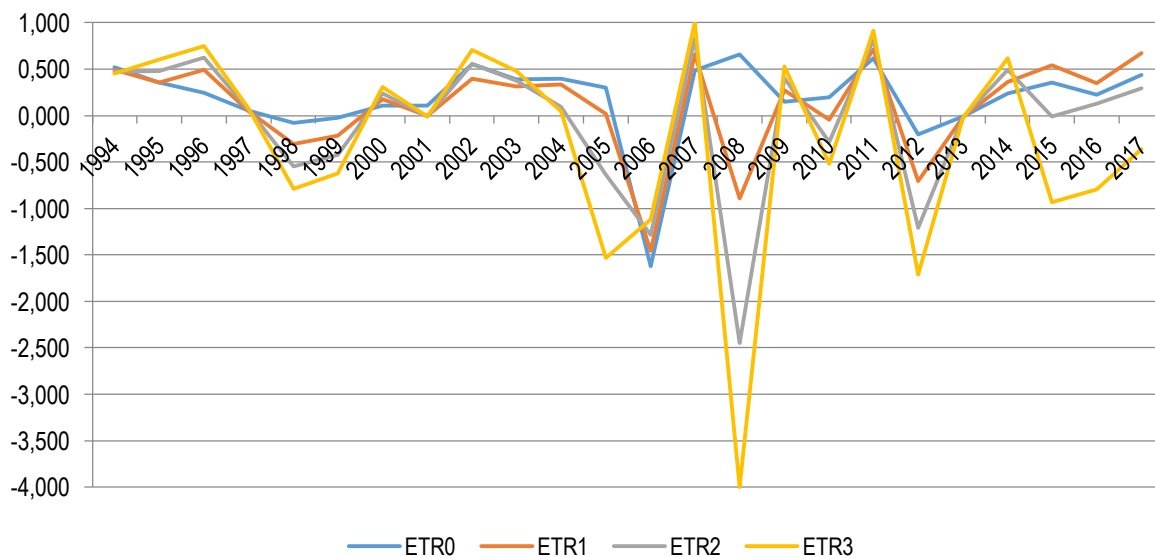
Source: own processing

Conclusion

The aim of this article was to assess the selected aspects of individual income tax - a personal income tax in the Czech Republic. First, the subject of analysis was a dependence between the amount of the deduction for the taxpayer and dependents – children – living with the taxpayer in one household. In this case, a high degree of dependence between the development of the values of these amounts were determined. With a higher number of children, owing to the increasing amount of deduction for a child and unchanging value of deduction for the taxpayer, the dependence reduces.

The size of the tax burden is revealed not only by deductions, whether in the form of tax allowances or tax credits, but the tax rate as well. For assessing the tax burden, the effective tax rates are highly relevant. Conclusion stated in the previous paragraph also confirms the mentioned, that is: that the tax rate and thus the tax burden of taxpayers receiving an average wage and claiming the deduction for more children is gradually reduced, while the effective tax rate in case of a taxpayer who does not apply the deduction for dependent children, has the gradual upward trend. There was also confirmed a dependence of tax collection on personal income tax of individuals from employment on effective tax rates.

The nominal income tax rate, since its introduction in the Czech Republic in 1993 to the present, decreased, instead of moving progressive tax rate there is currently applied only one tax rate of 15% in most cases. This 15% rate is, however, calculated from the super-gross wage, which is gross wage plus compulsory social and health insurance. Due to the existence of items reducing either the tax base or calculated tax, the taxation by personal income tax still remains progressive. Stated progressiveness of the tax helps, on the other hand, to fulfill the redistributive function of taxation.

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APPENDIX

Table A. Time series of ETR

Year	ETR$_0$			ETR$_1$			ETR$_2$			ETR$_3$		
	AC	RC	CG	AC	RC	CG	AC	RC	CG	AC	RC	CG
1994	0,517	0,060	1,060	0,495	0,074	1,074	0,474	0,098	1,098	0,451	0,154	1,154
1995	0,355	0,039	1,039	0,356	0,049	1,049	0,477	0,090	1,090	0,600	0,178	1,178
1996	0,248	0,026	1,026	0,495	0,065	1,065	0,621	0,107	1,107	0,747	0,188	1,188
1997	0,055	0,006	1,006	0,044	0,005	1,005	0,058	0,009	1,009	0,071	0,015	1,015
1998	-0,077	-0,008	0,992	-0,306	-0,038	0,962	-0,546	-0,085	0,915	-0,787	-0,164	0,836
1999	-0,027	-0,003	0,997	-0,218	-0,028	0,972	-0,421	-0,071	0,929	-0,624	-0,156	0,844
2000	0,106	0,011	1,011	0,174	0,023	1,023	0,240	0,044	1,044	0,308	0,091	1,091
2001	0,108	0,011	1,011	-0,001	0,000	1,000	-0,009	-0,002	0,998	-0,011	-0,003	0,997
2002	0,555	0,056	1,056	0,393	0,051	1,051	0,552	0,096	1,096	0,703	0,191	1,191
2003	0,386	0,037	1,037	0,315	0,039	1,039	0,376	0,060	1,060	0,482	0,110	1,110
2004	0,396	0,036	1,036	0,337	0,040	1,040	0,093	0,014	1,014	0,048	0,010	1,010
2005	0,297	0,026	1,026	0,014	0,002	1,002	-0,636	-0,094	0,906	-1,530	-0,312	0,688
2006	-1,621	-0,140	0,860	-1,454	-0,165	0,835	-1,287	-0,211	0,789	-1,119	-0,331	0,669
2007	0,487	0,049	1,049	0,660	0,089	1,089	0,832	0,173	1,173	1,004	0,444	1,444
2008	0,659	0,063	1,063	-0,894	-0,111	0,889	-2,447	-0,433	0,567	-4,001	-1,225	-0,225
2009	0,147	0,013	1,013	0,273	0,038	1,038	0,400	0,125	1,125	0,527	-0,716	0,284
2010	0,195	0,017	1,017	-0,044	-0,006	0,994	-0,284	-0,079	0,921	-0,523	2,502	3,502
2011	0,619	0,054	1,054	0,716	0,097	1,097	0,814	0,245	1,245	0,912	-1,246	-0,246
2012	-0,205	-0,017	0,983	-0,706	-0,087	0,913	-1,208	-0,292	0,708	-1,710	-9,500	-8,500
2013	-0,010	-0,001	0,999	-0,015	-0,002	0,998	-0,021	-0,007	0,993	-0,027	0,018	1,018
2014	0,236	0,020	1,020	0,363	0,049	1,049	0,490	0,169	1,169	0,617	-0,396	0,604
2015	0,352	0,029	1,029	0,541	0,070	1,070	-0,010	-0,003	0,997	-0,933	0,993	1,993
2016	0,226	0,018	1,018	0,348	0,042	1,042	0,130	0,038	1,038	-0,796	0,425	1,425
2017	0,436	0,034	1,034	0,672	0,078	1,078	0,294	0,084	1,084	-0,360	0,135	1,135

Source: own processing

Qualified Personnel Training for the Eastern Gas Program

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Abstract:

The Republic of Sakha (Yakutia) is a priority for consolidating the positions of the Russian Federation in the hydrocarbon market of the Asia-Pacific region. A characteristic trend in the period up to 2030 is to strengthen the professional guidance of young people, aimed at participation in industrial and infrastructure projects. It is necessary to bring the structure of the training of specialists and workers in accordance with the needs of the labor market. In this paper we consider main tasks to upgrade vocational education system.

Keywords: Eastern gas program; investment projects; engineering staff; highly-qualified personnel

JEL Classification: E24; I25; J24; J62

Introduction

For the integrated development of the gas industry in Eastern Siberia and the Far East of the Russian Federation the Ministry of Energy of Russian Federation approved the state program for the creation in the Eastern Siberia and the Far East a unified system for the gas extraction, transportation and supply, taking into account the possible gas export to the markets of China and other countries of the Asia-Pacific region.

The main objectives of the Eastern Gas Program are to meet domestic demand for natural gas, develop Russia's export potential, form a gas processing and gas chemical industry to produce products with high added value. Within the framework of this program, gas production centers are being established in the Krasnoyarsk Territory, the Irkutsk Region, the Republic of Sakha (Yakutia), the Sakhalin Region and the Kamchatka Territory. It is also expected to create a developed gas transportation infrastructure and its subsequent integration with the Unified Gas Supply System of Russia.

1. State–of–Art

Among the regions of the Far East, Yakutia occupies a leading position on the energy potential. The Republic of Sakha (Yakutia) is a priority for consolidating the positions of the Russian Federation in the hydrocarbon market of the Asia-Pacific region.

At present, the oil and gas industry is one of the most dynamically developing industry in the region (Figure 1). The largest Russian oil and gas companies implement large-scale projects for the exploration and development of deposits, construction of pipeline systems, oil and gas transshipment complexes, oil refining and gas chemical facilities.

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Figure 1. Energy potential of the Republic of Sakha (Yakutia)
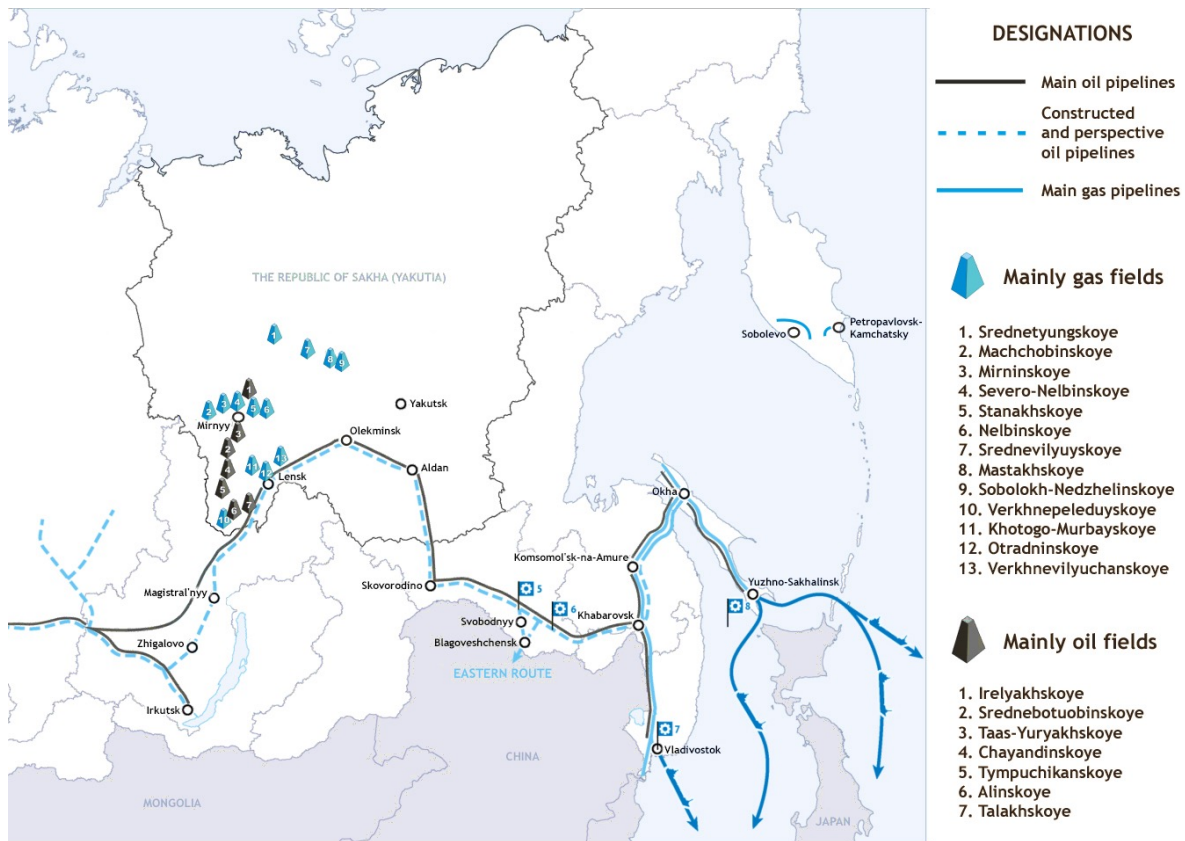
According to the Energy Strategy of Russia by 2020 in Eastern Siberia and the Republic of Sakha (Yakutia) it is planned to bring oil production up to 50 million tons per year and gas production to 95 billion m^3 per year, as it entails a huge need for staff. This relevance is reflected in the Program of Social and Economic Development for the period until 2030.

2. Methodology

The main task and way of employment development in the Republic of Sakha (Yakutia) is to create new jobs by implementing strategic investment projects for the development of new industries such as oil and gas complex, development of the transport system, energy, small and medium-sized enterprises. Also it includes professional training and involvement of local labor resources.

A characteristic trend in the period up to 2030 is to strengthen the professional guidance of young people, aimed at participation in industrial and infrastructure projects. At the same time, the uneven increase in demand for labor resources is predicted as a result of the implementation of large investment projects in the Republic (Table 1).

Table 1. The need for labor resources for the implementation of investment projects

No	Indicator name	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	The need for scientific personnel, people	216	216	216	216	216	216	216	216	216	216
2	The need for engineering personnel										
2.1	On the 1st (maximum) version of Gas Business Development PJSC "Gazprom", people	6898	7072	7580	7095	6892	844	7390	7466	7323	7294
2.2	On the 2nd (basic) version of Gas Business Development PJSC "Gazprom", people	6898	7072	7331	7160	6912	7468	7229	7542	7290	7425
2.3	On the 3rd (minimum) version of Gas Business Development PJSC "Gazprom", people	6815	7057	7210	7019	7043	7165	7184	7061	7197	7151

Source: Passport of the Innovative Development Program of Gazprom until 2025

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- Construction of an oil refinery - 970 people;
- Geological exploration within the Western Anabar license area - 200 people (Samashova, Kurumbaev and Abilgazin 2014)

Figure 3. Involvements of local labor resources for the construction and operation of investment projects on the territory of the Republic of Sakha (Yakutia)

3. Results

Development of transport, communications, energy, the formation of the processing industry requires skilled labor. In this regard, the list of vocational education programs of the technical direction is widening: building specialties, transport, information and communication technologies, energetics. To modernize the extractive industry geological and mineral resource development needs to be expanded. It requires the opening and re-profiling of professions and specialties in the vocational education system.

In order to train competitive workers and specialists we are currently working on to ensure the mechanism of social partnership in the system of secondary and primary vocational education.

Further active promotion of investment projects of the Republic will contribute to the quality of the labor market development in the region. To prevent obstacles to the implementation of the plans, it is necessary to carry out a deliberate balanced personnel policy, create a comfortable living environment in the Republic and favorable conditions for attracting highly qualified labor resources by creating motivational employment and consolidation mechanisms.

To meet the human resources needs of investment projects, it is necessary to solve the following tasks:
- the improvement of the multistage system of personnel training for the organization of innovative production;
- the introduction of a regional standard for the staffing of industrial growth;
- •the organization of the labor market monitoring system to determine the effectiveness of activities in vocational education and training;
- •the creation and development of multifunctional centers of applied qualifications to realize of the educational needs of a person;
- carrying out an integrated assessment of professional, personal and managerial skills and abilities;
- •the improvement of the system for forecasting the personnel demand for the medium and long term;
- the identification of unclaimed and promising professions;
- targeted vocational guidance work among the youth for their involvement in the labor market demanded professions, the introduction of new technologies in the organization of professional orientation of population;
- training highly qualified personnel on the basis of targeted training in Russian and international research and educational centers, innovative organizations;
- the organization of internships for young specialists in industrial enterprises;
- creating conditions for the formation of the professional career of students and young professionals;

- the improvement of mechanisms to facilitate and monitor the employment of graduates of educational institutions of higher and secondary vocational education;
- the development of state support for young specialists' measures for their consolidation in industrial areas;
- the introduction of the practice of professional standards in the personnel policy of enterprises and organizations;
- the introduction of mechanisms for certification of employees' qualifications.

A shortage of pedagogical staff and masters of vocational training is also noted everywhere, which is explained by the low level of wages, the lack of an influx of young people and the aging of pedagogical cadres.

New approaches are needed to address the challenges that Russian business needs today. In particular, the involvement of companies' specialists in primary and secondary vocational education institutions and the provision of an industrial base to involve it in the educational process could improve the level of training of young personnel. The organization of their training, taking into account certain professional qualification requirements and the introduction of a system for the distribution of graduates in companies with the assignment of their workplace (including for the period of military service) will contribute to the formation of a personnel reserve.

Conclusion

The leading role in providing the personnel of the Yakutia gas production center as part of the Eastern Gas Program is assigned to the North-Eastern Federal University.

One of the most important tasks of the university is to form partnerships with the labor market. The main incentive is a mutual interest in improving the quality of training specialists. Strategic partnership implies different models of interaction, covering the educational, scientific and production spheres and can be realized in the following forms:

- professional and public accreditation of professional educational programs in the oil and gas sector;
- the organization of students' practices and degree projects in companies;
- R & D in accordance with the needs of companies;
- attracting students to design and research activities;
- •the development of strategic partnership infrastructure, including the creation of laboratories, research and production structures.

One of the key factors in the success of the entire modernization process is a successful upgrade vocational education system. It is important to develop dual education, modern centers of applied qualifications are needed that will overcome the shortage of personnel. The average age in the Republic of Sakha is 32 years. Every teenager gets a choice of who he is to be, what profession will most accurately contribute to his or her self-realization. In this regard oil and gas industry refers to one of the most highly paid and attractive.

According the dual education system, the company and the educational institution work together to achieve a common goal - the qualitative training of demanded professionals. In this case, the student acquires certain professional skills at an early stage of training, and also forms personal qualities necessary for his professional activities, such as the teamwork ability, searching for the best technological solutions, responsibility for the assigned workplace. In the work the student rethinks the future specialty, makes informed decisions about the correct choice of the profession. In addition, the future specialist with conscientious work can provide additional income and work experience required for employment in today's market conditions (Vorobyova 2015).

A potential employer with his own idea about the specialist is able to "intervene" in the learning process, taking part in changing training program around specific issues for this production. Partnership with the school makes possible to evaluate potential human resources in the early stages of vocational training. In case of a clear disparity, it is possible to refuse to graduate in job or to enroll him or her in a position with a lower salary.

The educational institution is also interested in business partnership with production, as it gets access to operational information about the current state of production processes, so that it can really assess the future need for personnel, update training programs, identify priority areas of research and R & D.

The dual education system has proven itself in many countries of the world. In Austria, Denmark, Switzerland and Norway the dual education system is successful, when ordinary school activities are combined with practical training programs. It is noteworthy that in these countries the lowest youth unemployment rate in Europe. China is also following a similar path, where about 3000 schools of skilled workers offer comprehensive courses of professional training in the most demanded professions in the labor market. About 90% (since 1998, this 400 million people) graduates of such schools do not have problems with employment.

Today, Germany's vocational education system is one of the leaders in the level of personnel qualification, and its dual education system is a model for the entire European Union. Almost one and a half million students in 350 specialties and 500,000 companies are involved in the dual system of Germany. Small and medium enterprises provide almost 80% of pupils. Experts urge other countries to follow similar examples, and warn that if no action is taken, the dangerous combination of high unemployment and the increased "non-standard" employment may lead to the formation of a new lost generation (Rainer Hertz GIZ Germany).

Integration of educational, scientific and production activities will allow for a wide-ranging training and retraining of specialists with higher and postgraduate professional education on a fundamentally new level of quality, create conditions for the professional adaptation of graduates to the modern labor market.

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