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Journal of Applied Economic Sciences

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On the System-Theoretical Foundations of Non-Economic Parameter Constancy Assumptions in Economic Growth Modeling

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Abstract:

Most growth models assume that some of the model parameters that are determined in non-economic systems are exogenous and constant. Such non-economic parameter constancy assumptions (abbr. 'NEPCAs') seem inevitable in economic growth modeling, yet they are not necessarily consistent with the empirical evidence on significant cross-system interactions, *i.e.,* long-run interactions between the economic system and the non-economic systems (*e.g.,* socio-cultural, political, and ecological system). We derive the system-theoretical conditions under which NEPCAs can be good approximations of cross-system interactions: we (a) discuss the standard types of dynamic equilibrium and the problems that arise when using them to justify NEPCAs in growth models (in presence of cross-system interactions), (b) formulate an equilibrium type (a 'stable partial dynamic equilibrium') that solves these problems, and (c) demonstrate the applicability of this equilibrium type as a foundation of the NEPCAs used in the AK growth model. Finally, we discuss some topics for further research.

Keywords: long-run economic growth; parameter conditions; cross-system interactions; dynamic systems theory; dynamic equilibrium, AK model

JEL Classification: O40; A12

Introduction

Over the last decades, economic growth theory has reoriented towards quantitative, positive, and predictive models that can 'reproduce' the observed quantitative characteristics of the long-run dynamics of economic variables while assuming that some 'non-economic parameters' are constant. These 'non-economic parameters' are the exogenous model parameters (*e.g.,* time-preference rate, savings rate, population growth rate, and depreciation rate) that are primarily determined in non-economic systems (*e.g.,* in the socio-cultural, political, and ecological system). Major examples of such a model are (the positive interpretations of) the Solow (1956) model and the Ramsey-(1928)-Cass-(1965)-Koopmans-(1967) model, which are the basis for numerous (positive and quantitative) growth and development models.

The 'non-economic parameter constancy assumptions' (NEPCAs) described above are associated with a major problem. According to the empirical evidence discussed in Section 1, there are interactions between the economic system and the non-economic systems. Such cross-system interactions imply that although the non-economic parameters are determined in non-economic systems, they are not necessarily independent of economic system dynamics, since economic system dynamics may have an effect on non-economic systems that leads to a change of the non-economic parameters of the economic model/system. That is, the assumption that the non-economic parameters of the positive/quantitative economic growth models are exogenous or constant is not necessarily consistent with the empirical evidence on cross-system interactions. For example, the positive interpretation of the Ramsey-(1928)-Cass-(1965)-Koopmans-(1967) model seeks to explain the observable long-run economic dynamics (among others, long-run per-capita income growth) while assuming that several parameters (*e.g.,* the time-preference rate and the population growth rate) are constant. However, the empirical evidence and theory imply that these parameters depend, among others, on the socio-cultural characteristics of the society/economy and that in the long run, per-capita income growth has an impact on the socio-cultural system (Sections 1 and 5). In general, the explanatory and predictive validity of positive and quantitative economic long-run models that are based on NEPCAs may be restricted/biased in presence of cross-system interactions.

This discussion challenges the common practice of basing economic growth models on NEPCAs and questions whether we need to change the approach to long-run economic dynamics modeling by focusing on large-scale (interdisciplinary) models that endogenize 'all' NEPCAs or by searching for empirical evidence on the various NEPCAs that are used in standard economic growth models ('empirical foundations of NEPCAs'). As discussed in

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Section 2, these alternatives are time-intensive, complex, and model-*specific* and, anyway, NEPCAs seem inevitable in economic growth modeling. Moreover, cross-system interactions may but need not necessarily imply that NEPCAs are inadequate. In particular, in some types of dynamical system, NEPCAs are a good approximation of cross-system linkages (even if there are interactions between the systems). For these reasons, we seek to identify these dynamical system types and analyze the implications of cross-system interactions for NEPCAs in a *general* framework.

By using the system-theoretical approach described in Section 2, we identify the conditions under which the NEPCAs used in economic growth modeling are consistent with cross-system interactions. In particular, we show that the equilibrium type that we name 'partial dynamic equilibrium' may serve as a system-theoretical foundation of NEPCAs. As discussed in the concluding section of our paper, this result can be (a) used for further methodological discussion of economic growth modeling with respect to the necessity of interdisciplinarity, (b) applied in future modeling of cross-system interactions (as demonstrated in Section 5), and (c) used for identifying the real-world non-economic (sub-)systems that are not modelable by NEPCAS and, thus, elaborating an interdisciplinary research program on endogenization of NEPCAs in economic growth modeling. Moreover, we provide a version of the AK growth model with interactions between the non-economic and economic system (via socio-cultural development and population growth) demonstrating the applicability of the partial dynamic equilibrium as a foundation of the NEPCAs used in the AK model.

The rest of the paper is structured as follows. In the next section, we discuss briefly the literature on cross-system interactions. In Section 2, we explain our methodological approach. Section 3 introduces the mathematical description of the economic and non-economic system (which relies on differential equation systems). Section 4 is devoted to the discussion of the standard types of dynamical system equilibrium in the context of NEPCAs and the derivation of the concept of partial dynamic equilibrium. In Section 5, the latter concept is applied for modeling the interaction between the economic and non-economic system based on the AK growth model. Concluding remarks are provided in the last section of the paper.

1. Literature Review

There are numerous studies of the interactions between *specific* economic variables/systems and *specific* non-economic variables/systems, see *e.g.:*
- Bourguignon (2005) on the impact of economic development on social structures;
- Alesina and Giuliano (2015) and Galor and Michalopoulos (2012) on the impact of culture on economic development (via institutions among others);
- Acemoglu *et al.* (2001) on the effect of institutions on per-capita income;
- Acemoglu *et al.* (2001), Alesina and Fuchs-Schündeln (2007), and Fuchs-Schündeln and Paolo (2016) on the effect of the political system (colonial origin, socialism) on the economic system (via impacts on institutions, preferences, and education);
- the literature on the impact of economic development on democracy and vice versa (*e.g.,* Huber *et al.* (1993) and Persson and Tabellini (2006)).

Similar literature can be found on the linkages between the economic and the ecological system via, *e.g.,* pollution and resource depletion (see, *e.g.*, Brock and Taylor (2005) for an overview and Kollenbach (2015, 2017) for a recent theoretical contribution to this topic) and agro-climatic characteristics and economic behavior (see Galor and Ozak (2016)). Among others, Galor and Moav (2002) study the interactions between biological human characteristics and economic development.

In general, the studies listed in this section imply that there are interactions between the economic system and different non-economic systems (among others, socio-cultural, ecological/biological, and political systems).

2. Methodology

As noted in the introduction of this paper, besides our system-theoretical approach, there are two alternatives for addressing the problems associated with NEPCAs: (a) empirical foundations of NEPCAs and (b) large-scale (interdisciplinary) modeling (for endogenizing 'all' NEPCAs). While it is often possible to provide an empirical foundation of the NEPCAs used in a specific economic model by showing that they are supported by empirical evidence (alternative (a)), many parameters of economic models are highly theoretical and, thus, difficult to estimate by using empirical data. Moreover, as discussed in Section 4.3, such empirical NEPCAs foundations are restricted in validity unless they are supported by interdisciplinary (or non-economic) theoretical models (alternative (b)). However, in general, even interdisciplinary theoretical (large-scale) models (that seek to endogenize NEPCAs

by incorporating the empirically proven inter-system linkages) cannot cover all thinkable cross-system linkages, *i.e.,* in general, they rely on some sort of NEPCAs. In other words, the alternatives (a) and (b) are time-intensive, complex, and model-specific and, anyway, NEPCAs seem inevitable in economic growth modeling. Moreover, in some types of dynamical system, NEPCAs can be a good approximation of cross-system linkages (even if there are interactions between the systems) as we will see.

For all these reasons, it seems interesting to complement the alternatives (a) and (b) (and the literature on *specific* cross-system interactions discussed in Section 1) by a *general system-theoretical* approach for deriving the conditions under which NEPCAs are good approximations of cross-system interactions in economic growth modeling. In detail, this approach is as follows. First, we set-up a general dynamical system representing the evolution of the economic and non-economic system and the interactions between the two systems. Then, we apply some standard types of dynamic equilibrium (*e.g.*, structurally stable equilibriums and homeostasis) to this dynamical system and discuss whether the dynamics arising in these equilibriums are consistent with NEPCAs. As we show, two major problems arise when applying the standard equilibrium types: the standard equilibrium types either do not allow for cross-system interactions or are 'unreliable' foundations of NEPCAs since they bear the possibility that NEPCAs are violated at some future point of (system) time. Therefore, we formulate an equilibrium type (which we name 'partial dynamic equilibrium') that does not give rise to these problems and, thus, may serve as a system-theoretical foundation of NEPCAs. Moreover, we provide a version of the AK growth model with interactions between the non-economic and economic system (via socio-cultural development and population growth) demonstrating the applicability of the partial dynamic equilibrium as a foundation of the NEPCAs used in the AK model.

3. A Mathematical Description of the Systems

While there are different mathematical notational conventions, we choose the following notation for reasons of simplicity: small italic letters (*e.g.*, e) or small italic Greek letters (*e.g., ε*) denote scalars; bold small letters (*e.g.*, **e**) denote vectors or vector functions; capital bold Greek letters (*e.g.*, **Φ**) denote vector functions; capital italic letters (*e.g.*, E) denote sets; R is the set of real numbers; and a dot over a vector indicates its derivative with respect to time (*e.g.,* $\dot{\mathbf{e}}$ is the derivative of **e** with respect to time).

Let $\mathbf{e}(t) \equiv (e_1(t), e_2(t), …, e_\varepsilon(t)) \in E \subseteq R^\varepsilon$ denote the ε-dimensional vector of variables describing the state of the economic system at time $t \in [0, \infty)$, where E is the set of all feasible or meaningful states of the economic system. Moreover, let $\mathbf{n}(t) \equiv (n_1(t), n_2(t), …, n_\eta(t)) \in N \subseteq R^\eta$ be the η-dimensional vector of variables describing the state of a non-economic system at time $t \in [0, \infty)$, where N is the set of all feasible or meaningful states of the non-economic system. As discussed in the introduction of this paper, we assume that the economic system is dependent on the parameter vector $\mathbf{p}(t) \equiv (p_1(t), p_2(t), …, p_\pi(t)) \in P \subseteq R^\pi$ and that the parameter vector is dependent on the non-economic system, as stated by (1), where $\mathbf{Φ}^p$ is a vector function of the type $\mathbf{Φ}^p: N \to P$.

$$\mathbf{p}(t) = \mathbf{Φ}^p(\mathbf{n}(t)) \tag{1}$$

Without loss of generality, we rely on differential equations for modeling the dynamics of the systems. In particular, we assume that the economic system dynamics are determined by (2) and (3), where $\mathbf{Γ}^e$ is a vector function of the type $\mathbf{Γ}^e: E \times P \to R^\varepsilon$ and $\mathbf{e}_0$ is the initial state of the economic system.

$$\dot{\mathbf{e}}(t) = \mathbf{Γ}^e(\mathbf{e}(t), \mathbf{p}(t)) \tag{2}$$

$$\mathbf{e}(0) = \mathbf{e}_0 \in E \tag{3}$$

If we define the function $\mathbf{Φ}^e: E \times N \to R^\varepsilon$, $\mathbf{Φ}^e(\mathbf{e}(t), \mathbf{n}(t)) := \mathbf{Γ}^e(\mathbf{e}(t), \mathbf{Φ}^p(\mathbf{n}(t)))$, then we can transform (2) as follows:

$$\dot{\mathbf{e}}(t) = \mathbf{Γ}^e(\mathbf{e}(t), \mathbf{Φ}^p(\mathbf{n}(t))) = \mathbf{Φ}^e(\mathbf{e}(t), \mathbf{n}(t)) \tag{4}$$

In line with the previous discussion, we model the non-economic system by using differential equations and assume that the non-economic system is dependent on the economic system, as stated by (5) and (6), where $\mathbf{Φ}^n$ is a vector function of the type $\mathbf{Φ}^n: E \times N \to R^\eta$ and $\mathbf{n}_0$ is the initial state of the non-economic system.

$$\dot{\mathbf{n}}(t) = \mathbf{Φ}^n(\mathbf{e}(t), \mathbf{n}(t)) \tag{5}$$

$$\mathbf{n}(0) = \mathbf{n}_0 \in N \tag{6}$$

Overall, this discussion implies that (a) the dynamics of the economic system **e** depend on the state of the economic and non-economic system (cf. (4)) and (b) the dynamics of the non-economic system **n** depend on the

state of the economic and non-economic system (cf. (5)). Moreover, as we can see, we use autonomous differential equations for describing the dynamics of the economic and non-economic system. In general, this is not a problem (in long-run growth modeling), since we can always define the terms of the differential equations that are explicitly dependent on time as auxiliary variables and assign them to the non-economic system **n**, as demonstrated in Section 5.

Moreover, we define the vector $\mathbf{s}(t) \equiv (e_1(t), e_2(t), \ldots, e_\varepsilon(t), n_1(t), n_2(t), \ldots, n_\eta(t))$, which represents the state of the overall system at time t, such that the economic system **e** and the non-economic system **n** can be interpreted as subsystems of the system **s**. Our discussion implies that $\mathbf{s}(t) \in E \times N$ and (7) are true, where $\mathbf{\Phi}^s: E \times N \to R^{\varepsilon+\eta}$ is a vector function.

$$\dot{\mathbf{s}}(t) = (\mathbf{\Phi}^e(\mathbf{s}(t)), \mathbf{\Phi}^n(\mathbf{s}(t))) =: \mathbf{\Phi}^s(\mathbf{s}(t)) \tag{7}$$

In terms of the notation introduced in this section, the 'non-economic parameters constancy assumptions' discussed in the introduction of this paper can be represented by (8), where $T \subseteq R$ is the model application period representing the past and future time to which the (economic) model is assumed to apply.

$$\forall t \in T \ \ \dot{\mathbf{p}}(t) = 0 \qquad \text{'NEPCAs'} \tag{8}$$

4. Types of Dynamical System Equilibrium and their Implications for NEPCAs

In this section, we discuss different types of dynamical system equilibrium known from mathematical dynamical systems theory, systems theory, and economics. As we will see, many of the dynamical system equilibrium types seem valuable for modeling the dynamics of the economic and non-economic system. However, only one type (namely, the partial dynamic equilibrium) seems to support NEPCAs when there are interactions between the systems.

4.1 Structural Stability of the Non-Economic System and Bifurcations

Structural stability is a very important concept in dynamics modeling, see Andronov *et al.* (1987) and Guckenheimer and Holmes (1989) for a discussion. A dynamic system is regarded as structurally stable if marginal variations in model parameters do not change the qualitative behavior of the system. Obviously, the structural stability of the dynamic system used to model economic dynamics is essential, since if even marginal parameter variations change the qualitative predictions of the model, the model is not a very reliable explanation of economic dynamics in the light of measurement problems/inadequacies regarding model parameters and variables (cf. Andronov *et al.* 1987, 374-405). Thus, the structural stability of the economic system **e** (with respect to the changes in the parameters **p** determined by the non-economic system **n**) is a premise for economic modeling and, henceforth, we assume that the economic system is structurally stable in this sense.

For the following discussion, the structural stability of the non-economic system **n** is much more interesting. When studying the interactions between the economic system **e** and the non-economic system **n**, the structural stability of the non-economic system **n** and the structural stability of the economic system **e** can be understood as antipodal concepts: while the structural stability of the economic system refers to the reaction of the economic system **e** to a change in non-economic variables **n** (cf. (4)), the structural stability of the non-economic system refers to the reaction of the non-economic system **n** to a change in economic variables **e** (cf. (5)). We can formalize this concept of the structural stability of the non-economic system **n** by using the model introduced in Section 3 as follows. First, assume that the economic-variables vector **e** is given/constant, *e.g.*, $\mathbf{e}(t) = \tilde{\mathbf{e}} \equiv (\tilde{e}_1, \tilde{e}_2, \ldots, \tilde{e}_\varepsilon)$, where $\tilde{e}_1 = \text{const.}$, $\tilde{e}_2 = \text{const.}$, $\ldots$, $\tilde{e}_\varepsilon = \text{const.}$, and $\tilde{\mathbf{e}} \in E$. Then, (5) implies that the dynamics of the non-economic system **n** are given by the following equation.

$$\dot{\mathbf{n}}(t) = \mathbf{\Phi}^n(\tilde{\mathbf{e}}, \mathbf{n}(t)), \ \ \mathbf{n}(0) = \mathbf{n}_0 \in N \tag{5'}$$

Based on these assumptions, we can postulate the following definition of the structural stability of the non-economic system **n**, which is restricted to stable fixed points, yet sufficient for our purposes.

Definition 1. Let the dynamics of the vector $\mathbf{n}(t)$ be determined by (5). Moreover, assume that (5) is such that for all $\mathbf{n}_0 \in N$, the vector $\mathbf{n}(t)$ converges to the stable fixed point $\mathbf{n}^*(\tilde{\mathbf{e}}) \in N$ if $\forall t \in T \, \mathbf{e}(t) = \tilde{\mathbf{e}} \in E$. In other words, given the parameter vector $\tilde{\mathbf{e}} \in E$, the dynamic behavior of the non-economic system (5') is (per assumption) characterized by a stable steady state $\mathbf{n}^*(\tilde{\mathbf{e}}) \in N$. In this case, the non-economic system **n** is structurally stable on the (connected) set $\tilde{E} \subseteq E$ (where $\tilde{\mathbf{e}} \in \tilde{E}$) if for each $\mathbf{e} \in \tilde{E}$, there exists a (stable) fixed point $\mathbf{n}^*(\mathbf{e}) \in N$.

If the non-economic system **n** changes its qualitative behavior when **e** leaves $\tilde{E}$ (e.g., if the omega limit-set changes from a fixed point to a limit-cycle), then the boundary bd($\tilde{E}$) := cl($\tilde{E}$)\int($\tilde{E}$) represents the set of points of bifurcation.

Obviously, on its own, the concept of structural stability of the non-economic system **n** (cf. Definition 1) does not allow us justify NEPCAs in economic modeling. If the non-economic system (5') has a (globally) stable fixed point **n***, as stated by Definition 1, then changes in the initial conditions **n**$_0$ of the non-economic system **n** are accompanied by the convergence to one and the same fixed point **n***. This does not, however, imply that the fixed point of the non-economic system **n*** does not change if the economic variables **e** change. In general, if the non-economic system **n** is (a) dependent on the economic system **e**, as stated in (5'), and (b) structurally stable with respect to the economic system **e** (cf. Definition 1), then the focus **n*** is a function of the economic system **e**, *i.e.,* **n***(**e**). That is, a change in **e** leads to a change in **n***. Thus, in presence of continuous economic dynamics and cross-system interactions, the structurally stable non-economic system **n** described by Definition 1 does not necessarily generate a constant/static 'fixed point' **n***, *i.e.*, **n** is not necessarily constant in the limit. Therefore, **p** is not necessarily constant in the limit (cf. (1)), *i.e.*, NEPCAs (8) can be violated even in the limit. We turn now to special types of structurally stable system that can be consistent with (8).

4.2. A Stable and Independent Fixed Point of the Non-Economic System

As explained in Section 4.1, the fixed point type (**n***) described by Definition 1 is not necessarily consistent with the NEPCAs (8), since, in general, **n*** is dependent on **e**. A special case arises if the non-economic system **n** is dependent on the economic system **e**, as stated in (5'), but the fixed point **n*** is not. In this case, each time a change in **e** occurs, the economy seeks to converge to one and the same **n***. However, the economic system **e** is, in general, not describable by one or several discrete (non-systematic/erratic) changes; rather, the economic system **e** changes continuously, perpetually, and systematically (according to the economic theory). Thus, even if **n*** is independent of **e**, a steadily changing economic system **e** leads to steady or even increasing deviation of the non-economic system **n** from the fixed point **n***, *i.e.*, **n** is not necessarily constant in the limit. Therefore, the NEPCAs (8) may be violated in the limit (cf. (1)). Overall, even in the case of independency described in this section, the fixed-point type (**n***) described by Definition 1 is not necessarily consistent with the NEPCAs (8) in the limit, and we turn now to a special case named homeostasis.

4.3. Homeostasis of the Non-Economic System

If we assume that not only the fixed point **n*** of the non-economic system **n** is independent of the economic system **e** (Section 4.2) but also that there are no (significant) transitional dynamics of the non-economic system **n** for a given set ($\bar{E}$) of economic variables **e**, we obtain the concept of 'homeostasis of the non-economic system', which we define as follows.

Definition 2. For a given vector $\bar{\mathbf{e}} \in E$, the non-economic system **n** (cf. (5)) is in the state of homeostasis if (a) there exist open and connected sets $\bar{E}$ and $\hat{E}$ such that (5'') is true and (b) $\bar{\mathbf{e}} \in \bar{E}$.

$$\bar{E} \subset \hat{E} \subseteq E \wedge (\dot{\mathbf{n}}(t) = 0 \text{ if } \mathbf{e} \in \bar{E}) \wedge (\dot{\mathbf{n}}(t) \neq 0 \text{ if } \mathbf{e} \in \hat{E}) \tag{5''}$$

The concept of homeostasis seems adequate for modeling of, e.g., switching of policy/political regimes and ecological changes. Homeostasis of the non-economic system **n** represents a problem for the application of NEPCAs in economic modeling and their empirical validation: (5'') states that the non-economic system **n** is stable/static as long as the economic system **e** is within the set $\bar{E}$. If the economic system **e** leaves the set $\bar{E}$, the non-economic system **n** may start to change over time. Thus, for example, if the economic system **e** is initially within the set $\bar{E}$ and we measure the empirical indexes representing the non-economic system **n**, we may come to the wrong conclusion that the non-economic system **n** is stable or does not react to economic dynamics and, thus, the NEPCAs (8) are satisfied (see (1)). However, if subsequently, the economic system **e** develops such that it leaves the set $\bar{E}$ (which may be plausible in long-run modeling), the non-economic system **n** may start to change and to react to economic system changes (cf. (5'')). In this case, the assumption '$\dot{\mathbf{n}}(t) = 0$' and, thus, '$\dot{\mathbf{p}} = 0$' (cf. (1)) is not adequate for modeling the long-run dynamics, *i.e.,* (1), (8), and (5'') may contradict each other in long-run modeling.

Overall, if some of the non-economic subsystems may behave according to the concept of homeostasis, neither can long-run predictions of economic dynamics rely on the NEPCAs (8) nor can these NEPCAs be validated by empirical evidence on the constancy of non-economic parameters **p**. In particular, a theory of the development of the non-economic system **n** that excludes the possibility of homeostasis of the non-economic system **n** is

required (in addition to the empirically measured stability of the non-economic system **n**) to justify the NEPCAs in economic models. In general, this requires interdisciplinary or non-economic theoretical research.

Obviously, if the non-economic system **n** is in the state of homeostasis, it does not react to economic system dynamics (cf. Definition 2). This contradicts the evidence showing that the economic and non-economic systems interact (see Section 1). Nevertheless, it can be attempted to merge the concept of homeostasis of the non-economic system **n** with the empirical evidence on cross-system interactions by assuming that the cross-system interactions have been observed while the economic system **e** has been outside the set $\bar{E}$. Then, however, for applying the concept of homeostasis (and, thus, the NEPCAs (8)) in the modeling of future non-economic system dynamics (over the period *T*), it is necessary to show (theoretically) that even though the non-economic system **n** has not been in the state of homeostasis in the past, it will be in the state of homeostasis in future (over *T*). Again, this requires interdisciplinary or non-economic theoretical research. Moreover, the concept of homeostasis, as used in this paragraph, can be substituted by the concept discussed in Section 4.6.

Note that if homeostasis is defined such that $\forall \mathbf{e} \in E$ $\dot{\mathbf{n}}(t) = 0$ (i.e., $\bar{E} = E$, cf. Section 3 and (5'')), the non-economic system **n** is independent of the economic system **e**. Therefore, this definition of homeostasis does not serve our purposes, since empirical evidence implies that economic dynamics have impacts on non-economic dynamics (cf. Section 1).

4.4 Slow/Weak Dynamics/Reaction of the Non-Economic System

One of the conventional wisdoms about institutional and socio-cultural change is that it is relatively slow or that it reacts weakly to the changes in the economic system (see, *e.g.,* Roland (2004), Streeck and Thelen (2005), and Acemoglu and Robinson (2010) for a discussion of institutional development). Thus, it may be argued that the parameter changes reflecting the institutional and socio-cultural change or, in general, change of the non-economic system **n** could be neglected (provided that the economic system **e** does not 'overreact' to small changes in the parameters **p** determined in the non-economic system **n**, as discussed in Section 4.5).

The problems associated with this argument are manifold. First, even if the non-economic system **n** changes slowly, the changes may accumulate over time such that the cumulative change may become significant or measurable over the long periods to which long-run economic models refer (cf. Streeck and Thelen 2005, 8). Second, not only accumulation over time but also over systems is relevant: since, in general, the parameters **p** of an economic model does not only depend on one non-economic subsystem but on many different non-economic subsystems, the case may arise that the impacts of each non-economic subsystem are neglectable while the overall impact of all non-economic systems is significant. Third, even small (cumulative) changes in the non-economic (sub)system(s) may have strong impacts on the economic system **e** and, thus, may be not neglectable in economic modeling if (a) the elasticity of the economic system **e** with respect to the non-economic system parameters **p** is great ('overreaction to small changes in **p**'), (b) the economic system **e** is not structurally stable with respect to the changes in the non-economic parameters **p**, or (c) the economic system **e** is close to some point of bifurcation, such that even a relatively small change in the non-economic parameters **p** leads to a large change in the economic system **e** or to a change in the qualitative properties of economic dynamics (cf. Section 4.1). The occurrence of characteristics (a)–(c) can be tested by studying the economic model solely, *i.e.*, interdisciplinary research is not necessary to analyze whether the (model of the) economic system is overly elastic, structurally unstable, or close to bifurcation points. Fourth, even if it can be empirically shown that the non-economic system **n** has changed slowly or reacted weakly to economic dynamics in the past, we cannot exclude that due to (quasi-)homeostatic nature of the non-economic system **n** (cf. Section 4.3), **n** may start to change/react much more quickly/strongly at some future point in time (when the economic system **e** leaves the set $\bar{E}$). Thus, empirical validation of slow/weak non-economic system dynamics/reaction does not provide a firm foundation of NEPCAs and either interdisciplinary or non-economic theoretical research is necessary to do so, as discussed in Section 4.3. Fifth, in general, the statement that the dynamics of a non-economic system **n** are weak/slow such that they can be neglected seems to be imprecise or vague. (When is an impact channel weak enough such that it can be neglected?)

We can conclude this discussion as follows: due to accumulation over time and over systems, even slow/weak dynamics of the non-economic (sub)system(s) become sooner or later measurable or significant and, thus, must be accounted by a change in (a) the non-economic variables **n** and (b) the non-economic parameters **p** (cf. (1)) at some point in time *t'*, which can be mathematically expressed by (5'''), where *t'* is the point in time at which the cumulative change in the non-economic parameters **p** becomes measurable or significant.

$(\mathbf{p}(t) = \mathbf{p}^1 \in P$ for $t \leq t') \wedge (\mathbf{p}(t) = \mathbf{p}^2 \in P$ for $t > t')$ 　　　　　　　　　　　　　　　　(5''')

4.5. Weak Reaction of the Economic System to Non-Economic System Changes

Another interesting case arises when the reaction of the economic model to the changes in its non-economic parameters **p** is relatively weak. At the first look, the study of this case does not require interdisciplinary research but only the study of the effects of parameter changes in the corresponding economic model. For example, we may ask, what happens in the Ramsey-(1928)-Cass-(1965)-Koopmans-(1967) model if the time-preference changes over time. In particular, we can analyze the effects of non-economic parameter changes on the quantitative and qualitative results of the economic model.

As discussed in Section 4.1, for studying the qualitative reaction of an economic model to the changes in its non-economic parameters **p**, the concept of structural stability can be used. For example, the Ramsey-1928, Cass-1965, Koopmans-1967 model is, in general, structurally stable (with respect to time-preference rate changes).

Regarding the quantitative effects of non-economic parameter changes in an economic model, arguments similar to the arguments discussed in Section 4.4 can be developed. First, even if we can show that for a given velocity of non-economic parameter change, the economic model can neglect these changes at the present (since they have a relatively weak impact on the economic variables **e**), we cannot exclude that due to quasi-homeostatic nature of the non-economic system **n**, the non-economic system dynamics accelerate in future such that the changes in **n** become relevant for the economic system **e**. Thus, the argument that (for a certain empirically observed velocity-range of non-economic system dynamics) the effects of the non-economic parameter changes are neglectable in an economic model does provide a firm foundation of NEPCAs and either interdisciplinary or non-economic theoretical research is necessary to do so, as discussed in Section 4.3. Second, the statement that the effects of non-economic parameter changes are weak and, thus, neglectable is imprecise (cf. Section 4.4).

4.6. Partial Dynamic Equilibrium

The concepts discussed in Sections 4.1–4.5 allow only for limited cross-system interactions (cf. Section 4.3), are vague/imprecise (cf. Sections 4.4 and 4.5), or imply that there is the possibility that the NEPCAs (8) become inadequate if the economic system **e** develops beyond some scope (*e.g., Ē* or *t'*) and, thus, bear some uncertainty regarding the applicability of the NEPCAs (8). The concept of 'partial dynamic equilibrium' suggested in this section is a derivate of the previously discussed concepts and tries to solve the problems associated with them. In particular, we try to show in this section that it is possible to model two interacting systems (the economic and non-economic system) by applying the NEPCAs (8) while reducing the vagueness and uncertainty associated with the concepts discussed in Sections 4.1–4.5.

4.6.1. Partial Dynamic Equilibrium and NEPCAs

In economic models, two types of dynamic equilibria arise: (standard) dynamic equilibria and asymptotic dynamic equilibria. Analogously, we distinguish between a (standard) partial dynamic equilibrium and an asymptotic partial dynamic equilibrium. As formulated by Definition 3a, a partial dynamic equilibrium can be achieved in finite time (for example, if the initial conditions are such that the economy is in partial dynamic equilibrium at $t = 0$). In contrast, an asymptotic partial dynamic equilibrium refers only to the limit dynamics (cf. Definition 3b).

Definition 3. Assume that the dynamics of the system **s** are governed by the differential equation system (1)/(2)/(5), where the initial conditions $\mathbf{e}_0$ and $\mathbf{n}_0$ are given by (3) and (6). We say that, given the initial conditions (3) and (6), (a) the system **s** is in partial dynamic equilibrium over the period $\underline{T} \subseteq T$ if $\forall t \in \underline{T}\ \dot{\mathbf{e}}(t) \neq 0 \wedge \mathbf{p}(t) = \Phi^P(\mathbf{n}(t)) = \mathbf{p}^* \in P$ (cf. (1)) and (b) the system **s** is characterized by an asymptotic partial dynamic equilibrium if $\lim_{t\to\infty} \dot{\mathbf{e}}(t) \neq 0$ and $\lim_{t\to\infty} \mathbf{p}(t) = \lim_{t\to\infty} \Phi^P(\mathbf{n}(t)) = \mathbf{p}^* \in P$ (cf. (1)).

Now, we discuss Definition 3 rather abstractly, while in Section 5, we provide examples of the concepts discussed here.

Definition 3a states that in partial dynamic equilibrium, the economic system **e** is non-static while the non-economic system **n** behaves such that the parameter vector **p** is constant (and, thus, NEPCAs (8) are satisfied). **p** can be constant in two cases. First, obviously, $\mathbf{p}(t) = \Phi^P(\mathbf{n}(t))$ is constant if $\mathbf{n}(t)$ is constant. This case is not very interesting, since it presumes that the non-economic system **n** is static, which contradicts the premise made in the introductory section of this paper that economic dynamics lead to non-economic system dynamics. Second, the parameter vector **p** may be constant ($\dot{\mathbf{p}}(t) = 0$, $\mathbf{p}(t) = \mathbf{p}^*$) even if the non-economic system is non-static ($\dot{\mathbf{n}}(t) \neq 0$) provided that the parameter equation system $\Phi^P(\mathbf{n}(t)) = \mathbf{p}^*$ is underdetermined (cf. Meckl 2002). For example, if $\Phi^P(\mathbf{n}(t)) = \mathbf{p}^*$ is a system of linear equations with $\pi < \eta$, then there may exist a one- or higher-dimensional subspace/set N^* (*e.g.*, a line, a plane, etc.) of vectors **n** satisfying $\Phi^P(\mathbf{n}) = \mathbf{p}^*$; thus, if $\mathbf{n}(t)$ is non-constant and its law of motion satisfies $\mathbf{n}(t) \in N^* \ \forall t$, then **p** is constant for all t. In particular, assume that, *e.g.*, $\Phi^P(\mathbf{n}(t)) = \mathbf{An}(t) =$

$\mathbf{p}^*$, where $\mathbf{A} = \{b_{ij}\}$ is a rank-3 3×3-matrix with given constant elements b_{ij}, i.e., $\pi = 3$, $\eta = 3$, and $\mathbf{p}^* \equiv (p_1^*, p_2^*, p_3^*)$ and $\mathbf{n}(t) \equiv (n_1(t), n_2(t), n_3(t))$ are column vectors. In this case, there can exist only one solution $(\mathbf{n}^*)$ of the linear equation system $\mathbf{An}(t) = \mathbf{p}^*$ and, thus, $\forall t\ \mathbf{n}(t) = \mathbf{n}^*$, i.e., $\mathbf{n}$ must be constant. However, if $\mathbf{A}$ has rank 2 (i.e., the equation system $\mathbf{An}(t) = \mathbf{p}^*$ is underdetermined), then there exists a solution of the following form: $n_1(t) = c_1 + c_2 n_3(t)$ $\wedge$ $n_2(t) = c_3 + c_4 n_3(t)$, where c_1-c_4 are functions of b_{ij} and of some p_i^*. If we assume that $n_1(t)$ and $n_2(t)$ satisfy these equations for all t, then we can choose an arbitrary law of motion (which may be derived from a non-economic theory) for $n_3(t)$ and, nevertheless, the equation system $\mathbf{An}(t) = \mathbf{p}^*$ is satisfied for all t. The set N^* is then given as follows: $N^* = \{\mathbf{n} \equiv (n_1, n_2, n_3) \in R^3: n_1 = c_1 + c_2 n_3 \wedge n_2 = c_3 + c_4 n_3\}$. Alternatively, if $\Phi^p(\mathbf{n}(t)) = \mathbf{p}^*$ is a smooth (underdetermined) non-linear equation system, then $\Phi^p(\mathbf{n}) = \mathbf{p}^*$ may define a (smooth) (hyper)surface or manifold; as long as the non-economic system $\mathbf{n}$ moves along this (hyper)surface/manifold, $\mathbf{p}$ can be constant while $\mathbf{n}(t)$ is non-constant.

Overall, when the system $\mathbf{s}$ is in partial dynamic equilibrium (cf. Definition 3a), (a) the NEPCAs (8) are satisfied, (b) the economic system $\mathbf{e}$ is non-static, and (c) the non-economic system $\mathbf{n}$ can be non-static in the case that the parameter equation system $\Phi^p(\mathbf{n}(t)) = \mathbf{p}^*$ is underdetermined. (If a system that is characterized by (a)–(c) existed in reality, empirical investigations could identify some dynamic dependencies between some economic and some non-economic variables (cf. Section 1)). Moreover, if the system $\mathbf{s}$ is right from the beginning (i.e., for all $t \geq 0$) in partial dynamic equilibrium, then the non-economic system $\mathbf{n}$ does not have any impacts on the economic system $\mathbf{e}$, since these impacts are transmitted via $\mathbf{p}$ in our model (cf. (1) and (2)) and $\mathbf{p}$ is constant in partial dynamic equilibrium (cf. Definition 3a). Thus, the partial dynamic equilibrium (Definition 3a) itself, i.e., the assumption that the system $\mathbf{s}$ is in partial dynamic equilibrium for all $t \geq 0$, does not serve our purposes. (Nevertheless, the partial dynamic equilibrium can be very useful if we assume that the system $\mathbf{s}$ is not in partial dynamic equilibrium at $t = 0$ but later; see Section 4.6.2.)

In contrast, the asymptotic partial dynamic equilibrium (Definition 3b) seems to be useful in general. According to Definition 3b, the parameter vector $\mathbf{p}(t)$ converges to the fixed point $\mathbf{p}^*$. Thus, the NEPCAs (8) are satisfied asymptotically (Figure 1). Moreover, Definition 3b allows for interactions between the economic and non-economic system during the transition period (i.e., before the limit); in particular, $\mathbf{e}(t)$, $\mathbf{n}(t)$, and $\mathbf{p}(t)$ are not necessarily constant during this transition period ($\mathbf{p}(t)$ must be constant only in the limit). In general, a system $\mathbf{s}$ that is characterized by an asymptotic partial dynamic equilibrium seems to be useful for founding NEPCAs (in presence of cross-system interactions). In particular, when the system has converged sufficiently close to $\mathbf{p}^*$ (at time t^*) such that the future changes in $\mathbf{p}$ are relatively small (i.e., $\forall t \geq t^*\ \mathbf{p}(t) \approx \mathbf{p}^*$) while $\mathbf{e}(t)$ and $\mathbf{n}(t)$ are (still) not constant, the NEPCAs (8) are approximately satisfied while cross-system interactions exist.

Overall, the asymptotic partial dynamic equilibrium has a major advantage in comparison to the equilibrium types discussed in Sections 4.3–4.5. While the NEPCAs (8) are satisfied asymptotically in the case of an asymptotic partial dynamic equilibrium, the equilibrium types discussed in Sections 4.3–4.5 allow for a violation of (8) at some future point of (system) time; exactly speaking, in the case of the equilibria described in Sections 4.3–4.5, a future violation of (8) is possible or even asymptotically inevitable.

4.6.2. Stability of the Partial Dynamic Equilibrium, Transitional Dynamics, and NEPCAs

Now, we turn to the definition and discussion of the stability of the partial dynamic equilibrium, the transitional dynamics, and their relevance for NEPCAs.

Definition 4. Let the dynamics of the system $\mathbf{s}$ be governed by the differential equation system (1)/(2)/(5), and assume that (1)/(2)/(5) has solutions on the initial conditions set $S° \equiv E° × N° \subseteq S \equiv E × N$. In particular, assume that for each $\mathbf{s}_0 \equiv (\mathbf{e}_0, \mathbf{n}_0) \in S°$, there exists a function $\mathbf{s}(t, \mathbf{s}_0) \equiv (\mathbf{e}(t, \mathbf{s}_0), \mathbf{n}(t, \mathbf{s}_0))$ that is consistent with (1)/(2)/(5) for all $t \in T = [0, \infty)$ and satisfies $\mathbf{s}(0, \mathbf{s}_0) \equiv (\mathbf{e}(0, \mathbf{s}_0), \mathbf{n}(0, \mathbf{s}_0)) = \mathbf{s}_0$. (a) Assume that the system $\mathbf{s}$ is in partial dynamic equilibrium at $\underline{t} \in T$ (cf. Definition 3a) given the initial state $\underline{\mathbf{s}}_0 \in \underline{S} \equiv \underline{E} × \underline{N} \subseteq S°$, i.e., $\Phi^p(\mathbf{n}(\underline{t}, \underline{\mathbf{s}}_0)) = \mathbf{p}^* \in P$ and $\dot{\mathbf{e}}(\underline{t}, \underline{\mathbf{s}}_0) \neq 0$. This partial dynamic equilibrium is (asymptotically) stable on the set $\underline{S}$ if (9) and (10) are satisfied. (b) Assume that the system $\mathbf{s}$ is characterized by an asymptotic partial dynamic equilibrium (cf. Definition 3b) given the initial state $\underline{\mathbf{s}}_0 \in \underline{S} \equiv \underline{E} × \underline{N} \subseteq S°$, i.e., $\lim_{t\to\infty} \Phi^p(\mathbf{n}(t, \underline{\mathbf{s}}_0)) = \mathbf{p}^* \in P$ and $\lim_{t\to\infty} \dot{\mathbf{e}}(t, \underline{\mathbf{s}}_0) \neq 0$. This asymptotic partial dynamic equilibrium is stable on the set $\underline{S}$ if (11) is true.

$$\forall t > \underline{t}\ \ \Phi^p(\mathbf{n}(t, \underline{\mathbf{s}}_0)) = \mathbf{p}^* \wedge \dot{\mathbf{e}}(t, \underline{\mathbf{s}}_0) \neq 0 \tag{9}$$

$$\forall \mathbf{s}_0 \in \underline{S}\ \ \lim_{t\to\infty} \Phi^p(\mathbf{n}(t, \mathbf{s}_0)) = \mathbf{p}^* \wedge \lim_{t\to\infty} \dot{\mathbf{e}}(t, \mathbf{s}_0) \neq 0 \tag{10}$$

$$\forall \mathbf{s}_0 \in \underline{S}\ \ \lim_{t\to\infty} \Phi^p(\mathbf{n}(t, \mathbf{s}_0)) = \mathbf{p}^* \in P \wedge \lim_{t\to\infty} \dot{\mathbf{e}}(t, \mathbf{s}_0) \neq 0 \tag{11}$$

Definition 5. If all the statements of Definition 4 hold for $\underline{S} = S°$ ($\underline{S} = S°$), the partial dynamic equilibrium (the asymptotic partial dynamic equilibrium) is globally stable.

The stability criterions used in Definition 4 are standard. Stability condition (9) states that if the system **s** is in partial dynamic equilibrium (at the time point $\underline{t}$), then it stays in partial dynamic equilibrium (for all $t \geq \underline{t}$); condition (10) ensures that if (a) the system **s** is not in partial dynamic equilibrium and (b) the initial conditions are within some stability set ($\underline{S}$), then **s** converges to the partial dynamic equilibrium. Moreover, an asymptotic partial dynamic equilibrium is stable on the set $\underline{S}$ if the system **s** converges to the asymptotic partial dynamic equilibrium for all initial conditions belonging to the set $\underline{S}$. Only the requirement that the economic system **e** is non-static all the time (cf. (9)–(11)) may be regarded as a deviation from the standard stability definition.

For discussing the geometrical properties of a stable partial dynamic equilibrium, let $X(\mathbf{s}_0) := \{(\mathbf{e}(t, \mathbf{s}_0), \mathbf{\Phi}^p(\mathbf{n}(t, \mathbf{s}_0)) \in E \times P: t \in [0, \infty)\}$ be a trajectory in **e**-**p** space, where $\mathbf{s}_0 \in \underline{S}$ or $\mathbf{s}_0 \in \underline{S}$ (cf. Definition 4). Figure 1 depicts an example of the convergence to a stable partial dynamic equilibrium (cf. Definition 4a) in the case of a one-dimensional economic system ($\varepsilon = 1$) and a one-dimensional parameter system ($\pi = 1$). Alternatively, this depiction of the transition to a stable partial dynamic equilibrium (cf. Definition 4a) can be interpreted as an asymptotic partial dynamic equilibrium (cf. Definition 3b). Moreover, Figure 1 depicts an example of a standard dynamic equilibrium (stable fixed point) for reasons of comparison.

Figure 1. Examples: (Asymptotic) (Partial) Dynamic Equilibrium ($\varepsilon = \pi = 1$).
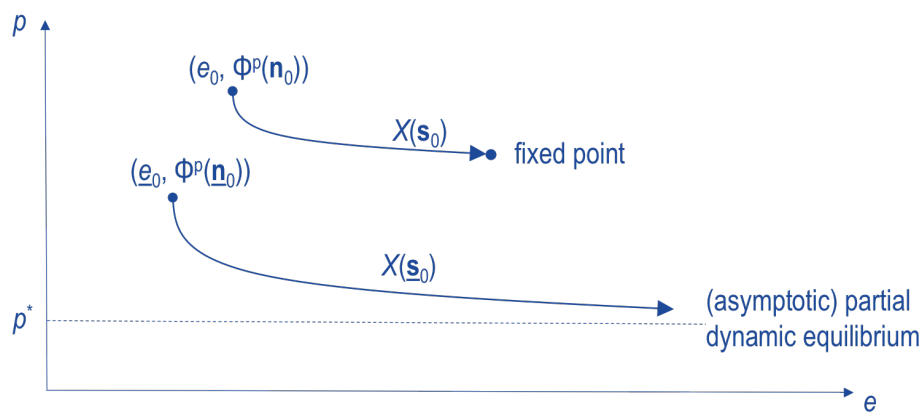
If we do not only analyze the dynamics in partial dynamic equilibrium as done in Section 4.6.1, but also consider the transitional dynamics (i.e., the convergence to the partial dynamic equilibrium) as implied by Definitions 4 and 5, the (transition phase to the) partial dynamic equilibrium can be an interesting foundation of NEPCAs. Assume that (a) the dynamical system **s** satisfies all the assumptions postulated in Definitions 3a and 4a and (b) initially (*i.e.,* at $t = 0$), the system **s** is not in partial dynamic equilibrium but converges to it according to Definition 4a (*i.e.*, the system **s** is in the transition phase). Under these assumptions, the dynamics of the system **s** can be consistent with the NEPCAs (8) despite interactions between the economic system **e** and the non-economic system **n**. The proof is straight forward. First, since the system is not in partial dynamic equilibrium over the transition phase, interactions between the economic and non-economic system are not ruled out in general; in particular, $\mathbf{e}(t)$, $\mathbf{n}(t)$, and $\mathbf{p}(t)$ are not necessarily static over the transition phase (cf. Definition 4a). Second, since the parameter vector $\mathbf{p}(t)$ converges to the steady state $\mathbf{p}^*$ (cf. Definition 4a), the NEPCAs (8) are satisfied asymptotically. In particular, if the system has converged sufficiently close to the stable partial dynamic equilibrium (at time t^*) such that the future changes in **p** are relatively small (*i.e.*, $\forall t \geq t^*$ $\mathbf{p}(t) \approx \mathbf{p}^*$) while $\mathbf{e}(t)$ and $\mathbf{n}(t)$ are (still) not constant, the NEPCAs (8) are approximately satisfied while cross-system interactions exist.

As we can see, the concept of the transition to a stable partial dynamic equilibrium has a major advantage in comparison to the equilibrium types discussed in Sections 4.3–4.5: while the NEPCAs (8) are satisfied asymptotically in the case of a stable partial dynamic equilibrium, the equilibrium types discussed in Sections 4.3–4.5 allow for a violation of (8) at some future point of (system) time (see Section 4.6.1).

4.6.3. Summary and Discussion

The discussion in Sections 4.6.1 and 4.6.2 implies that we can provide a foundation of NEPCAs in presence of cross-system interactions if we assume that the system (1)–(7) is either characterized by a (stable) asymptotic partial dynamic equilibrium (cf. Definition 3b) or in the transition phase to a stable partial dynamic equilibrium (cf. Definition 4a). In both cases, the system **s** has the following properties:

- the economic and non-economic system are dependent upon each other (cf. (1)–(7)), *i.e.*, there are cross-system linkages;
- the cross-system interactions (*i.e.,* the interactions between **e** and **n**) are measurable over the transitional phase (*i.e.*, during the convergence to the equilibrium) and, thus, can be consistent with the empirical evidence on cross-system interactions (see Section 1);
- the NEPCAs (8) are satisfied asymptotically, moreover, they are approximately satisfied in finite time;
- the economic system **e** is even asymptotically non-static, which is consistent with the empirical evidence on long-run economic dynamics;
- the NEPCAs (8) may be satisfied (asymptotically) even if the non-economic system **n** is (asymptotically) non-static.

Note that the definition of the partial dynamic equilibrium can be reformulated such that it covers the case of an asymptotically static economic system **e**. In this case, both, the economic system **e** and the parameter vector **p** are static in the limit. Thus, additional conditions become necessary to ensure that **p** converges more quickly to its equilibrium than **e** does, such that for some relatively large t, there are significant economic dynamics ($\dot{\mathbf{e}} \neq 0$) while the NEPCAs (8) are approximately satisfied ($\mathbf{p}(t) \approx \mathbf{p}^*$). These 'additional conditions' can be formulated in terms of limit tangential vector angles associated with the trajectory $X(\mathbf{s}_0)$ describing the dynamics of the system **e**-**p**, as will be discussed in a separate paper.

For a discussion of the application of the concept of partial dynamic equilibrium in the context of structural change in multi-sector frameworks and for a comparison of this concept to the related concepts (*e.g.*, 'generalized balanced growth', 'aggregate balanced growth', and 'asymptotically constant growth path') used in structural change modeling, see Stijepic (2011). Note, however, that in some sense, the concepts applied in the structural change literature are antipodal to the concepts discussed in our paper: the structural change theories search for a growth path that allows for some sort of *dynamic equilibrium* ('balanced growth') *of the aggregate economic system* while another system (namely, the economic *sector* system) is not in dynamic equilibrium; in contrast, we search for a trajectory (of the system **s**) along which the *(aggregate) economic system is not in dynamic equilibrium*, while another system (namely, the non-economic system) is in a dynamic equilibrium.

5. The Partial Dynamic Equilibrium as a Foundation of the AK Model NEPCAs

In this section, we suggest a simple model of the long-run interaction between the economic and non-economic system based on the textbook AK model (see, *e.g.*, Barro and Sala-i-Martin (2004, 63ff.) for a description of the latter). The AK model assumes that the productivity parameter (a), the savings rate (σ), the population growth rate (λ), and the depreciation rate (δ) are constant and exogenous. While there are papers that show that these parameters can be endogenized in economic models (*e.g.,* the Ramsey-(1928), Cass-(1965), Koopmans-(1967) model endogenizes the savings rate), it makes sense to assume that these parameters are determined (at least to some extent) in non-economic systems (*e.g.*, in the socio-cultural, ecological/climate, and political system; see Section 1 for references/evidence). In fact, the models that endogenize the AK model parameters are dependent upon other constant/exogenous parameters that are, in general, determined in the non-economic system (*e.g.*, the Ramsey-(1928)-Cass-(1965)-Koopmans-(1967) model assumes that the savings rate is determined by an exogenous and constant time-preference rate among others). Thus, even such models are based on NEPCAs. Since this Section 5 is devoted to a demonstration of the application of the partial dynamic equilibrium in the context of NEPCAs and not to a full theoretical foundation of the AK model, we simplify the discussion and the mathematical derivations significantly by assuming that all the AK model parameters are determined in the non-economic system. The reader may, however, keep in mind that the AK model parameters are partially determined in the economic system and partially determined in the non-economic system, *i.e.*, they are 'partial' NEPCAs. Thus, further research may deal with the precise distinction between non-economic and economic determinants of these parameters.

Following the standard AK model, we assume that per-capita capital (k) is accumulated according to the following equation:

$$k'(t) = \sigma(t)a(t)k(t) - [\lambda(t) + \delta(t)]k(t), \quad k(0) = k_0 \text{ is given} \tag{12}$$

Per-capita output (y) and per-capita consumption (c) are determined by (13) and (14).

$$y(t) = a(t)k(t) \tag{13}$$

$$c(t) = [1 - \sigma(t)]\, y(t) \tag{14}$$

Thus, according to the terminology introduced in Section 3, the economic system **e** encompasses the three variables k, y, and c and the parameter vector **p** consists of the parameters λ, σ, a, and δ, as stated by (15) and (16).

$$\mathbf{e}(t) := (k(t), y(t), c(t)), \ \ \varepsilon = 3 \tag{15}$$

$$\mathbf{p}(t) := (\lambda(t), \sigma(t), a(t), \delta(t)), \ \ \pi = 4 \tag{16}$$

The textbook AK model assumes that the parameters **p** are constant, as stated by (17).

$$\mathbf{p}(t) = \mathbf{p}^* := (\lambda^*, \sigma^*, a^*, \delta^*) \tag{17}$$

As discussed at the beginning of Section 5, (17) can be interpreted as a NEPCA. In contrast, to the textbook AK model, we assume that (a) the parameter vector $\mathbf{p}(t)$ is endogenously determined in the non-economic system **n** and (b) the non-economic system **n** and the economic system **e** depend upon each other. Without loss of generality, we implement these assumptions as follows. First, we assume that the non-economic variable $n_1(t)$ is determined by (18)–(20).

$$n_1(t) = \eta_1/[\eta_2(t) + y(t)]^{\wedge}\eta_3 \tag{18}$$

$$\eta_2(t) = \eta_0\exp(\eta_4 t) \tag{19}$$

$$\eta_0, \eta_1, \eta_2, \eta_3, \eta_4 > 0 \tag{20}$$

For example, n_1 may be interpreted as an inverse index of socio-cultural development, where the index value is within the range $(0, \eta_1/\eta_0{}^{\wedge}\eta_3]$. The lower n_1, the higher the socio-cultural development level. For example, a high n_1 indicates that the society is relatively patriarchic, ruled by religious and family institutions, hierarchic, *etc*., while a relatively low n_1 indicates that the society is relatively emancipated, liberal, government ruled, *etc*. (see e.g., Bourguignon 2005).

As we can see, (18) implies that economic development supports socio-cultural development, since n_1 decreases with per-capita income y. This assumption is supported by the literature on the positive effect of industrialization (which is closely related to per-capita income growth in early stages of development) on socio-cultural development (e.g. Bourguignon 2005).

Moreover, (18) and (19) imply that (in the economy being considered) there is some autonomous socio-cultural development indicated by η_2. That is, there is socio-cultural development even without economic development. This assumption reducing the relevance of economic development for socio-cultural development seems to make sense. It is, however, not crucial for any of our results.

We assume that the population growth rate λ is dependent on socio-cultural development (n_1) and, via the function φ_1, on some other non-economic variables (n_2, n_3, and n_4), as stated by (21) and (22).

$$\lambda(t) = \underline{\lambda} + n_1(t) + \varphi_1(n_2, n_3, n_4) \tag{21}$$

$$\underline{\lambda} > 0, \ \varphi_1 > 0 \tag{22}$$

Equation (21) states that socio-cultural development has a negative impact on the population growth rate. This may make sense, since, *e.g.,* emancipation and decreasing role of religious institutions decrease the fertility rate.

To simplify the discussion, we assume, without loss of generality, that (23) and (24) are true.

$$\forall t \ \ \sigma(t) = \varphi_2(n_2, n_3, n_4) \equiv \sigma^* > 0 \ \wedge \ a(t) = \varphi_3(n_2, n_3, n_4) \equiv a^* > 0 \ \wedge \ \delta(t) = \varphi_4(n_2, n_3, n_4) \equiv \delta^* > 0 \tag{23}$$

$$n_2, n_3, \text{ and } n_4 \text{ are given and constant.} \tag{24}$$

That is, the parameters σ, a, and δ are functions (φ_2, φ_3, and φ_4) of constant non-economic parameters (n_2, n_3, and n_4) and are, thus, constant. Even with this restriction, we can demonstrate all the relevant aspects of the partial dynamic equilibrium and NEPCAs.

According to the terminology introduced in Section 3, we can define the vector **n** as follows.

$$\mathbf{n}(t) := (n_1(t), n_2, n_3, n_4), \ \ \eta = 4 \tag{25}$$

Overall, we can see that in this model, the economic system **e**, the parameter vector **p**, and the non-economic system **n** are defined by (15), (16), and (25), respectively. The functions $\mathbf{\Gamma}^e(\mathbf{e}(t), \mathbf{p}(t))$ (cf. (2)), $\mathbf{\Phi}^p(\mathbf{n}(t))$ (cf. (1)), and $\mathbf{\Phi}^n(\mathbf{e}(t), \mathbf{n}(t))$ (cf. (5)), which relate **e**, **p**, and **n**, are implied by (12)–(14), (21)/(23), and (18)/(24). We can see that our model, which is determined by (12)–(16) and (18)–(25), has the following characteristics:

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- the three-dimensional economic system **e** (cf. (15)) depends on the four-dimensional parameter vector **p** (cf. (16)) via (12)–(14);
- the parameter vector **p** (cf. (16)) depends on the four-dimensional non-economic system **n** (cf. (25)) via (21) and (23);
- the non-economic system **n** (cf. (25)) depends on the economic system **e** (cf. (15)) via (18).

In particular, we can see that, in accordance with Section 1, economic system dynamics have an impact on non-economic system dynamics (cf. n_1 and y in (18)) and vice versa (cf. k, λ, and n_1 in (12) and (21)), *i.e.*, there are cross-system interactions. Moreover, the model assumptions (12)–(16) and (18)–(25) imply that there exists a (locally) stable asymptotic partial dynamic equilibrium (cf. Definition 3b) that is consistent with the AK model NEPCAs (17) in the limit, which can be proven as follows. (12), (21), and (23) imply (26). (13), (18), (19), (21), and (23) imply (27).

$$k'(t)/k(t) = \sigma^* a^* - [\lambda(t) + \delta^*] \qquad (26)$$

$$\lambda(t) = \underline{\lambda} + \eta_1/[\eta_0 \exp(\eta_4 t) + a^* k(t)]^{\wedge}\eta_3 + \varphi_1(n_2, n_3, n_4) \qquad (27)$$

Analogous to the standard AK model, (23) and (26) imply that $k'(0)/k(0) > 0$ if the product of savings rate and productivity parameter ($\sigma^* a^*$) is greater than the sum of population growth rate and depreciation rate ($\lambda(0) + \delta^*$), which is a standard assumption in the AK model. If we assume that the model parameters are such that $k'(0)/k(0) > 0$, then (20), (26), and (27) imply that (a) $\forall t \geq 0$ $k'(t)/k(t) > 0$ and (b) $\lambda(t)$ decreases strictly monotonously over time and converges to $\underline{\lambda} + \varphi_1(n_2, n_3, n_4)$, *i.e.*, $\lim_{t \to \infty} \lambda(t) = \underline{\lambda} + \varphi_1(n_2, n_3, n_4) =: \lambda^*$. This result, (16), (23), and (25) imply that while the non-economic system **n** and the parameter vector **p** are non-static over time (since $\lambda(t)$ is non-static), they are constant in the limit, *i.e.*, $\lim_{t \to \infty} \mathbf{n}(t) = \mathbf{n}^* \equiv (0, n_2, n_3, n_4)$ and $\lim_{t \to \infty} \mathbf{p}(t) = \mathbf{p}^* \equiv (\lambda^*, \sigma^*, a^*, \delta^*)$. Moreover, (13)–(15) and the fact that $\forall t \geq 0$ $k'(t)/k(t) > 0$ imply that the economic system **e** is non-static (even in the limit). This completes the proof of the existence of an asymptotic partial dynamic equilibrium in our model (cf. Definition 3b). The local stability of this asymptotic partial dynamic equilibrium is implied by the fact that the equilibrium exists for a non-empty and connected set of initial states **e**(0) and **n**(0). In particular, k_0, $y(0)$, $c(0)$, and $n_1(0)$ can be varied (within some ranges) without changing (a) the limit value ($\lim_{t \to \infty} \mathbf{p}(t) = \mathbf{p}^*$) of the parameter vector **p** and (b) the qualitative limit dynamics ($\lim_{t \to \infty} \dot{\mathbf{e}}(t) > 0$) of the economic vector **e** (cf. Definition 4b).

Overall, the AK model version presented in this section provides a foundation of the standard AK model's NEPCAs (17) while allowing for cross-system interactions. In particular, (a) the NEPCAs (17) are satisfied in the limit (and approximately satisfied when the parameter vector **p** is close to its limit state **p***), (b) there are interactions between the economic system **e** and the non-economic system **n** while the parameter vector **p** converges to its limit state **p*** (cf. the discussion of Definition 3b in Section 4.6.1), and (c) all the limit-predictions of our model are identical to the limit-predictions of the standard AK model despite cross-system interactions. Moreover, our model adds a transitional phase to the textbook AK model and, thus, increases the consistency of the AK model with the empirical evidence on the existence of transitional phases. In particular, the GDP growth rate ($\dot{y}/y$) increases and the population growth rate (λ) decreases over the transitional phase of our model because of interactions between socio-cultural and economic development. Thus, our model may serve as a joint socio-cultural and economic explanation of the transition from the pre-industrial 'Malthusian development phase' (which is characterized by slow GDP growth and fast population growth) to the modern industrial development phase (which is characterized by relatively fast GDP growth and relatively slow population growth). See also Galor (2011) for a detailed discussion of unified growth theory.

Conclusion

As discussed in the introduction of this paper, (a) over the last decades, economic growth theory has reoriented towards quantitative, positive, and predictive models that are based on non-economic parameter constancy assumptions (abbr. NEPCAs), (b) NEPCAs seem to be very useful if not inevitable in long-run economic dynamics modeling, and (c) in the light of the empirical evidence on the interactions between the economic and non-economic system and the limits to the inclusion/study of all the specific interactions between all the economic and all the non-economic subsystems, it seems important to discuss the system-theoretical foundations of NEPCAs in presence of cross-system interactions. Devoting our paper to the latter, we approached as follows.

First, in Sections 4.1–4.5, we discussed the known types of dynamic equilibrium (among others structurally stable systems, homeostasis of the non-economic system, and slowly developing non-economic systems) that seem to be standard candidates for generating the dynamics that are consistent with NEPCAs in economic models. This discussion yields two mayor results:

- There are two major arguments against the validation of NEPCAs via empirical evidence on the constancy of the corresponding parameters or via the study of the interactions between the economic system and specific non-economic (sub)systems:
  - (i) non-economic systems may be homeostatic, *i.e.*, they may be stable over long periods of time and, nevertheless, change significantly or even drastically when the economic variables surpass certain threshold levels, such that the present/past empirical information on the constancy of non-economic variables/parameters does not imply that these variables/parameters will be constant in the near future;
  - (ii) even if it can be shown (theoretically or empirically) that each non-economic (sub) system's interaction with the economic system is marginal, the cumulative magnitude of the interactions between the economic system and the group of all relevant non-economic (sub)systems may be significant.
- There are several problems when using the standard types of dynamic equilibrium (cf. Sections 4.1–4.5) for justifying NEPCAs in economic modeling. Most importantly, the standard equilibrium types:
  - (i) do not allow for cross-system interactions;
  - (ii) bear the possibility that NEPCAs are violated at some future point of (system) time and, thus, are not reliable foundations of NEPCAs;
  - (iii) are not consistent with NEPCAs or
  - (iv) require interdisciplinary theoretical research for justifying their application in modeling of cross-system interactions, *e.g.*, theoretical research trying to exclude the possibility that the non-economic system is (quasi-)homeostatic (cf. Sections 4.3 and 4.4).

Second, we formulated a dynamic equilibrium type (which we name partial dynamic equilibrium) that solves these problems. In this sense, the concept of the (asymptotic) partial dynamic equilibrium represents the conditions that ensure that NEPCAs are consistent with cross-system interactions, *i.e.*, it reveals the system-theoretical nature of NEPCAs in presence of cross-system interactions.

Finally, we provided a simple theoretical model of the interactions between the economic and non-economic (in particular, socio-cultural) system to demonstrate the application of the partial dynamic equilibrium in the context of NEPCAs used in economic modeling (and, in particular, in the AK model). In our model, cross-system interactions arise, where (a) the socio-cultural development (*e.g.*, emancipation) affects the population growth rate and, thus, the economic system/growth and (b) economic development has a positive impact on socio-cultural development (cf., *e.g.,* Bourguignon (2005)). These interactions generate a transition phase (from the Malthusian stage to the modern industrial stage), while the NEPCAs of the standard AK model are satisfied in the limit, *i.e.*, our model converges to the standard AK model in the limit.

While we do not seek to support or oppose the usage of NEPCAs in long-run economic dynamics modeling, our results can be understood as a support of NEPCAs, since we show that NEPCAs can be consistent with cross-system interactions while avoiding the problems that arise when standard dynamic equilibrium types (cf. Sections 4.1–4.5) are used to justify NEPCAs, as discussed above.

The concept of the partial dynamic equilibrium and, in particular, the conditions under which NEPCAs can be consistent with cross-system interactions (see Section 4.6.3 for a summary) can be used in further research as follows. First, the methodological implications of the partial dynamic equilibrium for economic growth modeling could be studied and further types of mathematical foundations of NEPCAs in presence of cross-system interactions could be elaborated. Second, our results can be applied in future theoretical modeling of cross-system interactions, as demonstrated in Section 5. In particular, the application of partial dynamic equilibriums (and dynamic equilibriums in general) simplifies the analysis of cross-system interactions and system dynamics. Thus, a modeling approach focusing on modeling partial dynamic equilibria could help to cope with the complex dynamics arising in the analysis of cross-system interactions. Third, theoretical and empirical research could try to identify the non-economic (sub-) systems that are not modelable by partial dynamic equilibria and, therefore, should be incorporated/endogenized in economic growth modeling. In this way, the weaknesses of the models that rely on NEPCAs (and, in particular, the system interactions that are neglected by NEPCAs) could be identified more clearly and an (interdisciplinary) research program on endogenization of NEPCAs in economic growth modeling could be elaborated.

References

[1] Acemoglu, D., Johnson, S., and Robinson, J.A. 2001. The Colonial Origins of Comparative Development: An Empirical Investigation. *The American Economic Review,* 91(5): 1369–1401. DOI:https://dx.doi.org/10.1257/aer.91.5.1369

[2] Acemoglu, D., Robinson, J. 2010. The Role of Institutions in Growth and Development. *Review of Economics and Institutions,* 1(2): Article 1. DOI: https://dx.doi.org/10.5202/rei.v1i2.1. Available at: https://pdfs.semantic scholar.org/23f8/e32c393d16053bf82e820051c3e2025a3f9a.pdf

[3] Alesina, A., Fuchs-Schündeln, N. 2007. Good-Bye Lenin (or Not?): The Effect of Communism on People's Preferences. *The American Economic Review,* 97(4): 1507–1528. DOI: https://doi.org/10.1257/aer.97.4.1507

[4] Alesina, A., Giuliano, P. 2015. Culture and Institutions. *Journal of Economic Literature,* 53(4): 898–944. DOI: https://doi.org/10.1257/jel.53.4.898

[5] Andronov, A.A., Vitt, A.A., Khaikin, S.E. 1987. *Theory of Oscillators.* Dover Publications, Mineola, New York, ISBN: 0486655083; 9780486655086, 815 pp.

[6] Barro, R.J., Sala-i-Martin, X. 2004. *Economic Growth.* 2nd Edition. MIT Press, Cambridge, Massachusetts, ISBN: 0262025531, 9780262025539, 654 pp.

[7] Bourguignon, F. 2005. *The Effect of Economic Growth on Social Structures*. In: Philippe Aghion and Steven N. Durlauf (Eds.) "Handbook of Economic Growth", Volume 1, Part B, 2005, 1701–1747 (Chapter 27).

[8] Brock, W.A., Taylor, S. 2005. *Economic Growth and the Environment: A Review of Theory and Empirics*. In: Philippe Aghion and Steven N. Durlauf (Eds.) "Handbook of Economic Growth", Volume 1, Part B, 2005, 1749–1821 (Chapter 28).

[9] Cass, D. 1965. Optimum Growth in an Aggregative Model of Capital Accumulation. *Review of Economic Studies,* 32: 233–240. DOI: https://doi.org/10.2307/2295827

[10] Fuchs-Schündeln, N., Paolo, M. 2016. Long-Lasting Effects of Socialist Education. *Review of Economics and Statistics,* 98(3): 428–441. DOI: https://doi.org/10.1162/REST_a_00583

[11] Galor, O. 2011. *Unified Growth Theory.* Princeton University Press, Princeton, NJ, ISBN: 9780691130026, 328 pp.

[12] Galor, O., Michalopoulos, S. 2012. Evolution and the Growth Process: Natural Selection of Entrepreneurial Traits. *Journal of Economic Theory,* 147(2): 759–780. DOI: https://doi.org/10.1016/j.jet.2011.04.005

[13] Galor, O., Moav, O. 2002. Natural Selection and the Origin of Economic Growth. *The Quarterly Journal of Economics,* 117(4): 1133–1191. DOI: https://doi.org/10.1162/003355302320935007

[14] Galor, O., Ozak, O. 2016. The Agricultural Origins of Time Preference. *American Economic Review,* 106(10): 3064-3103. DOI: https://doi.org/10.1257/aer.20150020

[15] Guckenheimer, J., Holmes, P. 1990. *Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields.* Springer, New York, ISBN-10: 3540908196, 475 pp.

[16] Huber, E., Rueschemeyer, D., Stephens, J.D. 1993. The Impact of Economic Development on Democracy. *The Journal of Economic Perspectives,* 7(3): 71–86. DOI: https://doi.org/10.1257/jep.7.3.71

[17] Kollenbach, G. 2015. Abatement, R&D and Growth with a Pollution Ceiling. *Journal of Economic Dynamics and Control,* 54: 1–16. DOI: https://doi.org/10.1016/j.jedc.2015.02.014

[18] Kollenbach, G. 2017. Endogenous Growth with a Limited Fossil Fuel Extraction Capacity. *Canadian Journal of Economics,* 50(1): 233–272. DOI: https://doi.org/10.1111/caje.12256

[19] Koopmans, T.C. 1967. *Intertemporal Distribution and Optimal Aggregate Economic Growth*. Cowles Foundation Discussion Papers 228, Cowles Foundation for Research in Economics, Yale University.

[20] Meckl, J. 2002. Structural Change and Generalized Balanced Growth. *Journal of Economics,* 77(3): 241–266. DOI: https://doi.org/10.1007/s00712-002-0542-0

[21] Persson, T., Tabellini, G. 2006. Democracy and Development: The Devil in the Details. *American Economic Review,* 96(2): 319–324. DOI: https://doi.org/10.1257/000282806777212396

[22] Ramsey, F.P. 1928. A Mathematical Theory of Savings. *Economic Journal*, 38: 543–559. DOI: https://doi.org/10.2307/2224098

[23] Roland, G. 2004. Understanding Institutional Change: Fast-Moving and Slow-Moving Institutions. *Studies in Comparative International Development,* 38(4): 109–131. DOI: https://doi.org/10.1007/BF02686330

[24] Solow, R.M. 1956. A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70: 65–94. DOI: https://doi.org/10.2307/1884513

[25] Stijepic, D. 2011. *Structural Change and Economic Growth: Analysis within the Partially Balanced Growth-Framework.* Sudwestdeutscher Verlag für Hochschulschriften, Saarbrucken. Available at: http://deposit.fernuni-hagen.de/2763/

[26] Streeck, W., Thelen, K. 2005. *Introduction: Institutional Change in Advanced Political Economies*. In: Wolfgang Streeck and Kathleen Thelen (Eds.) "Beyond Continuity – Institutional Change in Advanced Political Economies", 2005, Oxford University Press, New York, 1–39.

Financial Markets, Shocks and Omori-Utsu Law

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Abstract:

A lot of physicists and economists have contributed to studies showing analogies between physical complex systems and economic and financial markets. In this paper we have compared the complex system of earthquakes with Internet, social media and finance. In particular, we have observed as Omori's law conforms in both to the evolution of the tweets and to the securities exchanged on the financial market after dissemination of information. The analysis of empirical data concerns companies operating in the market. We have tested the relationships between variables through Person correlation coefficient and the relationship between phenomena with power trend-lines. We show that these complex financial systems follow a specific law that is related to the Omori's law.

Keywords: econophysics; Omori's law; finance; shock; tweet; price stock; earthquake

JEL Classification: G10; G15; F37; C15

Introduction

Physical models are used more and more to explain the complexities of financial markets (Sharma, Agrawal, Sharma M., Bisen, Sharma 2011, Bouchaud, Cont 2002, 543-550, Dash 2010, Savoiu 2012, Faloutsos, McCauley 2004, Sornette 2003). From the last decade a group of physicists began to take an interest to the analysis of economic systems by applying techniques and paradigms of statistical and theoretical physics. This discipline is called Econophysics (Mantegna, Stanley 2007) and it is the "application of typical methods of physics to the study of financial market, considered as complex system" (Stanley 2000, 1-17). Brownian motion and Black and Sholes model are two important examples to describe points of contact between economics and physics. The first is a probabilistic model used in physics to describe the motion of pollen grains suspended in a liquid with Gaussian probability distribution and which was later applied to economic and financial problems for similarity with the pricing of financial securities. The second is still used today as a "standard" model to describe the evolution of prices, an it shows that prices have a lognormal probability distribution (Cocolicchio, Grilli, Maddalena 2006). So it's important to have a new vision of the economy to have a more realistic understanding of phenomena.

In this paper we consider the relation between a well known physical law, that is the Omori's law which is applied to earthquakes, and financial markets with a special focus on the case of shocks as a consequence of social media rumors and information. The phenomena that occur in many complex systems as earthquakes, internet and financial markets are characterized by a power law distribution (Faloutsos, Faloutsos and Faloutsos 1999, Kapopoulos and Siokis 2005, 48-54, Lux and Alfarano 2016) We consider that financial markets, social media and internet are complex systems, and we suppose that a shock resulting from information on the web can be compared to earthquakes and consequently the Omori's law can be applied to these two systems. In the first section we explain the Omori's law that describes the dynamics of earthquakes. Then we have illustrated the methodology that we have used to analyze the data of empirical cases. The date shows a similarity between the law and the phenomena that happen in the Internet and in the financial market after a scandal or event that concerns a firm.

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1. Research Background

Physics has directly and indirectly influenced many economic theories. For example, the discovery of gravity by Isaac Newton gave way to a new method of research in science in general (Hetherington 1983, 497-505) in his work, say that "Adam Smith's efforts to discover the general laws of economics were directly inspired and shaped by the examples of Newton's success end discovering the natural laws of motion"). Luis Bachelier in his doctoral thesis in mathematics (Theory de La Speculation) claimed that prices of financial asset moved in a random walk following the Brownian motion (de Area Leão Pereira, da Silva, Pereira 2017). But the origin of this discipline can be attributed to Mandelbort, which in the early 1960, introduced a fractal approach to economics to describe characteristics of the financial and economic time series (Selçuk 2004, 306-316). The Mandelbort study gave life to a discussion in the econophysical world: the connection between the financial series and the laws of power (de Area Leão Pereira, Fernandes de Silva, Pereira 2017, 251-261). Many studies have been conducted to show the connection between physics and finance, both seen as complex systems. A study conducted by Lillo and Mantegna (Lillo, Mantegna 2003) proves that - in complex systems - phenomena occur with some probability that cannot be overlooked. They examine the statistical properties of the financial index time series after a financial crash and they demonstrate that a power law is detected when the financial market is moved by its typical state. Speculative bubbles and financial crashes are two typical phenomena in economy, and in particular, in finance. The presence of these two phenomena arouse a lot of interest and raises some questions about how they are formed, whether it is possible to predict and if it is possible to monitor their dynamics. This interest has allowed to physicists and economists to collaborate with each other to find some similarities between the two worlds.

After a great earthquake it is immediately triggered what is known as aftershock, it is characterized by its particular trend that usually after 48 hours shows a decrease in the number of shock that will lessen day after day until it disappears. Omori's law defines the decrease of aftershock following a main earthquake; this empirical formula was discovered in 1894. Omori has analyzed the Nobi earthquake of 1891 and he observed that the frequency of aftershock decreased in the time (t) after the main shock, the frequency decay is given by the following formula, amended in 1961 by Utsu:

$$n(t) = \frac{K}{(t+c)^\rho} \tag{1}$$

where: K and c are two positive constants and ρ is a parameter between 0,9 and 1,5.

This means that the number of aftershock decreases rapidly immediately after the main shock. The curve will follow the following trend (Figure 1).

Figure 1. Frequency decrease after the main shock
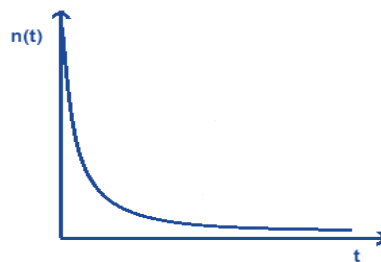
A second formulation of Omori's law can be obtained by observing the number of shock from time *0* up to *t*. During this period the cumulative number of shock observed after the main earthquake is:

$$N(t) = \frac{k[(t+c)^{1-\rho} - c^{1-\rho}]}{1-\rho} \tag{2}$$

The curve will follow an upward trend (Figure 2):

Figure 2. Number of shocks after the main earthquake
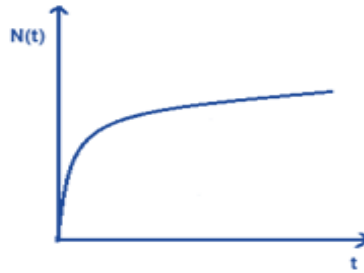
Empirical investigations conducted in (Lillo, Mantegna 2003) show that the time series of stock or index return is not strictly stationary, but they are influenced by the volatility of the financial asset, the standard deviation of assets returns that describe a stochastic process. They show that financial markets after a shock follows the physical law of Omori-Utsu.

2. Methodology

Our empirical analysis focuses on two cases: the Moncler's scandal in November 2014 and Intesa Sanpaolo case during Expo 2015. We have considered the following empirical data:
- the number of shock n(t) and cumulative number of shock N(t). The number of shock refers to a magnitude greater than two;
- the number of tweets;
- the price for quoted securities in Italian Stock Exchange.

The relationships between variables have been tested by Pearson correlation coefficient. A correlation coefficient measures the linear relationship between two statistical variables, it is denoted by r. The Pearson product-moment correlation coefficient is defined as the covariance of the two variables divided by the product of their variance (Girone 2009):

$$r = \frac{\sigma_{xy}}{\sigma_x \sigma_y} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - y)^2}} \tag{3}$$

where: n is number of observations; σ is variance of variables; x_i is value of i-th unit of variable x; y_i is value of i-th unit of variable y; $\bar{x}$ is the average of variable x; $\bar{y}$ is the average of variable y.

The Pearson correlation coefficient has a range of values from -1 to +1:
- If $r>0$ the variables are positively correlated.
- If $r<0$ the variables are negatively correlated.
- If $r=0$ the variables are not correlated.

In order to evaluate the evolution of events in these complex systems we have considered trend-lines; a trend-line is most reliable when its R-squared value is at or near to 1. The R-squared measures the proportion of the variability of the data and the accuracy of the statistical model used and it is defined as follows (Cameron, Trivedi 1998):

$$R^2 = \frac{ESS}{TSS} = \frac{\sum_{i=1}^{n}(\widehat{\mu_i} - \bar{y})^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2} \tag{4}$$

In this paper we have used power trend-lines since our data sets compare measurements that increase or decrease at a specific rate.

3. Case study

The first case study concerns Moncler. It was at the center of a scandal raised by an Italian television show called "Report" on 2th November 2014. The Italian brand which is famous in the world for the production of luxury goods had delocalized its production using low quality feathers and the extraction of the feathers was happening when the animal was still alive.

The case triggered two immediate effects. The first, was the effect on Social Media, the second concerned the effect on the stock exchanges with a drop in stock the price.

In Table 1 we present the analysis of the effect on social media and the results compared to Omori's law. We captured the number of tweet[3] from 3th November 2014 (the day after the news) up to 3th December 2014 with a total of 30 observations (*https://twitter.com/search-advanced?lang=it*)

We compared the tweets with the number of shock recorded during the Aquila earthquake with a magnitude greater than 2 from 6th April 2009 (the day of main shock) up to 6th May 2009 with a total of 30 observations (*http://cnt.rm.ingv.it/*)

Table 1. Analysis of the effect on social media and the results compared to Omori's law

Date	Daily number of tweets	Date	Daily number of shocks
3 November 2014	2563	6 April 2009	669
4 November 2014	1057	7 April 2009	352
5 November 2014	280	8 April 2009	203
6 November 2014	107	9 April 2009	249
7 November 2014	114	10 April 2009	140
8 November 2014	94	11 April 2009	96
9 November 2014	43	12 April 2009	69
10 November 2014	43	13 April 2009	91
11 November 2014	133	14 April 2009	118
12 November 2014	90	15 April 2009	73
13 November 2014	33	16 April 2009	50
14 November 2014	26	17 April 2009	50
15 November 2014	23	18 April 2009	38
16 November 2014	30	19 April 2009	24
17 November 2014	50	20 April 2009	23
18 November 2014	44	21 April 2009	29
19 November 2014	26	22 April 2009	29
20 November 2014	34	23 April 2009	25
21 November 2014	30	24 April 2009	33
22 November 2014	36	25 April 2009	21
23 November 2014	12	26 April 2009	20
24 November 2014	22	27 April 2009	25
25 November 2014	21	28 April 2009	22
26 November 2014	25	29 April 2009	10
27 November 2014	13	30 April 2009	27
28 November 2014	28	1 May 2009	13
29 November 2014	29	2 May 2009	16
30 November 2014	15	3 May 2009	17
1 December 2014	21	4 May 2009	10
2 December 2014	20	5 May 2009	10

In Table 2, we have calculated the variables in order to compute the correlation coefficient.

Table 2. Calculated variables in order to compute the correlation coefficient

Observation	Numb.of tweet X_i	Numb.of shock y_i	$x_i - \overline{x}$	$y_i - \overline{y}$	$(x_i - \overline{x})^2$	$(y_i - \overline{y})^2$	$(x_i - \overline{x})(y_i - \overline{y})$
1	2563	669	2.394,260	583,93	5.732.512,87	340.978,130	1.398.092,11
2	1057	352	888,260	266,93	789.017,67	71.253,400	237.107,98
3	280	203	111,260	117,93	12.380.271	13.908,270	13.122,04
4	107	249	-61,733	163,93	3.811.000	26.874,130	-10.120,15
5	114	140	-54,733	54,93	2.995.730	3.017,671	-3.006,68
6	94	96	-74,733	10,93	5.585.070	119,530	-817,08
7	43	69	-125,73	-16,06	15.808.870	258,130	2.020,11
8	43	91	-125,73	5,93	15.808.870	35,200	-746,01
9	133	118	-35,733	32,93	1.276,87	1.084,60	-1.176,81
10	90	73	-78,733	-12,06	6.198,93	145,60	950,04
11	33	50	-135,73	-35,06	18.423,53	1.229,67	4.759,71

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[3] number of tweets containing the hastag: Moncler

Observation	Numb.of tweet X_i	Numb.of shock y_i	$x_i - \overline{x}$	$y_i - \overline{y}$	$(x_i - \overline{x})^2$	$(y_i - \overline{y})^2$	$(x_i - \overline{x})(y_i - \overline{y})$
12	26	50	-142,73	-35,06	20.372,80	1.229,67	5.005,18
13	23	38	-145,73	-47,06	21.238,20	2.215,27	6.859,18
14	30	24	-138,73	-61,06	19.246,93	3.729,13	8.471,98
15	50	23	-118,73	-62,06	14.097,60	3.852,27	7.369,38
16	44	29	-124,73	-56,06	15.558,40	3.143,47	6.993,38
17	26	29	-142,73	-56,06	20.372,80	3.143,47	8.002,58
18	34	25	-134,73	-60,06	18.153,07	3.608,00	8.092,98
19	30	33	-138,73	-52,06	19.246,93	2.710,93	7.223,38
20	36	21	-132,73	-64,06	17.618,13	4.104,53	8.503,78
21	12	20	-156,73	-65,06	24.565,33	4.233,67	10.198,11
22	22	25	-146,73	-60,06	21.530,67	3.608,00	8.813,78
23	21	22	-147,73	-63,06	21.825,13	3.977,40	9.317,04
24	25	10	-143,73	-75,06	20.659,27	5.635,00	10.789,58
25	13	27	-155,73	-58,06	24.252,87	3.371,73	9.042,91
26	28	13	-140,73	-72,06	19.805,87	5.193,60	10.142,18
27	29	16	-139,73	-69,06	19.525,40	4.770,20	9.650,91
28	15	17	-153,73	-68,06	23.633,93	4.633,071	10.464,11
29	21	10	-147,73	-75,06	21.825,13	5.635,00	11.089,84
30	20	10	-148,73	-75,06	22.121,60	5.635,00	11.164,915

$$r = \frac{60246,01}{482,68 * 133,33} = 0,93 \tag{5}$$

In Table 3, we consider the effects of such a shock on the Stock exchanges. On the 3th November there was a decline of the stock price "Moncler" which reached a minimum of €10.26. We considered the financial month of November 2014 (*https://it.finance.yahoo.com/quote/MONC.MI/history/*) with a total of 20 observation (excluding Saturdays and Sundays) and we have compared them with the cumulative number of shocks during the Aquila earthquake with a magnitude greater than 2 from 6 April 2009 (the day of main shock) at 25th April 2009 with a total of 20 observations (*http://cnt.rm.ingv.it/):*

Table 3. The effects of such a shock on the Stock exchanges

Date	Daily price stock	Date	Cumulative number of shock
		6 April 2009	669

Also in this case we have calculated the variables in order to compute the correlation coefficient (Table 4):

Table 4 - Correlation coefficient

Observation	Cumlative number shock X_i	Daily price stock y_i	$x_i - \overline{x}$	$y_i - \overline{y}$	$(x_i - \overline{x})^2$	$(y_i - \overline{y})^2$	$(x_i - \overline{x})(y_i - \overline{y})$
1	669	10,26	-1.230,30	-0,62	1.513.638,09	0,39	764,69
2	1.021	10,09	-878,30	-0,81	771.410,89	0,65	708,74
3	1.224	10,09	-675,30	-0,79	456.030,09	0,62	531,75
4	1.473	10,04	-426,30	-0,85	181.731,69	0,72	360,64
5	1.613	10,30	-286,30	-0,58	81.967,69	0,34	166,78
6	1.709	10,25	-190,30	-0,63	36.214,09	0,40	120,14
7	1.778	10,31	-121,30	-0,57	14.713,69	0,33	69,48
8	1.869	10,74	-30,30	-0,14	918,09	0,02	4,35
9	1.987	10,94	87,70	0,06	7.691,29	0,00	5,39
10	2.060	11,07	160,70	0,19	25.824,49	0,04	30,26
11	2.110	11,01	210,70	0,13	44.394,49	0,02	27,34
12	2.160	11,26	260,70	0,38	67.964,49	0,15	99,97
13	2.198	11,28	298,70	0,40	89.221,69	0,16	120,37
14	2.222	11,19	322,70	0,31	104.135,29	0,09	98,56
15	2.245	11,40	345,70	0,52	119.508,49	0,27	179,79
16	2.274	11,41	374,70	053	140.400,09	0,28	198,53
17	2.303	11,42	403,70	0,53	162.973,69	0,28	213,89
18	2.328	11,48	428,70	0,60	183.783,69	0,36	256,42

Observation	Cumlative number shock X_i	Daily price stock y_i	$x_i - \overline{x}$	$y_i - \overline{y}$	$(x_i - \overline{x})^2$	$(y_i - \overline{y})^2$	$(x_i - \overline{x})(y_i - \overline{y})$
19	2.361	11,46	461,70	0,58	213.166,89	0,33	267,15
20	2.382	11,65	482,70	0,76	232.999,29	0,58	368,79

$$r = \frac{4593,01}{2,45*2109,19} = 0,88 \qquad (6)$$

The correlation coefficients (0,93 in the first case and 0,88 in the second one) indicate a strong correlation between the variables. The second case study concerns Intesa Sanpaolo. An important event that contributed to the importance of this banking group was its presence at Expo 2015, in fact Intesa Sanpaolo was official global partner of Expo Milano 2015. This partnership has been mainly publicized through social media.

As first step we have calculated the number of monthly tweets containing both the word Intesa Sanpaolo and Expo (*https://twitter.com/search-advanced?lang=it*). We have observed data in one year, from July 2015 to June 2016 (Table 5) and we have compared them with daily number of shocks of Aquila Earthquake in the first twelve days *http://cnt.rm.ingv.it/.*

Table 5. Observed data in one year, from July 2015 to June 2016

Date	Monthly tweets	Date	Daily number of shock
July 2015	20	6 April 2009	669
August 2015	10	7 April 2009	352
September 2015	19	8 April 2009	203
October 2015	17	9 April 2009	249
November 2015	10	10 April 2009	140
December 2015	3	11 April 2009	96
January 2016	1	12 April 2009	69
February 2016	3	13 April 2009	91
March 2016	4	14 April 2009	118
April 2016	1	15 April 2009	73
May 2016	5	16 April 2009	50
June 2016	1	17 April 2009	50

In Table 6 we have calculated the variables in order to compute the correlation coefficient.

Table 6. Calculated variables in order to compute the correlation coefficient

Observation	Monthly tweet X_i	Daily shock y_i	$x_i - \overline{x}$	$y_i - \overline{y}$	$(x_i - \overline{x})^2$	$(y_i - \overline{y})^2$	$(x_i - \overline{x})(y_i - \overline{y})$
1	20	669	12,17	489,00	148,03	23.912,00	5.949,50
2	10	352	2,17	172,00	4,69	29.584,00	372,67
3	19	203	11,17	23,00	124,69	529,00	256,83
4	17	249	9,17	69,00	84,03	4.761,00	632,50
5	10	140	2,17	-40,00	4,69	1.600,00	-86,67
6	3	96	-4,83	-84,00	23,36	7.056,00	406,00
7	1	69	-6,83	-111,00	46,69	12.321,00	758,50
8	3	91	-4,83	-89,00	23,36	7.921,00	430,17
9	4	118	-3,83	-62,00	14,69	3.844,00	237,67
10	1	73	-6,83	-107,00	46,69	11.449,00	731,17
11	5	50	-2,83	-130,00	8,03	16.900,00	368,33
12	1	50	-6,83	-130,00	46,69	16.900,00	888,33

$$r = \frac{10945}{23,99*593,28} = 0,76 \qquad (7)$$

As a second step we have analyzed the effects of this partnership on the price of the stock. The observations were made during Expo period (from May 2015 to October 2015) and in the six months before Expo, for a total of twelve observations (*https://it.finance.yahoo.com/quote/ISP.MI/history/*). In Table 7 we have compared the average of monthly price stocks with the cumulative number of shocks of the first twelve days for Aquila Earthquake.

Table 7. Average of monthly price stocks with the cumulative number of shocks of the first twelve days for Aquila Earthquake

Date	Monthly stock price	Date	Cumulative number of shock
November 2014	1,96	6 April 2009	669
December 2014	2,11	7 April 2009	1021
January 2015	2,13	8 April 2009	1224
February 2015	2,37	9 April 2009	1473
March 2015	2,62	10 April 2009	1613
April 2015	2,68	11 April 2009	1709
May 2015	2,81	12 April 2009	1778
June 2015	2,88	13 April 2009	1869
July 2015	2,97	14 April 2009	1987
August 2015	2,94	15 April 2009	2060
September 2015	2,76	16 April 2009	2110
October 2015	2,82	17 April 2009	2160

From Table 8 we have computed the correlation coefficient.

Table 8. Correlation coefficient

Observation	Average monthly stock price X_i	Cumulative number shoc y_i	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - \bar{x})^2$	$(y_i - \bar{y})^2$	$(x_i - \bar{x})(y_i - \bar{y})$
1	1,96	669	-0,63	-970,42	0,39	941.708,51	608,94
2	2,11	1021	-0,48	-618,42	0,23	382.439,17	295,29
3	2,13	1224	-0,46	-415,42	0,21	172.571,01	190,05
4	2,37	1473	-0,22	-166,42	0,05	27.694,51	36,20
5	2,62	1613	0,03	-26,42	0,00	697,84	-0,86
6	2,68	1709	0,09	69,58	0,01	4.841,84	6,44
7	2,81	1778	0,22	138,58	0,05	19.205,34	30,83
8	2,88	1869	0,29	229,58	0,09	52.708,51	67,15
9	2,97	1987	0,38	347,58	0,15	120.814,17	132,95
10	2,94	2060	0,35	420,58	0,12	176.890,34	148,26
11	2,76	2110	0,17	470,58	0,03	221.448,67	81,18
12	2,82	2160	0,23	520,58	0,05	271.007,01	121,04

$$r = \frac{1717,46}{1,17 * 1546,62} = 0,94 \tag{8}$$

Also in this case the correlation coefficients (0,76 in the first case and 0,94 in the second case) indicate a strong correlation between the variables.

4. Results

In Figure 3 and Figure 4 we have reproduced the data in order to show that the two phenomena follow the same trend:

- For Moncler case we have:

Figure 3. Power trend of daily shock

$y = 939,18x^{-1,244}$
$R^2 = 0,9345$

Daily number shock ◆   Power trendline ━━
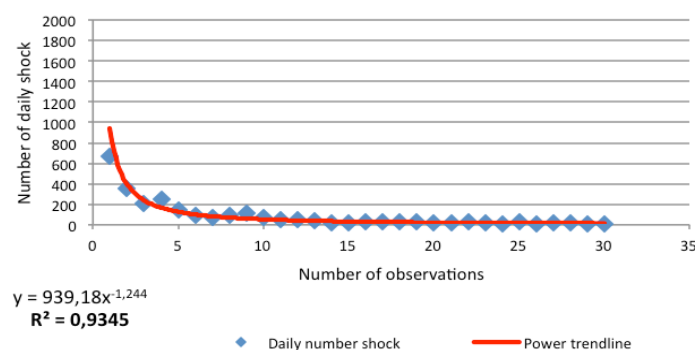
Figure 4. Power trend of daily tweet

$y = 1267x^{-1,318}$
$R^2 = 0,8561$
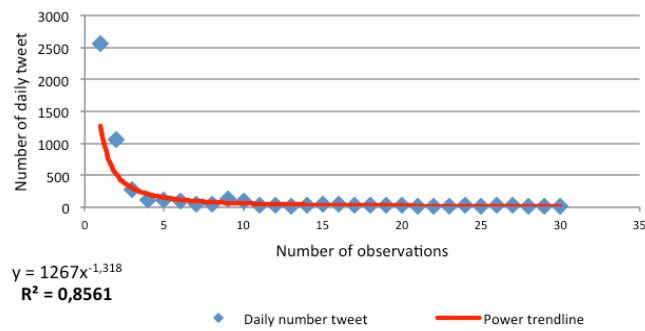
Figures 3 and 4 show that the power trend-line of shock is comparable with the power trend-line of tweet "Moncler" and the R-Squared is very close to 1. In Figure 5 we show the cumulative number of shocks during Aquila Earthquake.

Figure 5. Power trend line of number cumulative shock

$y = 791,13x^{0,3915}$
$R^2 = 0,962$
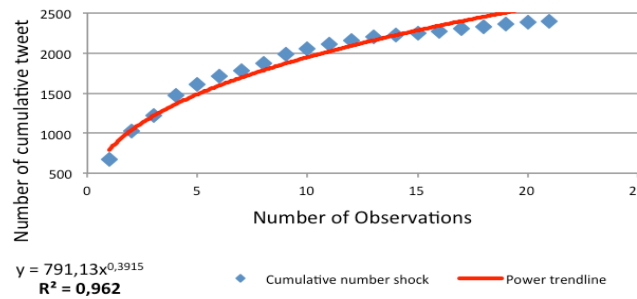
We can see that the power trend-line of cumulative shock fits well the trend-line of stock price trend. In both of graphs the R-squared is near to one, so it indicates high reliability. In Figures 6, 7 and 8 we present the trend-lines for Intesa Sanpaolo.

Figure 6. Power trend of montly stock price

$y = 9,6522x^{0,0559}$
$R^2 = 0,7858$
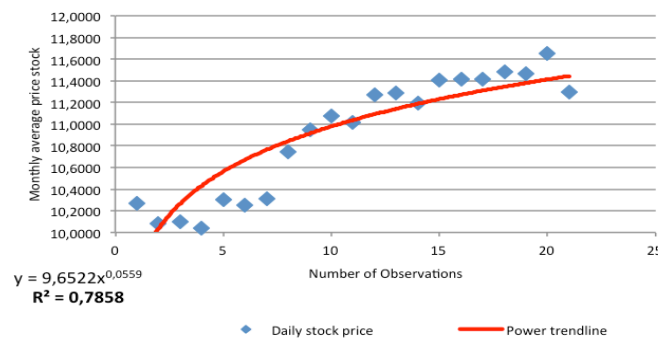
Figure 7. Power trend of daily shock

$y = 704,76x^{-1,019}$
$R^2 = 0,9194$
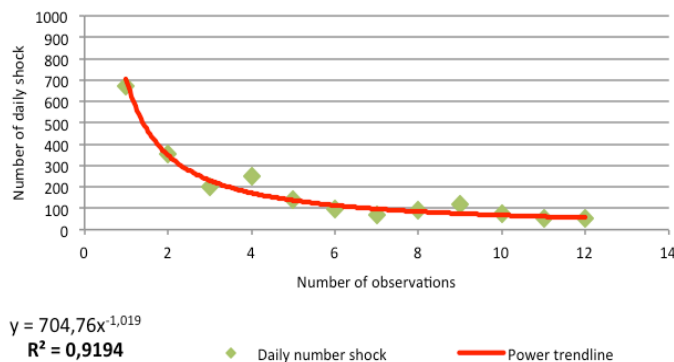
Figure 8. Power trend line of daily tweet

$y = 32,628x^{-1,163}$
$R^2 = 0,58811$
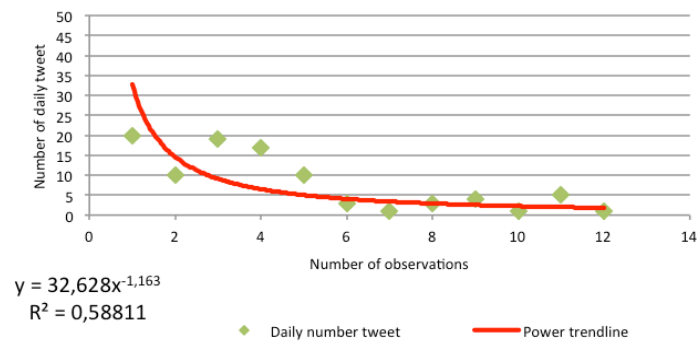
In the Figures 9-10 we show the power trend of cumulative shocks and monthly stock price.

Figure 9. Power trend line of cumulative shocks

$y = 725,89x^{0,46}$
$R^2 = 0,9843$
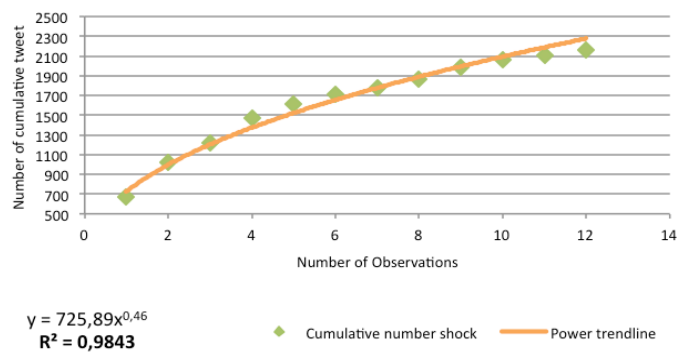
Figure 10. Power trend-line of monthly stock price

$y = 1,8955x^{0,1813}$
$R^2 = 0,8988$
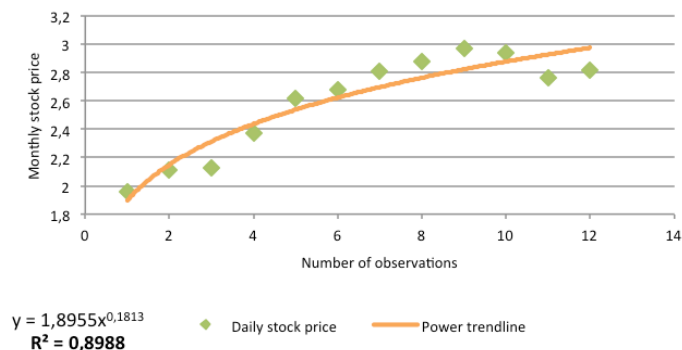
The R-Squared is consistent with the previous graphs, and it indicates high data adaptability.

Conclusions

In this study we have considered interactions between news, social media and the finance. The starting point has been the Omori's law. We have shown how this law can apply also in social media and finance.

We have considered two case studies and in both cases the results are positive, since it emerges that the trend of tweets and stock prices follows the trend of the curve of Omori's law.

References

[1] Bouchaud, J.P, Cont, R. 2002. A Langevin approach to stock market fluctuations and crashes. *European Physical Journal* B 6: 543-550.

[2] Cameron, A.C., Trivedi, K.P. 1998. *Regression Analysis of Count Data*, 2nd edition, Econometric Society Monograph No.53, Cambridge University Press, 566 pp.

[3] Cocolicchio, D., Grilli, L., Maddalena, L. 2006. *Econofisica: Metodi per l'economia*, Collana: Univ.degli Studi di Foggia - Collana Interdipartimentale di Studi Economici, Volume 11, ISBN: 8849513259, 88 pp.

[4] Dash, E. 2010. *A Richter scale for markets*, New York Times, Available at: http://www.nytimes.com/2010/08/01/ weekinreview/01dash.html

[5] de Area Leão Pereira, E.J., da Silva, M.F., Pereira, H.B.B. 2017. Econophysics: Past and Present, *Physica A* 473: 251-261

[6] Faloutsos, M., Faloutsos, P., Faloutsos C., 1999. *On Power-Law Relationships of the Internet Topology,* Stanford University, Available at: http://snap.stanford.edu/class/cs224w-readings/faloutsos99powerlaw.pdf

[7] Girone, G. 2009. *Statistica*, Carucci Editore, Bari, 540 pp

[8] Hetherington, N.S.1983. Isaac Newton's influence on Adam Smith's natural laws in economics, *Journal of the History of Ideas,* 44 (3): 497-505, DOI: 10.2307/2709178

[9] Kapopoulos, P., Siokis F. 2005. Stock market crashes and dynamic of after shocks, *Economics Letters,* 29: 48-54

[10] Lillo, F., Mantegna, R.N. 2003. Power law relaxation in a complex system: Omori law after a financial market crash, *Phys Rev E Stat Nonlin Soft Matter Phys*, 68(1). DOI: 10.1103/PhysRevE.68.016119

[11] Lillo, F., Miccichè, S., Mantegna, R.N. 2005. Econofisica: il contributo dei fisici allo studio dei sistemi economici, *Il nuovo saggiatore*, 21: 68-81. Available at: http://www1.unipa.it/~salvatore.micciche/saggiatore.pdf

[12] Lux, T., Alfarano, S. 2016. Financial power laws: Empirical evidence,models and mechanisms, *Chaos, Solitons & Fractals,* 88: 3-18, DOI: 10.1016/j.chaos.2016.01.020

[13] Mandelbort, B.B., Hudson, R.L, 2005. *Il disordine dei mercati. Una visione frattale di rischio, rovina e redditività*, Einaudi, ISBN-10: 8806169610, 316 pp.

[14] Mantegna, R.N., Stanley, H.E. 2007. *An Introduction to Econophysics: Correlations and Complexity in Finance*, Cambridge University Press, ISBN-10: 0521039878, 164 pp. Available at: http://image.sciencenet.cn/olddata/ kexue.com.cn/upload/blog/file/2008/6/200862824414226176.pdf

[15] McCauley J.L 2004. *Dynamics of Markets: Econophysics and Finance*. Cambridge University Press, Cambridge, ISBN: 0521824478, 9780521824477, 209 pp.

[16] Montagna, G. 2009. *L'Econofisica e i suoi temi di ricerca*, Dipartimento di Matematica e Fisica, Università cattolica del Sacro Cuore, Brescia, Available at: http://www.dmf.unicatt.it/~fisteam/corsi/fisicaoltre/seminario-montagna.pdf

[17] Savoiu, G. 2012. *Econophysics: Background and Application Economics, Finance and Sociophysics*, Academic Press; 1st Edition, ISBN-10: 0124046266, 178 pp.

[18] Selçuk, F. 2004. Financial Earthquakes, Aftershocks and Scaling in Emerging Stock Markets, *Physica A,* 333: 306–316.

[19] Sharma, B.G., Agrawal, S., Sharma, M., Bisen, D.P, Sharma, R. 2011. *Econophysics: A Brief Review of Historical Development, Present Status and Future Trends,* arXiv:1108.0977, Available at: https://www.researchgate.net/publication/51928924_Econophysics_A_Brief_Review_of_Historical_Development_Present_Statusand_Future_Trends

[20] Sornette, D. 2003. *Why Stock Markets Crash: Critical Events in Complex Financial Systems*. Princeton University Press, ISBN: 0691096309, 9780691096308, 421 pp.

[21] Stanley, H.E. 2000. Exotic Statistical Physics, with Applications to Biology, Medicine and Economics, *Physica A: Statistical Mechanics and its Applications,* 285: 1-17.

*** INGV Centro Nazionale Terremoti, Available at: *http://cnt.rm.ingv.it/*

*** Search Advanced, Available at: *https://twitter.com/search-advanced?lang=it*

*** Yahoo Finance, Available at: *https://it.finance.yahoo.com/quote/MONC.MI/history/*

*** Yahoo Finance, Available at: *https://it.finance.yahoo.com/quote/ISP.MI/history/*

Corporate Culture Key Criteria and Clustering

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Abstract:

The aim of this article is to revise the main distinctions between corporate cultures of different nations. National corporate cultures attract interest for economists all around the world. Such problem remains important nowadays as well, and it will be important in future, because effective cross-border cooperation is one of the crucial factors that attract overseas investors. Modern researches have proven that both cultural and financial cross-national bonds are getting stronger these days, which create new paradigms of international cooperation across the globe. Author set up new methods that analyse cross-cultural variance and statistically forecasting from the point of intercultural interaction. These methods are implemented for transnational cooperation assess and identification of its specific traits. The paper reflects a quantitative instrument that allows to measure cross-cultural conflictless and to sign out influenced criteria. The method can be applied in various levels, from measuring conflictless between two departments of a company to assessing return on investment of transnational companies coming to the new markets. Research is based on the criteria of corporate culture differentiation developed by Geert Hofstede. The study provides valuable information regarding the interaction of corporate cultures and enables to address this traditionally empiric question from statistical point of view.

Keywords: corporate culture; cross-culture; interaction efficiency; cultural criteria; social analysis

JEL Classification: C10; M14

Introduction

Present researches held by many sociologists show that both intercultural and international bonds become stronger and stronger nowadays, which leads to creating a totally new paradigm of interaction between different countries worldwide. Globalisation brings to surface the fact that now, unlike half a century ago, cross-cultural penetration gets stronger and stronger. Big international companies' eager to grow and increase their financial results set all new demands. It is evident that unhealthy atmosphere at the enterprise is the main reason of negative moral consequences, low labour productivity, decrease in product cost effectiveness and increase in personnel turnover. (Tzai-Zang, Ya-Fen 2005).

One should also keep in mind the fact that cross-cultural disparity is one of the most serious, though underestimated, barriers for potential investors planning to enter industries with significant turnover. In fact, incorrect corporate politics, inability to adapt corporate rules to basic regulations and standards, accepted in the invested country may lead to significant drop in effectiveness of investment project, even despite thorough analysis of its economic constituent (Shinichi, Katsuyuki, and Hideaki 2007). Thus, exploring and examining corporate cultures becomes vital for increased business productivity. The main problem that we face when trying to perform this study is the lack of objective, independent, reliable and measurable instruments practical for describing key criteria identifying corporate cultures. So the aim of our research is to revise main distinctions between corporate cultures of different nations and try and develop specific instruments that may be used to measure corporate culture. It is a very important aspect of any business, but unlike quantitative indexes, such as revenue or market share, it is purely subjective and unsubstantial, though important and influential (Lorincová, Hitka, Balážová 2016, 719-732; Moran 2017, 232-236). Consequently, the objectives of our research are listed as follows:

- systemise past researches performed in the relevant area and identify the instruments involved;
- choose key criteria that allow best to identify corporate cultures;
- pick statistical instruments suitable for the analysis;

- perform basic statistical analysis of corporate cultures and evaluate economic meaning of the analysis;
- perform statistical clusterisation of global corporate cultures and analyse the resultant clusters.

The analysis of cross-cultural differentiation allows to track evolutional dynamics of basic criteria, identifying human behaviour. With enough statistic data, this research can be held on both national and international levels. This research might also be interesting if we consider the fact that these cross-cultural criteria are very hard to modify. Whilst external features of corporate culture can rapidly change with time, basic ones are strongly resistant to evolution, which, despite changing cultural paradigm, allows researchers and investors to forecast corporate conflicts and identify which social aspects can be used as sticking points for cross-cultural interactions during future decades (Hofstede 1980).

Naturally, corporate cultures of various nations have been formed during hundreds of years under the influence of various contradictive (and, in many times, totally arbitrary) factors. The evolution of corporate cultures has walked its way from its total absence to global recognition of its importance and understanding that lots of hard work should be applied to grow corporate culture in a true supporting system that will significantly augment business productivity (Hai, D.H., Hai, N.M., Van Tien 2018, 450-465)

1. Research Background: Retrospective Analysis

The amount of attention given nowadays to corporate cultures is natural and can be easily explained, because optimising cross-cultural communication and interaction is the primary way to augment the efficiency of any corporate investments in personnel, as well as direct international investments, that have grown geometrically within past decades.

Many scientists are involved in the study of national corporate cultures and ways to improve integration and minimise cross-cultural conflicts (Rees, Kemp, and Davis 2012). However, most of these studies analyse corporate cultures from empiric, qualitative point of view, whilst statistic, quantitative approach isn't highly widespread. This situation requires reconsideration, in our opinion, because only statistical methods of analysis allow to identify key traits of corporate culture, established in any specific social peer group, regardless of its scale. They also allow the researchers to perform objective and unprejudiced assessment in terms of comparing corporate cultures amongst themselves. These quantitative results, in their turn, allow at first to identify the qualitative criteria of corporate cultures that differ most throughout cross-cultural interaction and then to elaborate measures to minimise negative consequences of cross-cultural dissimilarity.

In order to measure the strength of cross-cultural conflicts within global corporate cultures, we must first classify the basic differentiation criteria, identifying the dissimilarity between corporate cultures (Sageder, Feldbauer-Durstmüller 2018, Thabrew, Perrone, Ewing, Abkowitz, Hornberger 2018, 49-63). To perform that, we need specific criteria that will help systematise, structure and classify global managerial paradigm. Such criteria can be found in social researches held by Geert Hofstede, world known scientist, specialising on corporate cultures and cross-cultural communications.

Hofstede has analysed common and divergent traits of various corporate cultures of the world. This allowed him to point out several key criteria that identify corporate cultures (Hofstede 2007). We have chosen the following four criteria for our research:

- Power distance index (PDI);
- Individualism (IDV);
- Masculinity (MAS);
- Uncertainty avoidance index (UAI).

Hofstede used these criteria to develop personality tests. These tests allow to identify the level of each criterion (PDI, IDV, MAS, UAI) appropriate for any tested subject. Hofstede has applied his test system to more than 30,000 people from more than 90 countries, which gave him formalised numeric description of corporate cultures, dominating in analysed countries, classified according to four criteria that identify international diversification (Hofstede 1977).

For the sake of deeper analysis, we should look in more details at these four criteria in order to identify specific cultural traits controlled by each of them.

Power distance index (*PDI*) displays social acceptance of inequality. In other words, it displays the level of social disproportion that will be accepted by the population of analysed country. Companies in countries with high levels of PDI tend to be centralised and to have vertically stretched hierarchic structure. Managerial crew is usually outsized and salary varies in large bounds, according to employee's hierarchy. Low-qualified workers are generally at the bottom of hierarchic ladder, whilst the top is populated by highly ranked 'white collars'.

Individualism (IDV)*,* opposed to collectivism, reflects the extent to which a person integrates in its peer group. High level of IDV is natural for societies with weak interpersonal bonds. Everyone is supposed to be responsible for his or her own life and the life of his or her family, people are independent from the company they work for. Vice versa, in collectivist societies, starting from their birth date, people are integrated in peer groups with high level of interpersonal interaction.

Masculinity (MAS) and its antipode femininity display whether the role of a person in the society is strict or flexible, that is, masculine society tends to think that 'a man should behave as a man – earn money and protect his family, while a woman should raise children'. Feminine society tends to accept these basic guidelines in a more flexible way.

Uncertainty avoidance index (UAI) portrays social tolerance to uncertainty, unacceptance of vague future and strive to discover Absolute Truth. If UAI is low in the society, people are ready to live without concerns about tomorrow. Contrary, if UAI is high, people fear the future and need to have exact action plan in order to take any decisions.

According to Hofstede, the combination of these characteristics is sufficient to identify any corporate culture and can be used to analyse cross-cultural interaction. However, it should be mentioned that Hofstede has performed only qualitative analysis of assembled data, whilst it is evident that quantitative statistical analysis of this information allows to perform a deeper study of cross-cultural conflictness, effectiveness and adaptation (Denison, Mishram1995). Thus, in order to perform detailed differential analysis of cross-cultural interaction, we should develop task-specific methodical system.

2. Methodology: Comparison Methods

In order to explore the differentiation between corporate cultures, we can use basic methods of quantitative statistic analysis, which in this case will allow to measure the difference in values of all four principal criteria – PDI, IDV, MAS and UAI.

Simplest way to do this is to calculate average values – arithmetic average, mode and median – and identify their economical sense according to the goals of the research. Analysis of average values leads to the following conclusions:

PDI with minimal value of 11 and maximal value of 104 shows arithmetic average of 58.6 points, which is almost equal to median value of the interval. Meanwhile, mode for PDI equals 80, which is 21% higher than the median value. These results can be explained by historic and social background of this criterion – strict hierarchic authoritarian management system has globally dominated through centuries, alongside with high level of social inequality. The influence of these factors started to decrease only in recent times, leaving a deep trace on managerial cultures, especially in countries with emerging economics (Schein 2010).

Maximal value for IDV is 91, whilst minimal value is 6 points. In this case, values of arithmetic average and median are almost equal either, whilst modal value is as low as 20 points. It is 27% less than median value, and this fact can also be explained economically. Demonstration of individual personal qualities is not common for the vast majority of corporate cultures, because they are represented by the countries with emerging markets. Workers are anticipated to join the team of their peers and perform collectively in order to achieve shared goals. This social paradigm naturally results in low modal value of IDV criterion.

MAS criterion has symmetrical spread; its centre is in the middle of the interval, modal, median and arithmetic average values match within 10% interval. As a result, we might conclude that the allocation of this criterion is rather centred. This means that cultures with both high and low levels of MAS are commonly widespread in the world. Social attitude towards gender roles in the society changes gradually from strict fixation to total flexibility.

Median value of UAI equals its arithmetic average, which means that the allocation of this criterion is centred as well. However, its modal value is 86 and exceeds arithmetic average by more than 19%. Practically, this incoherence reflects on international corporate culture as indecisiveness, augmented desire to avoid insecurity, have social guarantees and structured routine job.

This primary analysis of corporate differentiation criteria allows to identify basic trends and characteristics common to all corporate cultures worldwide. As for cross-cultural interaction, in order to characterise and assess its conflictness, we should analyse the differentiation of each criterion separately. Before doing that we need to normalise the criteria. The methodology used for initial research makes them incomparable because scales used to measure these criteria differed for each of them.

Figure 1. Normalised differentiation criteria bar chart

PDI-n	
Average	38.10
Dispersion	17.95
Quantity	69
IDV-n	
Average	28.18
Dispersion	17.95
Quantity	69
MAS-n	
Average	43.73
Dispersion	17.95
Quantity	69
UAI-n	
Average	44.53
Dispersion	17.95
Quantity	69
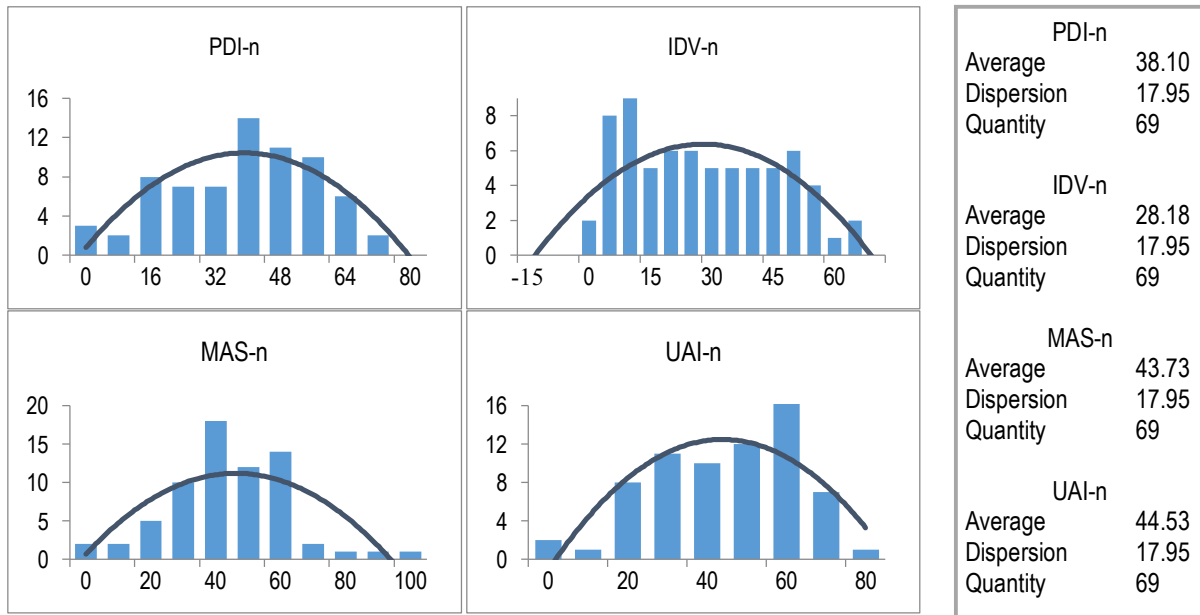
Differentiation of each characterising criterion allows to identify polar criteria, being the source of cross-cultural conflicts in most cases. This differentiation can be measured with three methods: decile method; max-min method; calculation of the Gini coefficient. Three tools are necessary in this research in order to minimise erroneous results. For instance, following is the Lorenz graph for all four criteria.

According to the analysis, IDV criterion has maximal differentiation, whilst MAS and UAI are less differentiated. This correlates with the fact that UAI and MAS have centred spread and can be explained from social aspect: at the current level, corporate society suffers more from the problems linked with hierarchical inequity than from the ones connected with the role of individual in the society.

Figure 2. Lorenz curve for normalised criteria
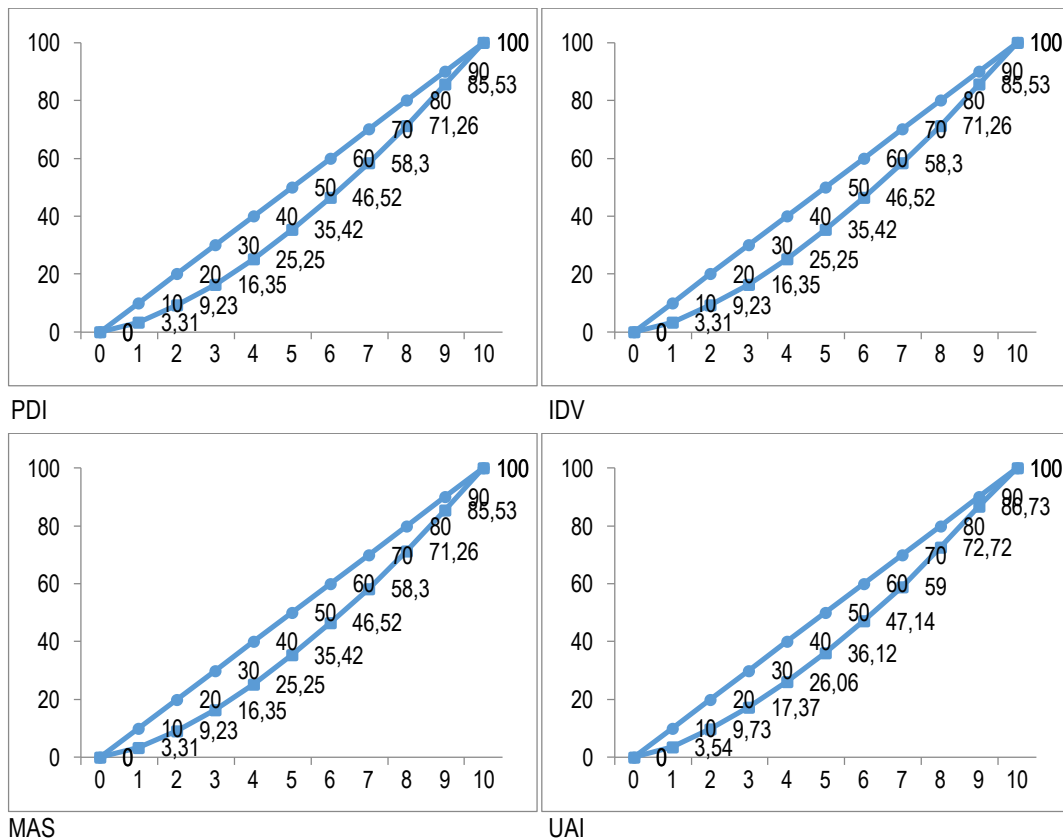
This research also shows that differentiation between IDV values of analysed countries is higher compared to those of MAS and UAI. Therefore, cross-cultural systems tend to generate more conflicts because of controversial behaviour of personnel in terms of manifestation of individualistic qualities, rather than qualities depending on other criteria. Analysis of cross-criteria correlation has shown significant level of correlation between IDV and PDI criteria, so we folded then into a new Decision Making Freedom (DMF) criterion that combines the characteristics of them both.

This statistic research allows to form basic conclusions about potential cross-cultural conflictness, because high level of criterial differentiation increases the probability that levels of cultural criteria in corporate communication will either be polar or differ significantly. This, in turn, will provoke corporate conflicts and minimise the productivity and personnel efficiency (Matraeva, Konov, Belyak 2016, 162-167)

For the sake of more in-depth analysis, we decided to perform multidimensional grouping of analysed corporate cultures. This is one of the methods that allow to identify groups of countries that interact with less possible conflictness.

3. Methodology: Multidimensional Clusterisation

In order to perform this task, we decided to calculate the multidimensional average value of the group, then formed normed differential matrix and, finally, selected clusters with hierarchical method. This method is the easiest and the most effective whilst sorting clusters of similar objects. It also allows to form the minimal possible hierarchical graph, making the resulting groups more representative.

We used the following formula to calculate our multidimensional average:

$$\overline{P_i} = \sum_{i=1}^{n} \left(\frac{x_i}{\overline{x_i}} \right) : k = \frac{\sum_{i=1}^{n} P_i}{k} \tag{1}$$

where: $\overline{P_i}$ is the multidimensional average for *i* element of research (country); k is the number of differentiation criteria, x_i is the absolute value of cross-cultural criterion *x* for *i* element of research; $\overline{x_i}$ is the average value of *x* cross-cultural criterion.

The result that we received allowed us to rank all the counties we included in the analysis according to the growth of our multidimensional average. This allowed us to find countries with the most comparable corporate cultures. We calculated the number of groups using the following formula:

$$n = 1 + 3.22 \times \log N \tag{2}$$

where: *n* is the number of groups; *N* is the number of values.

Thus, we formed the seven following groups.

Costa-Rica, Singapore, Vietnam, *etc*.	Trinidad, Thailand, Pakistan, Taiwan, Chile, *etc*.	Peru, Iran, Israel, Ecuador, Salvador, Bangladesh, *etc*.
Austria, New Zealand Germany, Canada, Turkey, *etc*.	Russia, Greece, Czech Republic, Mexico, Malta, *etc*.	Italy, Poland, Japan, Poland, Belgium
Hungary, Slovakia		

This clusterisation allows to form the groups of countries with anticipated low level of cross-cultural conflictness. The results have to be verified using other methods of cluster analysis in order to stress-test group sustainability. We tried several methods but decided to stick to the hierarchical Ward method because we had few research objects and it was impossible to identify the number of clusters in advance. Moreover, the results this method gave had the most interpretable economic meaning of all that we used. The Ward method uses dispersion analysis to assess distance between clusters. This method tends to create smaller clusters and usually unites groups that are close to each other. We used SPSS to evaluate our countries by the criterion of minimal Euclid distance.

The input data returned the dendrogram shown in Figure 3.

Figure 3. Clusterisation diagram: Euclid's distance, Ward method
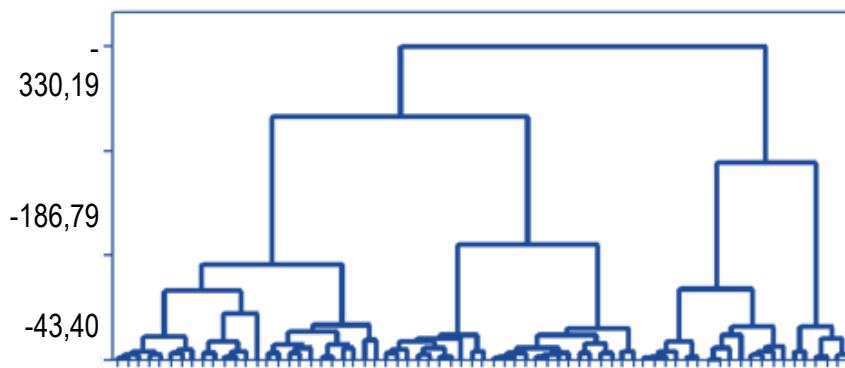
We examined the dendrogram and compared cluster similarity (decreasing trend) with the distance between clusters (increasing trend). This allowed us to identify the stop point of our clusterisation.

Figure 4 Clusterisation stop point
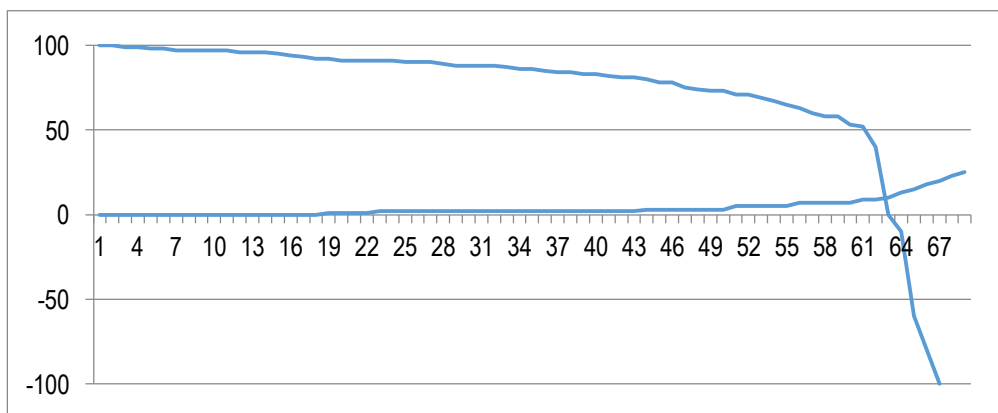
Figure 4 shows that cluster similarity drops significantly after the 60th step of clusterisation, whilst the distance between clusters starts growing steadily around the same interval. These lines cross at step 64, which seems to be the stop point of clusterisation. To check this, we used the Duda and Hart (DH) stop criterion. At step 64, DH criterion equals 0.4561, whilst the critical value is 0.6599 at 5% significance level. This can be interpreted as the indicator to reject single-cluster hypothesis (countries are homogeneous, no clusterisation is possible) and to accept clusterisation hypothesis. At step 63, DH criterion is above the critical value at our selected significance level, which means the opposite in terms of clusterisation and homogeneity. Thus, we proved that clusterisation should stop after step 63, which forms 6 clusters.

Figure 5. Clusterisation results: Ward method, 63 steps

To check the above-described hypothesis, we used SPSS to perform single-factor dispersion analysis, followed by multiple Fischer comparison. This allowed us to assess the difference in average values of criteria that were the basis of cluster separation.

Fischer clusterisation results with 95% confidence interval are given in Figure 6.
This data allowed us to state that there is at least one statistically significant differential criterion that separates each cluster from one another. Thus, the clusterisation we performed may be recognised as correct.

Figure 6. Clusterisation analysis: Fischer method

Cluster	1	2	3	4	5	6
1		DMF UAI	DMF MAS	MAS UAI	UAI	DMF MAS UAI
2			DMF MAS UAI	DMF MAS	DMF UAI	DMF MAS UAI
3				DMF MAS UAI	DMF MAS UAI	MAS UAI
4					MAS UAI	DMF MAS UAI
5						DMF MAS
6						

Graphic model of our clusterisation is demonstrated at the visualisation shown in Figure 7.

Figure7. Clusterisation analysis: visualisation
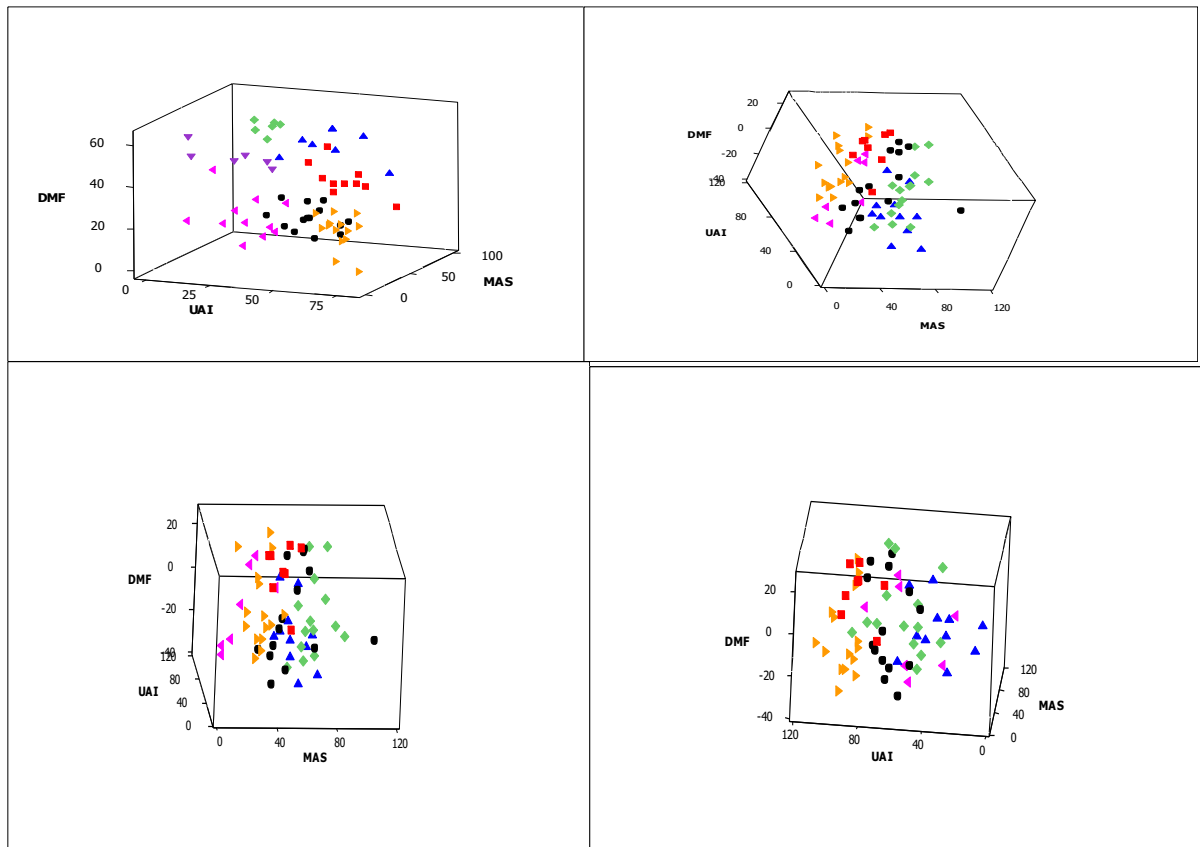
As a result, we identified the following clusters of corporate cultures:

Arab world, Bangladesh, Ecuador, Iran, Morocco, Venezuela, *etc*.	Belgium, Czech republic, France, Poland, Greece, Malta, *etc*.	Australia, Austria, Canada, Japan, The United States, Italy, Germany, *etc*.
Bulgaria, Portugal, Romania, Russia, Turkey, Chile, *etc*.	China, Hon-Kong, India, Jamaica, Malaysia, Singapore, *etc*.	Denmark, Estonia, Finland, Netherlands, Norway, *etc*.

We have proven the statistical validity of the above-performed clusterisation. In order to reveal its economic meaning, we should first describe the clusters that we have formed. For instance, the first cluster groups countries with low values of DMF factor, average level of MAS and average UAI. This cluster groups countries with emerging

markets. Lack of financial stability and very specific corporate management with prevailingly authoritative approach leads to decrease in DMF. MAS is way less significant than in other comparative clusters.

Conclusion

Corporate culture is a unique element of any society that is formed under the influence of various arbitrary factors throughout centuries. It usually remains concealed and tends to be treated without proper attention most of the time.

Owing to its nature, corporate cultures are hardly measurable and comparable, although extensive researches are held in this domain. In this article, we have presented a method to analyse corporate cultures by clustering them in economically and statistically meaningful groups. One of the next possible steps to improve and develop the research will be to carry out extensive economic research of these clusters, trying to find similarities and contrasts in their financial and political conditions. This will help to better understand the real-life representation of each differentiation criterion and the influence that each of them and their combination has on actual corporate management models adopted across the world (Kotter 2011).

Another practical application of these results will be to shape a cross-cultural situational model that describes interaction between different pairs of clusters, assesses its efficiency, shows strong and weak aspects of this interaction and offers possible strategies to minimise existing discrepancy.

It is also possible to develop an aggregate index of cross-cultural conflictness. It will show the overall effectiveness of transcultural collaboration without focusing on each specific reason why this collaboration is effective or not.

Generally, cluster analysis of corporate cultures seems to be an interesting way to understand and analyse cross-cultural communication. Basic mathematical and statistical instruments described in this article permit to assess overall conflictness of cross-cultural interaction and to identify social traits, being the reason of this conflictness.

References

[1] Hofstede, G. 1977. *Cultures and Organizations: Software of the Mind.* 1st edition, McGraw-Hill USA. ISBN: 0070293074, 9780070293076, 279 pp.

[2] Hofstede, G. 1980. *Culture's Consequences: International Differences in Work-Related Values.* Beverly Hills CA: Sage Publications, London and Beverley Hils, 475 pp.

[3] Hofstede, G. 2007. *Outlines & Highlights for Cultures and Organizations by Hofstede*/Geert Hofstede; New York City, US: AIPI. ISBN 1428826882, 112 pp.

[4] Kotter, J. P. 2011. *Corporate Culture and Performance*, New York, US: Free Press. ISBN 978-1451655322, 224 pp.

[5] Schein, E.H. 2010. *Organizational Culture and Leadership* (The Jossey-Bass Business & Management Series), Jossey-Bass, ISBN 978-0470190609, 464 pp.

[6] Hai, D.H., Hai, N.M., Van Tien, N. 2018. The influence of corporate culture on employee commitment. *Studies in Computational Intelligence*. 760: 450-465. DOI: 10.1007/978-3-319-73150-6_36

[7] Lorincová, S., Hitka, M., Balážová, Ž. 2016. Corporate culture in slovak enterprises as a factor of hrm quality - case study, *International Journal for Quality Research,* 10(4): 719-732.

[8] Moran, B. 2017. Corporate Responsibility: Purpose, Culture, and the People Strategy, *Sustainability,* 10(4): 232-236.

[9] Sageder, M., Feldbauer-Durstmüller, B. 2018. Management control in multinational companies: a systematic literature review. *Review of Managerial Science.* 1-44. DOI: 10.1007/s11846-018-0276-1

[10] Thabrew, L., Perrone, D., Ewing, A., Abkowitz, M., Hornberger, G. 2018. Using triple bottom line metrics and multi-criteria methodology in corporate settings. *Journal of Environmental Planning and Management,* 61(1): 49-63.

[11] Denison, D.R., Mishra, A.K. 1995. Toward a Theory of Organizational culture and effectiveness, *Organization Science,* 6 (2): 204 – 223, March – April. Available at: http://www.trustiseverything.com/wp-content/uploads/2012/07/denison-mishra-toward-a-theory-of-org-culture-and-effect-org-sci-1995.pdf

[12] Matraeva, L.V., Konov, A.A., Belyak, A.V. 2016. Statistical approach to the analysis of corporate culture interaction process. *International Review of Management and Marketing,* 6 (5): 162-167. Available at: http: www.econjournals.com

[13] Rees, C., Kemp, D., and Davis, R. 2012. *Conflict Management and Corporate Culture in the Extractive Industries: A Study in Peru.* Corporate Social Responsibility Initiative Report No. 50. Cambridge, MA: John F. Kennedy School of Government, Harvard University. Available at: https://sites.hks.harvard.edu/m-rcbg/CSRI/ CSRI_report_50_Rees_Kemp_Davis.pdf (accessed January 21, 2018)

[14] Shinichi, H., Katsuyuki, K., and Hideaki, M. 2007. *Does Corporate Culture Matter? An Empirical Study on Japanese Firms.* RIETI Discussion Paper Series 07-E-030. Available at: http://www.rieti.go.jp/jp/publications/ dp/07e030.pdf (accessed January 21, 2018)

[15] Tzai-Zang, L., Ya-Fen, T. 2005. *A Study of the Relationship between Organizational Culture and Organizational Effectiveness of the Electronic Industries in Taiwan.* Available at: http://www.kurims.kyoto-u.ac.jp/~kyodo/kokyuroku/contents/pdf/1461-15.pdf (accessed January 21, 2018)

Internet Usage in Entrepreneurial Process and Firm Characteristics

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Abstract:

In this study, we examine the impact of internet usage in entrepreneurial process on small firm characteristics. We look into the relation between states' success in designing online internet start-up, tax payment, and licensing systems, and small firms' characteristics in those states. Our results show that younger firms tend to concentrate in the US states with high-internet scores. We find that relatively larger firms are more concentrated in the states with high-internet start-up and internet tax payment scores. Single employee firms are more concentrated in the states with high-internet licensing scores. On the other hand, firms with 2-20 employees are more concentrated in the states with low-internet licensing scores. We also find some differences in firms' industries in the high-score states versus low-score states. Finally, we do not find significant differences between the firms in the high- versus low-score states in terms of firms' operational area.

Keywords: entrepreneur; entrepreneurship; small business; Internet; entrepreneurial activity; firm characteristics

JEL Classification: G38; L25; L26

Introduction

In this study, we examine the relation between technology use in entrepreneurial start-up process (as well as tax payment and licensing processes) and firm characteristics. What type of firms are attracted to the US states that have a better internet start-up process? Similarly, what type of firms are concentrated in the states with a better internet tax payment system or a better internet licensing system?

We use the results of the "United States Small Business Friendliness Survey" done by Kauffman Foundation and Thumptack.com in 2013. Using the responses in each state, we first compute each state's scores on internet start-up, internet tax payment and internet licensing. Then, we compare small firm characteristics across high- and low-internet start-up score states. We do the same comparison for high- versus low-internet tax score states. Finally, we compare small firm characteristics across high- and low-internet licensing score states.

The firm characteristics that we examine are the firm's operational area (*i.e.* the number of states that it operates in), whether most of its sales are local, firm age, firm size, and firm industry. For operational area, we have three classifications: firms that operate in only one state, firms that operate in two to five states, and firms that operate in more than five states. For local sales, we just look at whether the firm has ninety percent or more of its sales within 50 miles. For firm age, we have four classifications: firms that are established in less than a year, firms that are one or two years of age, firms that are three or four years of age, and firms that are older than four years of age. For firm size, we have five classifications: single employee, two to twenty employees, twenty-one to fifty employees, fifty-one to a hundred employees, and more than a hundred employees. We also look into the number of firms in nine different industries.

Our results will show the types of firms that are more attracted to certain aspects of the online systems. We are hoping that state officials will benefit from these findings. If certain online systems affect certain types of firms more, then the officials can focus on those systems only. This will help them allocate their resources more efficiently.

The paper proceeds as follows: section 1 discusses the previous literature, section 2 explains the data, section 3 demonstrates the empirical results, section 4 concludes.

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1. Literature Review

The use of technology during the entrepreneurial process is important because it makes the process much easier for the entrepreneur. Since technology makes the process easier, we expect a positive relation between states' technology use in this process and entrepreneurial activity.

The technology use relieves, at least partially, the entrepreneur from the burden of rules and regulations; therefore, in this section, we focus on the previous literature that examines how rules and regulations affect entrepreneurial activity in a region, country, or city. The papers on the impact of rules and regulations on entrepreneurial activity generally find a negative relation between the degree of rules and regulations in a country and the entrepreneurial activity.

In one of the earlier studies, Gartner and Shane (1995) contend that changes in technology, attitudes, values, and government regulations have a significant impact on changes in entrepreneurship over time. The authors also argue that the economic and social changes in the world also affect entrepreneurial activity. Wennekers and Thurik (1999) contend that both culture and institutional framework affect the amount of entrepreneurial activity in an economy. The authors argue that, besides these two factors, demographic, technological, and economic forces are also important for entrepreneurial activity. Zahra and Garvis (2000) examine the impact of technological changes, aggressive government intervention, and fierce local rivalries on US firms' activities in other countries. They find that, when the international environment is hostile, firms tend to struggle.

Later, Welter (2004) focus on female entrepreneurs and contends that there are shortcomings in the institutional environment that restrict women's interest in entrepreneurship. According to the author, in order to foster female entrepreneurship activities, countries need to improve the institutional environment first. Ovaska and Sobel (2005) examine entrepreneurial activities in post-socialist economies. The authors argue that certain factors (contract enforcement, credit availability, sound monetary policy, low government corruption, high foreign direct investment, low-level of regulations, and low tax rates) give citizens a high degree of freedom, and that these factors therefore are important for entrepreneurial activity.

Bitzenis and Nito (2005) examine entrepreneurial activities in Albania and find that lack of financial resources, changes in taxation procedures, unfair competition, and problems related to public order are the most important obstacles faced by entrepreneurs in that country. Klapper *et al.* (2006) examine how market entry regulations affect the number of new limited-liability firms, the average size of firms, and the growth of incumbent firms. The authors show that costly regulations restrict the creation of new firms.

Aidis *et al.* (2007) examine the impact of rules and regulations as well as gendered norms and values on female business development. They find that rules and regulations may permit women to start their own businesses, but gendered norms and values may restrict women's activities and their access to resources. Acs and Szerb (2007) show that, to increase entrepreneurial activity, middle-income countries should focus on increasing human capital, improving technology availability, and promoting enterprise development. On the other hand, they show that, for developed economies, the same cannot be said. In these countries, according to the authors, reducing entry regulations, in most cases, will not result in more high-potential startups. The authors argue that, these countries may try other things like labor market reform and deregulation of financial markets.

Parker (2007) finds that legal structures shape organizational forms in entrepreneurship. The author also shows that legal rules and institutions impact entrepreneurship in three areas: regulation, bankruptcy legislation, and the broad area of property rights, corruption, and the efficiency of courts. Sobel *et al.* (2007) contend that, once they become successful, entrepreneurs tend to lobby for government entry restrictions. According to the authors, bad political institutions yield to these demands and they place barriers on domestic and international competition.

Van Stel *et al.* (2007) find that two factors especially lower entrepreneurship rates across countries. These are labor market regulations and the minimum capital requirement required to start a business. Aidis *et al.* (2008) argue that Russia's relatively low levels of entrepreneurial activity can be explained by its institutional environment.

Manolova *et al.* (2008) argue that the overall institutional framework in each country is important but it should only serve as a first approximation only and interpreted with great care. Nyström (2008) shows that a smaller government sector, less regulations, better legal structure and security of property rights are important determinants of entrepreneurial activity in a country.

In another paper, Acs *et al.* (2009) examine factors such as taxes, legal restrictions, risk aversion, bureaucratic constraints, labor market rigidities, and lack of social acceptance on entrepreneurs and find that entrepreneurial activities tend to decrease under greater regulation, administrative burden and market intervention by government. Smallbone *et al.* (2010) argue that, in transition countries, governments play a particularly important

role for entrepreneurship development. According to the authors, in these countries, the government's in creating the institutional framework that enables and/or constrains entrepreneurship is important.

Stephan and Uhlaner (2010) show that two factors, namely opportunity existence and the quality of formal institutions, support entrepreneurship. Nawaser *et al.* (2011) show that laws, regulations, and motivational factors are important factors for entrepreneurship development.

Dreher and Gassebner (2013) find that the existence of a larger number of procedures required to start a business, as well as a larger minimum capital requirement are detrimental to entrepreneurship. Valdez and Richardson (2013) argue that a society's values, beliefs, and abilities may play a greater role than purely economic considerations of opportunity and transaction costs in entrepreneurship.

Branstetter *et al.* (2014) show that Portugal's deregulations to promote entrepreneurship resulted in increased firm formation and employment, but mostly among "marginal firms" (i.e. firms that are deterred by existing heavy entry regulations). Ghani *et al.* (2014) examine India and show that physical infrastructure quality and local education levels play the most important roles in promoting entry. The authors also show that while strict labor regulations discourage entrepreneurship, better household banking environments promote entry in the unorganized sector. García-Posada and Mora-Sanguinetti (2015) find that higher judicial efficacy increases the entry rate of firms, while it has no effect on the exit rate.

2. Data

In this study, we use the "United States Small Business Friendliness Survey" which is a survey done by Kauffman Foundation and Thumptack.com in 2013. This survey asks small business owners questions on their internet use for their business. The following are these questions:

- *"Did you use the internet to form/start your business?"*
- *"Have you used the internet to pay taxes on your business earnings?"*
- *"Have you used the internet to get a license or permit to do business?"*

For these questions, the respondents chose either "Yes" or "No". Then, we compute the percentage of owners who said "Yes" to these questions in each state. This way, we assign an "Internetstartscore", an "Internettaxscore", and an "Internetlicensingscore" for each state. Therefore, our first three variables are the "Internetstartscore", "Internettaxscore", and "Internetlicensingscore" variables. There are 41 states with adequate data, therefore we made our calculations for these 41 states.

The survey also asks business owners questions about firm characteristics like operating area, the percentage of local sales, firm age, firm size, and firm industry. These variables are explained below:

- Operstates 1: operating in a single state;
- Operstates 2-5: operating in two to five states;
- Operstate >5: operating in more than five states;
- Mostlocal: more than 90% of sales are within 50 miles of the firm;
- Ageofbus <1: firm is established less than a year ago;
- Ageofbus 1-2: firm is established one or two years ago;
- Ageofbus 3-4: firm is established three of four years ago;
- Ageofbus >4: firm is established more than four years ago;
- Employees 1: firm has only one employee;
- Employees 2-20: firm has two to twenty employees;
- Employees 21-50: firm has twenty-one to fifty employees;
- Employees 51-100: firm has fifty-one to one hundred employees;
- Employees >100: firm has more than one hundred employees.

The industry variables "Business", "Care", etc. are self-explanatory.

For each of the above firm characteristic variable, we compute the percentage values for each state. For example, in Virginia, what percentage of firms operate in only one state (*i.e.* Virginia)? If twenty percent of the small businesses operate in Virginia only, Virginia's "Operstates1" score is 20%. Therefore, each state in the survey has a percentage value for each of these variables.

Table 1 shows the summary statistics for our variables. All of the variables are in percentages. As we can see in Panel A, the mean "Internetstartscore" across all states is 58.21%. This means that, in the average state, 58.21% of small business owners used the internet to form/start their business. The mean "Internettaxscore" across all states is 34.54. This means that, in the average state, 34.54% of small business owners used the internet to pay

taxes on their business earnings. The mean "Internetlicensingscore" across all states is 32.94%. This means that, in the average state, 32.94% of small business owners used the internet to get a license or permit to do business.

For "Firm Operating Area", we have four variables. These are "Operstates 1", "Operstates 2-5", "Operstates > 5", and "Mostlocal". As we can see in Panel B, the mean values of these variables across all states are 64.77%, 27.64%, 7.59%, and 87.66%, respectively. These values indicate that, in the average state, 64.77% of the small firms operate in a single state, 27.64% operate in two to five states, 7.59% operate in more than five states, and 87.66% of the firms have at least 90% of their sales within fifty miles of the firm.

Panels C, D, and E show the summary statistics for "Firm Age", "Firm Size", and "Firm Industry", respectively.

Table 1. Summary Statistics (All Variables in %)

Variable	Mean	Median	Stdev	Min	Max
Panel A. Internet Score					
Internetstartscore	58.21	58.62	6.39	37.50	69.11
Internettaxscore	34.54	34.78	6.71	20.83	54.51
Internetlicensingscore	32.94	32.93	10.07	18.30	64.09
Panel B. Operational Area					
Operstates 1	64.77	67.07	12.83	33.33	85.39
Operstates 2-5	27.64	26.53	13.28	8.24	66.67
Operstates >5	7.59	7.53	2.56	0.00	15.00
Mostlocal	87.66	88.24	6.02	65.00	100.00
Panel C. Firm Age					
Ageofbus <1	6.16	6.02	2.84	0.00	11.90
Ageofbus 1-2	17.31	16.67	5.58	5.26	35.00
Ageofbus 3-4	18.06	18.63	4.26	8.70	29.03
Ageofbus >4	58.46	57.50	7.74	45.74	84.21
Panel D. Firm Size					
Employees 1	53.03	52.17	6.98	36.11	68.18
Employees 2-20	45.49	45.23	6.70	31.82	63.16
Employees 21-50	0.87	0.77	0.90	0.00	2.94
Employees 51-100	0.21	0.00	0.37	0.00	1.61
Employees >100	0.40	0.00	0.90	0.00	5.00
Panel E. Firm Industry					
Business	5.59	5.32	3.00	0.00	15.00
Care	4.48	3.88	3.05	0.00	17.39
Events	21.96	20.97	6.31	10.00	44.12
Instruction	7.04	7.26	3.32	0.00	15.00
Vehicle	2.47	2.60	1.67	0.00	5.65
Health	12.94	12.30	5.35	4.35	28.57
Home	35.03	35.42	5.54	21.74	45.00
Technology	9.73	9.52	4.97	0.00	30.00
Writing	0.77	0.47	0.91	0.00	3.66

In order to do the analyses, we run nonparametric tests (*i.e.* Mann Whitney Wilcoxon tests) that compare states with high and low scores in terms of "Internetstartscore". Then, we compare states with high and low scores in terms of "Internettaxscore". Finally, we compare states with high and low scores in terms of "Internetlicensingscore".

In order to differentiate between high and low score states in each category (*i.e.* "Internetstartscore", "Internettaxscore", and "Internetlicensingscore"), we use the mean values. The states with scores higher than the mean are classified as high-score states, and the states with scores lower than the mean are classified as low-score states.

In the next section, we first show the results of our comparisons between high-Internetstartscore states and low-Internetstartscore states. Then, we show the results of our comparisons between high-Internettaxscore states and low-Internettaxscore states. Finally, we show the results of our comparisons between high-Internetlicensingscore states and low-Internetlicensingscore states.

3. Results

Table 2 compares the firm characteristics across the high- and low- internet start score states. The last column shows the results of the Mann-Whitney Wilcoxon tests that compare the high- and low-score states.

We are seeing that there is no significant difference between the firms in the high- and low-score states in terms of their operational area. We look at the percentage of firms that operate in a single state, that operate in two to five states, and that operate in more than five states. We also look at the percentage of firms that have ninety percent or more of their sales within fifty miles. None of these percentages are significantly different in the high-score states versus in the low-score states.

While 66.14% of the firms in the high-score states operate in a single state, the corresponding percentage is 62.65% in the low-score states. This difference is statistically insignificant (p=0.1395). While 26.14% of the firms in the high-score states operate in two to five states, the corresponding percentage is 29.98% in the low-score states. This difference is also statistically insignificant (p=0.1613). Similarly, while 7.73% of the firms in the high-score states operate in more than five states, the corresponding percentage is 7.38% in the low-score states. This difference is also statistically insignificant (p=0.3393).

The comparison of the variable "mostlocal" also shows us that there is no significant difference between the two groups of states in terms of local sales. While 87.45% of the firms in the high-score states have most of their sales within fifty miles, the corresponding percentage is 87.99% in the low-score states. This difference is also statistically insignificant (p=0.3895).

With regard to firm age, the table shows that there are more firms that are three or four years of age in the high-score states. 19.40% of the firms in the high-score states are three or four years old, while only 15.98% of the firms in the low-score states are three or four years old. This difference is statistically significant (p=0.0168). On the other hand, the table shows that there are more firms that are older than four years in the low-score states. While 56.24% of the firms in the high-score states are older than four years, the corresponding percentage is 61.93% in the low-score states. This difference is also statistically significant (p=0.0501). We do not find any significant difference between the two groups in terms of younger firms (i.e. less than one-year old, or one or two years old firms).

With regard to firm size, we are seeing that there are more firms with at least a hundred employees in the high-score states when compared to the low-score states. While 0.50% of the firms in the high-score states have at least a hundred employees, the corresponding percentage is only 0.25% in the low-score states. This difference is statistically significant (p=0.0931). We do not see any significant difference between the two groups in other size groups.

With regard to firm industry, we are seeing that there is no significant difference between the two groups except for the "Home" industry. There are more firms in the low-score states that are in the "Home" industry when compared to the high-score states. While 33.50% of the firms in the high-score states are in this industry, the corresponding percentage is 37.42% in the low-score states. This difference is statistically significant (p=0.0058).

Table 2. Comparison of High- and Low-Internetstart Score States

Variable	High-Score		Low-Score		Mann-W.
	Mean	Med.	Mean	Med.	p-value
Panel A. Operational Area					
Operstates1	66.14	69.27	62.65	65.95	0.1395
Operstates2-5	26.14	22.35	29.98	28.04	0.1613
Operstates>5	7.73	8.24	7.38	7.25	0.3393
Mostlocal	87.45	87.56	87.99	88.53	0.3895
Panel B. Firm Age					
Ageofbus<1	6.51	6.25	5.62	5.33	0.1021
Ageofbus1-2	17.85	16.67	16.47	16.64	0.3105
Ageofbus3-4	19.40	18.99	15.98	17.80	**0.0168
Ageofbus>4	56.24	57.14	61.93	59.62	*0.0501
Panel C. Firm Size					
Employees1	53.44	51.89	52.38	52.32	0.4680
Employees2-20	44.85	45.16	46.49	45.71	0.3248
Employees21-50	0.97	0.77	0.73	0.64	0.2498
Employees51-100	0.25	0.00	0.15	0.00	0.2055
Employees>100	0.50	0.00	0.25	0.00	*0.0931

Panel D. Firm Industry					
Business	5.73	5.71	5.36	4.97	0.1424
Care	4.36	3.63	4.67	4.51	0.3393
Events	22.74	21.08	20.74	20.21	0.1549
Instruction	7.55	7.45	6.23	6.16	0.1337
Vehicle	2.60	2.60	2.26	2.68	0.3007
Health	13.33	12.30	12.33	12.16	0.3152
Home	33.50	34.09	37.42	37.12	***0.0058
Technology	9.39	9.52	10.27	9.20	0.4627
Writing	0.80	0.77	0.72	0.22	0.2835

Table 3 compares the firm characteristics across the high- and low- internet tax score states. The last column shows the results of the Mann-Whitney Wilcoxon tests that compare the high- and low-score scores.

We are seeing that there is no significant difference between the firms in the high- and low- tax score states in terms of their operational area. However, we are seeing that the difference in the variable "mostlocal" is statistically significant. There are more firms in the high-tax score states that have most of their sales local when compared to the low-tax score states. While 89.33% of the firms in the high-tax score states have most of their sales local, only 85.53% of the firms in the low-tax score states have most of their sales local. This difference is significant (p=0.0403).

With regard to firm age, there are more relatively younger firms in the high-tax score states compared to the low-tax score states. 6.83% of the firms in the high-score states are less than one-year old, while only 5.31% of the firms in the low-score states are less than one-year old. This difference is statistically significant (p=0.0172). 18.66% of the firms in the high-score states are three or four years old, while the corresponding percentage is 17.31% in the low-score states. This difference is also statistically significant (p=0.0671). We do not find any significant difference between the two groups in terms of other age groups.

With regard to firm size, we are seeing that there are more firms with fifty-one to a hundred employees in the high-score states when compared to the low-score states. While 0.27% of the firms in the high-score states have fifty-one to a hundred employees, the corresponding percentage is only 0.13% in the low-score states. This difference is statistically significant (p=0.0986). We do not see any significant difference between the two groups in other size groups.

Table 3. Comparison of High- and Low-Internettax Score States

Variable	High-Score		Low-Score		Mann-W.
	Mean	Med.	Mean	Med.	p-value
Panel A. Operational Area					
Operstates 1	65.87	67.07	63.37	67.01	0.2772
Operstates 2-5	26.83	25.45	28.66	27.02	0.4065
Operstates >5	7.30	7.31	7.97	7.93	0.2230
Mostlocal	89.33	88.82	85.53	86.98	**0.0403
Panel B. Firm Age					
Ageofbus <1	6.83	6.67	5.31	5.27	**0.0172
Ageofbus 1-2	16.52	16.98	18.33	16.32	0.3276
Ageofbus 3-4	18.66	19.15	17.31	17.54	*0.0671
Ageofbus >4	57.99	56.25	59.06	58.51	0.2241
Panel C. Firm Size					
Employees 1	53.09	51.61	52.94	53.63	0.2039
Employees 2-20	45.43	45.28	45.56	44.83	0.3614
Employees 21-50	0.86	0.79	0.88	0.51	0.4676
Employees 51-100	0.27	0.00	0.13	0.00	*0.0986
Employees >100	0.34	0.00	0.49	0.00	0.3006
Panel D. Firm Industry					
Business	5.00	5.00	6.33	6.17	**0.0339
Care	4.30	3.77	4.71	4.45	0.4895
Events	20.49	20.97	23.83	21.46	0.1528
Instruction	7.57	7.26	6.35	6.88	0.1755
Vehicle	2.58	2.60	2.33	2.64	0.3416
Health	13.49	11.94	12.24	12.40	0.3713
Home	36.21	36.21	33.52	34.39	*0.0742

Technology	9.38	9.52	10.18	9.20	0.4322
Writing	0.97	0.77	0.50	0.00	*0.0828

With regard to firm industry, we are seeing that there are more firms in the high-score states that are in the "Home" industry or in the "Writing" industry when compared to the high-score states. On the other hand, there are more firms in the low-score states that are in the "Business" industry.

Table 4 compares the firm characteristics across the high- and low- internet licensing score states. The last column shows the results of the Mann-Whitney Wilcoxon tests that compare the high- and low-score scores.

We are seeing that there is no significant difference between the two groups of states in terms of operational area, local sales, or firm age. None of the variables related to the operational area or firm age is statistically significant.

On the other hand, with regard to firm size, we are seeing that there are more single-employee firms in the high-score states when compared to the low-score states. While 55.03% of the firms in the high-score states are single-employee firms, the corresponding percentage is only 51.12% in the low-score states. This difference is statistically significant (p=0.0190). Interestingly, the table shows that there are more firms with two to twenty employees in the low-score states when compared to high-score states. While 43.49% of the firms in the high-score states have two to twenty employees, the corresponding percentage is 47.39% in the low-score states. This difference is also statistically significant (p=0.0105). We do not see any significant difference between the two groups in other size groups.

With regard to firm industry, we are seeing that there are more firms in the high-score states that are in the "Instruction", "Technology" and "Writing" industries when compared to the high-score states. On the other hand, there are more firms in the low-score states that are in the "Business" and "Care" industries.

Table 4. Comparison of High- and Low-Internetlicensing Score States

Variable	High-Score		Low-Score		Mann-W.
	Mean	Med.	Mean	Med.	p-value
Panel A. Operational Area					
Operstates1	67.28	67.78	62.39	66.31	0.1673
Operstates2-5	24.86	25.86	30.28	26.53	0.2019
Operstates>5	7.86	8.64	7.33	7.19	0.1395
Mostlocal	87.82	88.19	87.52	88.24	0.4844
Panel B. Firm Age					
Ageofbus<1	6.21	6.35	6.12	5.66	0.3193
Ageofbus1-2	18.23	17.55	16.44	15.76	0.1283
Ageofbus3-4	18.39	18.93	17.75	18.30	0.2786
Ageofbus>4	57.17	56.70	59.68	58.33	0.1705
Panel C. Firm Size					
Employees1	55.03	55.00	51.12	51.29	**0.0190
Employees2-20	43.49	44.07	47.39	47.83	**0.0105
Employees21-50	0.74	0.29	1.00	0.86	0.1566
Employees51-100	0.27	0.00	0.15	0.00	0.3385
Employees>100	0.47	0.00	0.34	0.00	0.2618
Panel D. Firm Industry					
Business	4.44	4.91	6.68	6.47	***0.0024
Care	3.88	3.33	5.05	4.42	*0.0960
Events	20.47	20.54	23.38	21.08	0.1911
Instruction	7.65	8.41	6.46	6.03	*0.0668
Vehicle	2.50	2.55	2.44	2.78	0.4844
Health	14.10	12.22	11.84	12.30	0.3147
Home	34.90	35.21	35.15	35.61	0.4844
Technology	11.01	10.78	8.52	8.15	***0.0064
Writing	1.05	0.82	0.49	0.00	**0.0442

Conclusion

In this study, we examine the relation between internet usage in entrepreneurial process and small firm characteristics. The "United States Small Business Friendliness Survey" done by Kauffman Foundation and Thumptack.com in 2013 is employed. This survey asks small business owners questions about their firm and their

state's online startup, tax payment, and licensing systems. Using the responses from each state, we first compute each state's scores on internet startup, internet tax payment and internet licensing. Then, we compare several small firm characteristics like operational area, firm age, size, and industry across high- and low- internet startup, internet tax payment and internet licensing score states.

When we compare the firm characteristics in the states with a high internet startup score versus in the states with a low internet startup score, we find significant differences in terms of firms' age. Older firms (*i.e.* firms that are older than four years) are more concentrated in the low-score states. Younger firms are more concentrated in the high-score states. Relatively larger firms are more concentrated in the states with high-internet startup scores. On the other hand, we do not find any significant difference in high- versus low-score states in terms of the firms' operational area. Also, we do not find any significant difference in terms of the firms' industry (except for "home" industry).

When we compare the firm characteristics in the states with a high internet tax payment score versus in the states with a low internet tax payment score, we find significant differences in terms of firms' age. Younger firms are more concentrated in the high-score states. Relatively larger firms are more concentrated in the states with high-internet tax payment scores. Although we do not find any significant difference in high- versus low-score states in terms of the firms' operational area, our results show that there are more firms with local sales in the high-score states. Our results also show that there are more firms in the "Home" and "Writing" industries and fewer firms in the "Business" industry in the high-score states.

Finally, when we compare the firm characteristics in the states with a high internet licensing score versus in the states with a low internet licensing score, we do not find any significant difference in terms of firms' age. With respect to firm size, single employee firms are more concentrated in the states with high-internet licensing scores. On the other hand, firms with 2-20 employees are more concentrated in the states with low-internet licensing scores. On the other hand, we do not find any significant difference in high- versus low-score states in terms of the firms' operational area. With respect to industries, we find significant differences. There are more firms in the "Instruction", "Technology" and "Writing" industries and fewer firms in the "Business" and "Care" industries in the high-internet licensing score states.

Our results indicate that certain types of small firms are more concentrated in the high-internet score states. Therefore, if a state wants to attract certain types of small firms into their states, they can utilize the findings here when making their investment decisions.

References

[1] Acs, Z.J., Braunerhjelm, P., Audretsch, D.B. and Carlsson, B. 2009. The knowledge spillover theory of entrepreneurship. *Small business economics,* 32(1): 15-30

[2] Acs, Z.J. and Szerb, L. 2007. Entrepreneurship, economic growth and public policy. *Small business economics*, 28(2-3): 109-122

[3] Aidis, R., Estrin, S. and Mickiewicz, T. 2008. Institutions and entrepreneurship development in Russia: A comparative perspective. *Journal of Business Venturing*, 23(6): 656-672.

[4] Aidis, R., Welter, F., Smallbone, D. and Isakova, N. 2007. Female entrepreneurship in transition economies: The case of Lithuania and Ukraine. *Feminist Economics*, 13(2):157-183.

[5] Bitzenis, A., and Nito, E. 2005. Obstacles to entrepreneurship in a transition business environment: the case of Albania. *Journal of Small Business and Enterprise Development*, 12(4): 564-578.

[6] Bransetter, L., Lima, F., Taylor, L.J. and Venâncio. A. 2014. Do entry regulations deter entrepreneurship and job creation? Evidence from recent reforms in Portugal. *The Economic Journal,* 124(577): 805-832.

[7] Dreher, A., and Gassebner, M. 2013. Greasing the wheels? The impact of regulations and corruption on firm entry. *Public Choice*, 155(3-4): 413-432.

[8] García-Posada, M., and Mora-Sanguinetti, J.S. 2015. Entrepreneurship and enforcement institutions: Disaggregated evidence for Spain. *European Journal of Law and Economics*, 40 (1): 49-74, Springer.

[9] Gartner, W.B. and Shane, S.A. 1995. Measuring entrepreneurship over time. *Journal of Business Venturing,* 10(4): 283-301.

[10] Ghani, E., Kerr, W.R. and O'connell, S. 2014. Spatial determinants of entrepreneurship in India. *Regional Studies,* 48(6): 1071-1089.

[11] Klapper, L, Laeven, L. and Rajan, R. 2006. Entry regulation as a barrier to entrepreneurship. *Journal of Financial Economics*, 82(3): 591-629.

[12] Manolova, T.S., Eunni, R.V., Gyoshev. B.S. 2008. Institutional environments for entrepreneurship: Evidence from emerging economies in Eastern Europe. *Entrepreneurship Theory and Practice*, 32(1): 203-218.

[13] Nawaser, K., Khaksar, S.M.S., Shaksian, F. and Jahanshahi, A.A. 2011. Motivational and legal barriers of entrepreneurship development. *International Journal of Business and Management*, 6(11): 112, Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.836.739&rep=rep1&type=pdf

[14] Nyström, K. 2008. The institutions of economic freedom and entrepreneurship: evidence from panel data. *Public Choice*, 136(3-4): 269-282.

[15] Ovaska, T., and Russell, S.S. 2005. Entrepreneurship in post-socialist economies. *Journal of Private Enterprise,* 21(1): 8-28.

[16] Parker, S.C. 2007. Law and the Economics of Entrepreneurship. *Comparative Labor Law & Policy Journal*, 28(4): 22-32.

[17] Smallbone, D, Welter, F., Voytovich, A., and Egorov. I. 2010. Government and entrepreneurship in transition economies: the case of small firms in business services in Ukraine. *The Service Industries Journal*, 30(5): 655-670.

[18] Sobel, R.S., Clark, J.R. and Lee, D.R. 2007. Freedom, barriers to entry, entrepreneurship, and economic progress. *The Review of Austrian Economics*, 20(4): 221-236.

[19] Stephan, U., and Uhlaner, L.M. 2010. Performance-based vs socially supportive culture: A cross-national study of descriptive norms and entrepreneurship. *Journal of International Business Studies*, 41(8): 1347-1364.

[20] Valdez, M.E., and Richardson, J. 2013. Institutional Determinants of Macro-Level Entrepreneurship. *Entrepreneurship Theory and Practice*, 37(5): 1149-1175.

[21] Van Stel, A., Storey, D.J. and Thurik, A.R. 2007. The effect of business regulations on nascent and young business entrepreneurship. *Small Business Economics*, 28(2-3): 171-186.

[22] Welter, F. 2004. The environment for female entrepreneurship in Germany. *Journal of Small Business and Enterprise Development*, 11(2): 212-221.

[23] Wennekers, S., and Thurik, R. 1999. Linking entrepreneurship and economic growth. *Small business economics,* 13(1), 27-56.

[24] Zahra, S.A. and Garvis, D.M. 2000. International corporate entrepreneurship and firm performance: The moderating effect of international environmental hostility. *Journal of Business Venturing*, 15(5): 469-492.

Risk Indicators and Risk Management Models for an Integrated Group of Enterprises

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Abstract:

The study is aimed at analyzing and developing a set of economic and mathematical models and methods for assessing the risk of market activity of structural divisions of a holding, their clustering in terms of risk level and selection of the optimal production and investment strategy of the holding with regard to risk factors. As part of the analyzed indicators, it is suggested to take into account those characterizing the risks in the main areas of the market activity of the structural divisions of a holding company: operational, financial and investment areas. In the paper, financial coefficients – risk indicators of the holding structural divisions in these areas were selected and justified for effective use of the regulatory approach to risk assessment, and numerical algorithms for their calculation were proposed. A numerical method for clustering the holding subdivisions according to the level of risk is presented. The economic-mathematical models and numerical methods for selecting the optimal investment strategy of the holding company were developed and verified, based on the Cost-Benefit Analysis (CBA) approach. The originality of the work lies in the proposed "end-to-end" procedure for assessing and managing the risks of an integrated production structure.

Keywords: integrated group of enterprises; risk; clustering and grouping methods; cost-benefit analysis; optimization model; mathematical programming problems; discrete optimization

JEL Classification: C61; D61; G32

Introduction

A significant (multiple) increase in investment in the real sector makes the basis for the growth of the Russian economy and the economies of Eastern European countries. The experience of developed countries with a market economy clearly demonstrates the following trend: the technological and product innovations is advanced by small venture enterprises taking risks and using the flexibility factor of the production program and labor mobility, and these innovations are implemented by large and, primarily, integrated structures focused on the growth of market efficiency by means of saving at a scale and diversifying risks according to the areas of activity. These features of integrated production structures and their main form - a vertically integrated holding company enable to increase the efficiency of production and investment strategies in conditions of a managed increase in the synergy of combining specific assets and reducing risks in the main areas of market activity: production, financing and investment. This explains the relevance of the topic of this research.

The main tasks of the study include selection and justification of financial coefficients – risk indicators of structural units of an integrated group of enterprises (IGE) in the production, financial and investment spheres of market activity; the development of methods for clustering subdivisions of the holding company into groups of structural business units that are homogeneous in terms of risk; development and verification of economic and mathematical models and numerical methods for optimal management of the investment activity of a vertically integrated holding company with regard to risk.

A vertically integrated production holding company whose subdivisions function in the conditions of uncertainty and risk of commodity, material and financial markets is the object of the study. Economic and

mathematical models and numerical algorithms for optimal management of the production and investment spheres of vertically integrated holding companies, taking into account the risks and limitations for own and company-wide resources are the subject of the study.

1. Literature Review

The problems of analysis, evaluation and accounting of external and internal risks in the planning tasks of production and financial activities of economic entities are sufficiently detailed by researchers as: Apalkova and Mishchenko (2017), Batkovsky (2015), Ehrhardt and Brigham (2009), Brodtsky and Baybuza (2015), Granaturov (2010), Maximov (2011), Maximov and Khalikov (2012), Mishchenko et al. (2017), Knight (1921), Stupakov and Tokarenko (2005), Tikhomirov and Tikhomirova (2010), Tapman (2002), Khalikov (2009), Khalikov and Maximov (2015), Sheremet (2011), Mishchenko and Khalikov (1993). It should be noted, however, that the manifestation of risk under conditions of vertical and horizontal integration and its impact on the magnitude of the synergistic effect of the IGE have not been adequately studied, as noted in a number of cited papers and, in particular, by Khalikov and Maximov (2015).

The development of a frame of models and methods for clustering subdivisions - structural business units according to the level of risk adapted to the market conditions of the IGE, enabling to select a substantiated investment strategy for a group of enterprises in conditions of intra-company competition for investment resources remains an important problem. The arsenal of models and methods for clustering the market environment objects according to the level of risk is widely represented by Abbyasova and Shabalina (2016), Dubrov, Mhitaryan and Troshin (1998), Duran and Odell (1974), and Mynin (2008), whose works predetermined the possibility of its use within the framework of this study.

The range of problems relating to the selection of priorities and directions for the implementation of the IGE investment strategy is important in the framework of providing insight into the prospects for integrating enterprises in the context of completion of market reforms. There is a certain scientific and practical reserve here, which should include the following researches (Apalkova and Mishchenko 2017, Batkovsky et al. 2015, Brodetsky and Baybuza 2015, Maximov and Khalikov 2012, Mishchenko et al. 2017, Shabalina 2017, Shchepilov 2004, Chursin et al. 2016, Kiselakova et al. 2016, Maximov and Khalikov 2016, Sycheva et al. 2017).

2. Methodology

The coefficient method, cash flow method, normative method of risk assessment, methods of clustering homogeneous objects of socio-economic nature and mathematical programming methods were used in the research.

The novelty of the research results consists in developing a normative approach to assessing the market activity risk of a manufacturing enterprise included in an integrated group, which, on the one hand, expands its production and investment potentials, and, on the other hand, imposes additional constraints on the compatibility of production and investment programs of this enterprise with the programs of neighboring ones included in one production and technological chain; in designing models and methods for optimal management of the investment activity of a vertically integrated holding company with regard to the constraints to the size of investment capital and to the risk of individual structural divisions.

The theoretical significance of the research lies in the development of the theory of risk and optimal management of market activity of integrated production structures, including vertically integrated holding companies. The practical importance of the research is determined by the development of economic and mathematical frame of models and methods, oriented to the growth of economic stability and efficiency of large enterprises of the corporate sector of the economy.

3. Problem setting

The modern era demonstrates the growing role of technological innovation and investment. While small enterprises are apt to generate innovations, the necessary financial and resource base for their implementation, adequate organization and management of industrial workflows at large production complexes can only be within the powers of large integrated structures that provide the prerequisite for successful innovation – unhindered horizontal communications between mass production, inventive and research activities (Belchenko 2010, Brodetsky and Baybuza 2015, Mishchenko et al. 2017, Shabalina 2017, Shchepilov 2004).

Thus, large integrated structures and, primarily, production holding companies ensure the continuity of the process of generating and introducing innovations in the modern economy and are an institutional basis of the investment-innovative model of its development.

This conclusion is vividly confirmed by statistics on the distribution of the gross marginal product between the groups of large, medium and small producers in such a seemingly low in terms of capital concentration and highly competitive industry as the agrarian sector of the Russian economy in which a group of large agricultural producers, and, primarily, of agribusiness holding companies, demonstrates steady growth (Figure 1, Table 1).

The most important feature of holding structures is the integration of business processes and the growth of synergistic effects of combining specific and inter-specific assets along a single production and technological chain. Such effects are manifested by saving on external costs of market exchange and intra-firm costs of coordination and planning (Belchenko 2010, Shchepilov 2004). But their influence is limited only by the medium-term period, which directly follows the stages of formation and development of an integrated group of enterprises (hereinafter, vertically integrated production holding company).

In the long term, intra-group transaction costs increase through planning and coordination costs and reduce the benefits of economies by the scale and intra-company transactions (Belchenko 2010, Maximov and Khalikov 2012). The uncertainty of the market (external) environment and the above mentioned institutional features of the corporate (internal) environment of the integrated production structure multiply the risk of lowering the profitability of the holding's core production activities and return on assets of the interconnected structural subdivisions – business units (SBUs). In Table 1 decrease in the net profit of ten largest Russian agribusiness holding companies in the period 2013-2016 is connected not only with the influence of macroeconomic factors and agribusiness peculiarities, but also with shortcomings of intra-corporate risk management and strategic planning in the production and, especially, investment spheres of activity.

Table 1. Net profit of agribusiness holding companies in 2013-2014

Company	Net profit, RUB mln			Net profit fluctuation (%)		
	2014	2015	2016	2014/2013	2015/2014	2016/2015
Miratorg Agribusiness Holding Company	16,396.0	21,085.0	13,782.4	169.8	128.6	65.4
Rusagro GC	20,177.0	23,690.0	13,675.0	630.1	117.4	57.7
Cherkizovo Group	13,318.0	6,020.8	1,919.0	638.1	45.2	31.9
Agro-Belogorie GC	5,990.0	5,983.0	3,044.1	354.4	99.9	50.9
BEZRK-Belgrankorm Agribusiness Holding Company	3,571.0	6,000.0	5,400.0	357.1	168.0	90.0
Prodimex Holding	3,571.0	6,000.0	5,400.0	357.1	168.0	90.0
Tkachev Agrokompleks Firm JSC	4,145.4	6,645.4	2,944.0	165.0	160.3	44.3
Cosmos Group Agribusiness Holding Company	1,157.5	586.3	621.0	-1,373.8	50.7	105.9
Prioskolie CJSC	4,877.0	1,736.1	1,981.7	120.5	35.6	114.1

Source: compiled by the authors based on BEFL Russian Agribusiness Companies' Rating 2015 and Agribusiness
   Companies' Rating 2017

Figure 1. Total cash receipts from farm marketings in the RF by the producers' categories (at actual prices for 2016)
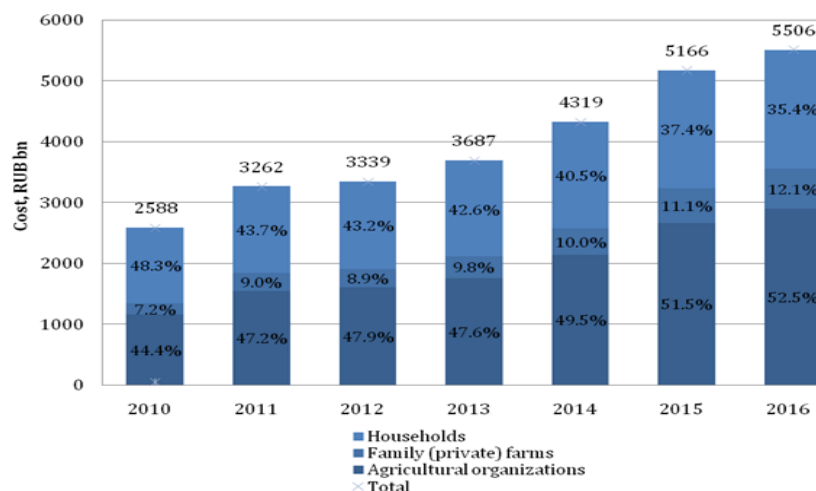
Source: compiled by the authors based on BEFL Russian Agribusiness Companies' Rating 2015 and
   Agribusiness Companies' Rating 2017

At the long-term stage, particular importance is attached to the investment activity of the holding company's SBUs that is aimed at strengthening the achieved competitive advantages and reducing the risk. This emphasizes the need to improve the conventional and develop original economic and mathematical models and methods for assessing and managing risk and selecting the optimal investment strategy of the production holding company.

4. Results

An important role in increasing the synergy of integration and enhancing the IGE efficiency is played by the organizational and technical structure, principles and mechanisms for arranging intra-firm investment activities. Belchenko (2010) and Shchepilov (2004) consider the main options of formation of a holding company's centralized investment fund.

According to the first option, the SBUs transfer part of its retained earnings to finance general corporate projects, and use the remaining funds to implement their own projects.

In this case, some projects will prove to be ineffective from the position of the holding company, since the expected systemic effect is likely to be lower than the superadditive one. Therefore, in the conditions of complete decentralization in financing of investment activities of the holding company's subdivisions, the overall efficiency of the projects planned for implementation will be lower in comparison with the corporate projects, as specifically mentioned in (Belchenko 2010).

According to the second option of financing investment projects of the holding company's divisions, it is supposed to implement a single investment program. In this case, corporate projects are financed by all SBUs by deducting a pre-specified share of profits in the holding's centralized investment fund. The average value of the economic effect per 1,000 rubles of the funds spent is determined for innovations that are not general corporate projects, but are included in the business plan of the holding company. While pursuing this option, the implementation of the investment project that is included in the holding company's business plan is financed by the SBU it is concerned with. If this SBE lacks own funds, additional costs are paid from the centralized investment fund of the holding. For SBUs that have invested their own funds in the centralized investment fund of the holding company, interest charges are payable, corresponding to the average profitability of the projects included in the corporate business plan of the holding company.

According to the third option of financing intra-company investments, it is assumed that along with the retained earnings of individual SBUs, the consolidated funds of the holding company which are administered by the management company (MC), as well as outside funds attracted from third-party investors, are also sources of financing. This option is implemented in the form of a mechanism for coordinating the interests of the MC and each SBU or individual SBUs with each other.

Multivariance and the availability of alternative schemes for financing the holding company's investment activities predetermine the need to choose the optimal option that is a compromise for an individual SBU and the MC and ensures a reduction in intra-firm transaction costs of harmonizing investment programs.

Thus, an important role is assigned to the task of developing methods for assessing the risk of market activity of the holding company's structural subdivisions, their clustering into groups that are homogeneous in terms of risk, and choosing a scheme for financing intra-firm innovations.

To assess the risk of the SBU, which is part of the holding company's organizational structure, the noted features of its functioning will be taken into account, considering in particular, the integration of investment and financial flows within the management company that acts as an "internal investment bank".

Funds allocated by the management company to structural business units – transfer deductions, due to high liquidity and low risk of profitability loss, can be equated to their own funds. This is the basis for the following parameters to be used as risk indicators of the financial, production and investment spheres of the holding company's SBEs (Abbyasova and Shabalina 2016, Brealey *et al*. 2016, Maximov and Khalikov 2012, Shabalina 2017):

- ▪ an equity-assets ratio "expanded" by the amount of transfer deductions is a risk indicator of the SBU's financial sphere:

$$K_a^{(x)} = \frac{EQ+TR}{TA},\qquad\qquad(1)$$

where: *TR* are transfer deductions of the MC to the SBU; *TA* – the SBU's balance sheet currency with regard to TR; *EQ* is the SBU's equity capital.

- the rate of return per a ruble of investments in production costs is an indicator of the SBUs' production sphere risk in the conditions of an expanded base of their financing, including own funds of SBUs and attracted funds of the MC:

$$\text{ROA}^{(x)} = \frac{\text{NOPLAT}^{(t)}}{\text{PK}^{(t)}},$$ (2)

where: *PK* is the average book value of assets in the production sphere of the SBU under study; *NOPLAT* is the indicator of the operating normalized profit adjusted for the amount of taxes.

It should be noted that the *NOPLAT* is an objective indicator of the return of the SBU's working capital, since the adjustment of the financial result to taxes and interest makes it possible not to account for the impact exerted by tax rates and non-permanent factors of the capital structure on the evaluation of the result obtained in the production sphere, which enables to compare various subdivisions of the holding company in terms of this indicator when they differ both in the scale of production, and in the level of specificity and risk of working capital (Shabalina 2017);

- the rate of return (profitability) of the initial and current investments in the company's cash flows is an indicator of the SBU's investment sphere risk:

$$ROAAM_t = \frac{NOPLAT_t + A_t - I_t}{I_0},$$ (3)

where: A_t is depreciation of assets PA_t of the enterprise's production sphere, accrued in period t and calculated at book value; I_0 - initial investment in the working capital; I_t - current investment in production assets.

The resulted risk indicators of financial, production and investment spheres of market activity of the holding company's subdivisions and scales corresponding to their level allow organizing correctly the procedure of dividing SBU into homogeneous clusters. The procedure for clustering the holding company's subdivisions by the level of risk is presented in detail in (Abbyasova and Shabalina 2016). Below is a brief description of the algorithm.

The *i*-th SBU ($i = \overline{1, I}$) is understood to be the object, and the quantitative assessment of the risk of its production, financial and investment spheres is seen as the attribute. Let us use the agglomeration method of cluster analysis (Apalkova and Mishchenko 2017) based on the consecutive connection of objects into clusters, which appeared to get close to each other at the next step of the algorithm.

The first step of the algorithm assumes that each SBU is an independent cluster (the number of clusters is equal to I). The SBUs that are included in one of the newly formed clusters must belong to one of the four risk groups (minimum, allowable, critical, or catastrophic). To implement the clustering procedure, let us define the metric $\rho(x_1, x_l)$ in the object space from the list: the Euclidean distance, the weighted Euclidean distance, the Jeffries-Matusita measure, the Hamming distance, the divergence coefficient. Quite often, the Euclidean distance acts as a metric. However, when conducting the cluster analysis, the researcher should use different metrics and select a metric that is appropriate from the researcher's position based on the results of the comparison. In accordance with the determined metric, pairwise distances between the SBU and the distance matrix are calculated; the minimal element (s_0, l_0), corresponding to $\min \rho(x_s, x_l)$ is found for this matrix.

The next step is to recalculate the distance matrix. As a result of uniting the SBU with the numbers s_0 and l_0 in one cluster, the dimension of the obtained matrix was reduced by a unity. In this case, the first cluster: $\rho((x_{s_0}, x_{l_0}); x_m)$ is the distance between the first cluster formed (s_0, l_0) and the object with the number m, acting as an independent cluster.

The distance between clusters is found using the following metrics: average distance (average-link method), maximum local distance ("far-neighbor" algorithm), and minimum local distance ("nearest-neighbor" algorithm).

The dimension of the distance matrix for implementation of each step of the clustering procedure is reduced by a unity. At the final step of the algorithm, one cluster is formed, combining all the previous clusters. The selection of the method for calculating the distances between clusters depends on the preferences of the researcher. It is recommended to perform clustering using various metrics, and then compare the results obtained. It is desirable that the final clustering would differ insignificantly.

To determine the total number of clusters is an important task of identifying the holding company's subdivisions in terms of the level of market activity risk. In our case, it acquires a special significance, because the number of risk-homogeneous clusters is limited to four: the first relates to the risk-free zone and includes units with a high level of market activity stability; the second cluster includes SBUs with an acceptable market activity risk;

the SBUs with a critical risk level refer to the third and the fourth covers the SBUs with the highest risk level (the catastrophic risk zone).

Proceeding from the formulation of the problem under consideration and determining that the total number of clusters should not be more than four, let us select the metric and the division quality functional corresponding to the selected metric (Duran 1974) which will guarantee the correct division of the SBUs into a certain number of clusters.

It should be noted that as a result of dividing the SBUs into groups that are homogeneous in terms of risk level, the number of clusters is not necessarily equal to four, for the following reasons.

Thus, some SBUs are not homogeneous in terms of risk in some spheres of market activity, which results in the possible belonging of some SBU to adjacent or even opposite risk zones. The inadequacy and (or) incorrectness of the information used in carrying out the clustering algorithm is likely to cause the appearance of heterogeneous clusters.

In addition, it should be noted that there may be a problem of the contradictory nature of the risk zones, when the SBU cannot be unambiguously assigned to a certain risk group due to combination of risks, and also a problem when the SBU is in an intermediate position between the adjacent risk zones.

A situation is possible when the SBU is in the borderline between the areas of acceptable and critical risk. To clarify the true situation, it is necessary to conduct an additional risk analysis for the analyzed spheres of market activity.

Based on the results of cluster analysis, at the next stage it is possible to organize economic and mathematical modeling of the holding company's optimal investment strategy either within the framework of the CBA concept (Cost-Benefit Analysis), or using the classical vector optimization method with criteria for minimum investment costs of the holding company's subdivisions, or for the maximum of the financial result from the implementation of the planned investment programs. In some specified sense, these approaches are alternative.

Let us consider the problem of choosing the optimal investment strategy of a production holding company focused on reducing risk in the production, financial and investment spheres of activity. In the conditions of the partially decentralized organizational structure of the holding company, each SBU independently forms an investment program financed from its own resources, borrowed funds and funds attracted from the centralized investment fund of the holding company, formed on the principles discussed above.

Within the framework of this formulation of the problem of choosing the investment strategy of the holding company, its formalization can be carried out within the framework of the CBA concept of 'cost-effect', which assumes the principal possibility of expert assessment (in terms of points) of the results of implementing individual investment projects (IP) of the SBU in three considered spheres of market activity. The SBU cost estimation can be based on both market and internal (transfer) prices.

Next we use the following notation for variables:

- $i = 1, \cdots, I_q$ - the SBU index of the q-th group ($q = 0, 1, 2, 3$); where "0" means no risk of market activity; "1" denotes an acceptable level of risk; "2" denotes a critical level of risk and "3" is used for a catastrophic level of risk;
- $j = 1, \cdots, J_i$ – the investment project (IP) index of the i-th SBU;
- l is the index of the estimated sphere of the SBU's market activity ("1" – operating (production), "2" – financial, "3" – investment spheres);
- $b_{i,l}$ is scoring of the estimated risk reduction level of the i-th SBU in the sphere l;
- $a_{i,j,l}$ is scoring of the planned risk reduction level of the i-th SBU in the sphere l in case of implementation of the j-th IP;
- $c_{i,j}$ are costs for the implementation of the j-th IP of the i-th SBU;
- $x_{i,j}$ is the sought-for intensity of the j-th IP of the i-th SBU ("1" - the project is accepted, "0" - the project is rejected).

A discrete model for the formation of an optimal strategy for the i-th group of the SBU, based on the minimum cost criterion, is presented in (Abbyasova and Shabalina 2016) and includes the following equations:

$$\sum_{i=1}^{I_q} \sum_{j=1}^{J_i} c_{i,j} \cdot x_{i,j} \rightarrow \min; \tag{4}$$

$$\sum_{j=1}^{J_i} a_{i,j,l} \cdot x_{i,j} \geq b_{i,l}, i = 1, \cdots, I_q, l = 1, 2, 3; \tag{5}$$

$$\sum_{j=1}^{J_i} x_{i,j} \leq 1, i = 1, \cdots, I_q, \tag{6}$$

$$x_{i,j} = \begin{cases} 0 \\ 1 \end{cases}, i = 1, \cdots, I_q, j = 1, \cdots, J_i. \tag{7}$$

The problem (4) - (7) relates to dimensional Boolean programming problems $\sum_{i=1}^{I_q} 2^{J_i}$ and can be effectively solved by a direct-search algorithm based on the lexicographic ordering of binary vectors of dimension $I_q \times J_i$ (J_i in this case means the IP set for a certain SBU having the greatest power).

An alternative approach to the solution of problem (4) - (7) is based on the search for the solution of the corresponding continuous analogue, in which the integrality restrictions (7) are replaced by the restrictions of the non-negativity of the variables:

$$x_{i,j} \geq 0, i = 1, \cdots, I_q, j = 1, \cdots, J_i. \tag{7'}$$

The equations (4)-(7 ') correspond to a dual objective:

$$\sum_{i=1}^{I_q} \sum_{l=1}^{3} b_{i,l} \cdot u_{i,l} - \sum_{i=1}^{I_q} t_i \to \max; \tag{8}$$

$$\sum_{l=1}^{3} a_{i,j,l} \cdot u_{i,l} - t_i \leq c_{i,j}, i = 1, \cdots, I_q, j = 1, \cdots, J_i; \tag{9}$$

$$u_{i,l} \geq 0, t_i \geq 0, i = 1, \cdots, I_q, l = 1,2,3. \tag{10}$$

In problem (8) - (10): $u_{i,l}$ is a dual estimate of a given level, by which it is necessary to reduce the risk (to increase the efficiency) of the *i*-th sphere of the SBU of the *q*-th group; t_i is the dual estimate of the *i*-th SBU.

Considering further the iterative procedure for finding the optimal solution of problem (4) - (7), let us denote variables related to the *k*-th step of the algorithm with the k index. In particular, at the *k*-th step, the solutions $x_{i,j}^0(k)$ and $u_{i,l}(k)$ of the conjugate problems (4) - (7) and (8) - (10), which enables to determine the vector $\bar{t}(k)$ of the SBU dual estimates:

$$t_i(k) = \max_{j=1,J_i} \{ \sum_{l=1}^{3} a_{i,j,l} \cdot u_{i,l}(k) - c_{i,j}; 0 \}, i = 1, \cdots, I_q. \tag{11}$$

The use of the method of determining the estimates $t_i(k)$ on the basis of equation (11) is dictated by the necessity to satisfy the relations of the duality theorems. Economic interpretation (11) is obvious: at the *k*-th step, the estimate of the *i*-th SBU is defined as corresponding to an effective variant of investment activity. In the absence of effective ($\sum_{l=1}^{3} a_{i,j,l} \cdot u_{i,l}(k) - c_{i,j} > 0$) the dual estimate of the SBU is assumed to be equal to zero (the case of $\sum_{j=1}^{J_i} x_{i,j} < 1$).

Let us define the integer-valued plan of the *k*-th step:

$$\overline{x_{i,j}}(k) = \begin{cases} 0, \text{if } \sum_{l=1}^{3} a_{j_i}^{r_i} \cdot u_{i,l}(k) - c_{i,j} < t_i(k); \\ 1, \text{if } \sum_{l=1}^{3} a_{j_i}^{r_i} \cdot u_{i,l}(k) - c_{i,j} = t_i(k). \end{cases} \tag{12}$$

In accordance with (12), the effective IPs are selected in the amount of not more than one for each SBU under constraint (6). These projects form a set of decisions of the *k*-th step and are introduced in the list of effective projects of the SBU of the *q*-th group.

To proceed to the next step, it is necessary to adjust the considered pair of dual problems associated with the additional definition of the list of effective IPs realized at step k: a new list of SBE and IP should be formed, excluding pairs (i, j), for which $\overline{x_{i,j}}(k) = 1$. Also, it is necessary to adjust the right-hand sides of the restrictions (5):

$$b'_{i,l} = \max \left\{ b_{i,l} - \sum_{i=1}^{I_q} \sum_{j=1}^{J_i} c_{i,j} \cdot \overline{x_{i,j}}(k) ; 0 \right\}, \tag{13}$$

where: $b'_{i,l}$ is the adjusted value of the risk assessment scoring of the *l*-th sphere of the *i*-th SBU, which should be used at step k+1.

In other respects, the elemental content and structure of the model described by a pair of conjugate problems (4) - (7) and (8) - (10), remain the same.

The number of iterations is finite and provides the only optimal integrality solution. The finiteness is guaranteed by the realization of one of three events: either the list of pairs (i, j) is over, or at the next step for all $l = 1,2,3$ $b'_{i,l} = 0$ (the case when the strategic goals of the investment policy of all SBUs of the *q*-th group are achieved), or the integrality plans of the two adjacent iterations coincide.

A variant of the 'speed increase' in the algorithm convergence is possible, based on the adjustment of the dual estimates for the constraints (5).

Let us introduce the corrector $\tau_{i,l}(k+1)$ of the i-th restriction of the type (5) for the step k+1:

$$\tau_{i,l}(k+1) = \begin{cases} -1, \text{if} \sum_{i=1}^{I_q} \sum_{j=1}^{J_i} a_{i,j,l} \cdot \overline{x_{i,j}}(k+1) \geq b'_{i,l} \text{ и } \sum_{i=1}^{I_q} \sum_{j=1}^{J_i} a_{i,j,l} \cdot \overline{x_{i,j}} \geq b_{i,l}; \\ 1, \text{if } \sum_{i=1}^{I_q} \sum_{j=1}^{J_i} a_{i,j,l} \cdot \overline{x_{i,j}}(k+1) \leq b'_{i,l} \text{ и } \sum_{i=1}^{I_q} \sum_{j=1}^{J_i} a_{i,j,l} \cdot \overline{x_{i,j}} \leq b_{i,l}; \\ 0, \text{in all the other cases.} \end{cases}$$ (14)

The corrector $\tau_{i,l}(k+1)$ shows in which direction it is necessary to 'shift' the estimate $u_{i,l}$ during the next iteration. In the case of a stable 'over-fulfilment' of the plan for reducing the risk level of the *l*-th sphere for the *i*-th SBU, it is necessary to decrease the estimate of $u_{i,l}$ at the next iteration, in case of stable 'shortfall' of the plan fulfillment it should be increased. In uncertain cases, it should be left the same.

The shift of the $u_{i,l}$ estimate is carried out according to the rule:

$$u'_{i,l}(k+1) = u_{i,l}(k+1) + \lfloor \tau_{i,l}(k+1) \cdot h(k+1) \rfloor \cdot u_{i,l}(k),$$ (15)

where: $u'_{i,l}(k+1)$ is an adjusted estimate for restriction (5), which should be used at the step $k+1$; $h(k+1)$ is a shift increment.

It is proposed to use the terms of the harmonic series as the elements of the $h(k)$ sequence:

$h(k) \to 0$;
$h(k+1) < h(k)$; (16)
$\sum_k h(k) = \infty$, which ensures the proximity of the adjustment step values for the adjacent iterations.

The quality of the integrality plan $\widehat{x_{i,j}}$, including the list of pairs (i,j) of SBUs and IPs $(i = 1, \cdots, I_q, j = 1, \cdots, J_i)$, can be estimated by the proximity of the functionals (4) of continuous and discrete problems.

The volume of required financing S_q of the investment projects of the *q*-th group of SBUs is determined by the value of the functional (4):

$$S_q = \sum_{i=1}^{I_q} \sum_{j=1}^{J_i} c_{i,j} \cdot \widehat{x_{i,j}}.$$ (17)

In case of shortage of the SBU's own funds and those centrally allocated by the MC: $S < S_q$ it is necessary to increase the requirements for the quality of investment strategies of the *q*-th group of the SBU. The latter is achieved by changing the vector of the right-hand parts of restrictions (5): it is required to increase the scoring of the planned result of implementing investment strategies in the most important area from the position of the *l*-th SBU area.

The model with a criterion for the maximum of the cumulative effect $\sum_{i=1}^{I_q} \sum_{j=1}^{J_i} \sum_{l=1}^{3} a_{i,j,l} \cdot x_{i,j}$ from the joint realization of the IP of the *q*-th group of the SBU is an alternative to the model (4) - (7') of the optimal investment strategy for the *q*-th group of the SBE. Nevertheless, this formulation of the problem does not satisfy the basic criterion for observing equal rights of the SBUs in access to the centralized resources of the holding company. Indeed, in this case, the IPs will be selected for the SBUs with high values of risk reduction indicators, which initially violates the principle of equality of the holding company's units in access to centralized investment resources.

The above makes it possible to propose the following variation of the presented model with a criterion for the maximum and a restriction on the amount of the MC funds that are allocated for financing the IPs of the SBU of the *q*-th group.

Let us select the set of indices of spheres characterizing the risk of the SBU of the *q*-th group, for which the restrictions of the type (5) are preserved (in these spheres it is necessary to increase the value of scoring by a given value $b_{i,l}$), to a separate class L_1. The set of other indices will be denoted by L_2: $L = L_1 \cup L_2$. The amount of allocated centralized funding for the IPs of the SBU of the *q*-th group will be denoted by S_q.

Without changing the above notation, let us formulate the optimization problem for selecting the IP list of the SBU of the *q*-th group for a given restriction on the total amount of funding from the centralized investment fund of the holding company:

$$\sum_{i=1}^{I_q} \sum_{j=1}^{J_i} \sum_{l=1}^{3} a_{i,j,l} \cdot x_{i,j} \to max;$$ (18)

$$\sum_{i=1}^{I_q} \sum_{j=1}^{J_i} a_{i,j,l} \cdot x_{i,j} \geq b_{i,l}, \ l \in J_1, i = 1, \cdots, I_q; \tag{5'}$$

$$\sum_{i=1}^{I_q} \sum_{j=1}^{J_i} c_{i,j,l} \cdot x_{i,j} \leq S_q; \tag{19}$$

$$\sum_{j=1}^{J_i} x_{i,j} \leq 1, i = 1, \cdots, I_q, l = 1,2,3; \tag{6}$$

$$x_{i,j} = \begin{cases} 0 \\ 1 \end{cases}, i = 1, \cdots, I_q, j = 1, \cdots, J_i. \tag{20}$$

The method for solving the problem (18), (5'), (19), (6), (20) is identical to the method for solving the problem (4) - (7'). Let us make a problem that is dual to (18), (5'), (19), (6), (20):

$$\sum_{i=1}^{I_q} t_i + S_q \cdot Z_q - \sum_{l \in J_1} b_{i,l} \cdot u_{i,l} \to min; \tag{21}$$

$$\sum_{l \in L_1} a_{i,j,l} \cdot u_j - t_i - c_{i,j,l} \cdot Z_q \geq b_{i,l}, l \in L_2; i = 1, \cdots, I_q;$$

$$j = 1, \cdots, J_i; \tag{22}$$

$$u_{i,l} \geq 0, t_i \geq 0, Z_q \geq 0, l \in L_1; i = 1, \cdots, I_q; q = 0,1,2,3. \tag{23}$$

The content of the variables $u_{i,l}$ and $t_{i,l}$ in representation of the problem (21) - (23) is analogous to their content in the problem (8) - (10). The newly added variable Z_q is a dual estimate of the constraint (19), that is, an estimate of the MC funds allocated to finance the IP of the SBU of the q-th group.

For this problem, the vector of dual estimates of SBU $\bar{t}(k)$ for step k is given by the correlations:

$$t_i(k) = \max_{l \in L_2; j=1; J_i} \left\{ \sum_{l \in L_1} a_{i,j,l} \cdot u_{i,l}(k) - c_{i,j} \cdot Z_q(k) - a_{i,j,l} ; 0 \right\}; \tag{24}$$

Other correlations of the above algorithm for solving the discrete problem (4) - (7') are transferred to the newly considered model.

Let us also note that the presence of multidirectional constraints (5') and (19) in the model representation is its essential feature. Namely, for some group of the SBUs, the allocated funding S_q may prove insufficient, and in this case the problem will not have a solution.

Consider the numerical example illustrating practical value of the presented model for selecting an optimum investment strategy of an industrial holding company. The vertically integrated holding company XXX includes ten SBUs, each of which offers several investment projects for the restructuring and retrofit of the production and technological facilities. The interconnectedness of the SBU investment projects included in the general technological chain is a special feature of the problem: these projects are either implemented jointly or rejected. The SBUs manage their own investment funds and attract transfers from the management company. In accordance with the above algorithm, at each iteration step, it is required to select the optimal set of investment projects corresponding to the maximum of the target function, and then, in accordance with the dual estimates of constraints on own and attracted investment resources, to redistribute the centralized resources of the holding company.

Tables 2 and 3 give the initial data of the control example.

As a result of solving the problem after four iterations the following results were obtained (Tables 4 and 5). The optimum value of the target function (137.5 nominal dollars) is achieved when implementing projects no. 14 of the 5th SBU and No. 25 of the 2nd SBU. The centralized fund of the XXX holding company includes 1894 nominal dollars of investment resources.

Table 2. Indicators of investment projects of the XXX holding company's subdivisions

Structural business unit index	Investment project index	Investment spending (in nominal dollars)	Normalized earnings
1	1	1090	1300.0
1	2	1450	1850.0
1	3	940	1200.0
2	4	2050	2672.5
2	5	1770	2180.0
2	6	1840	2327.5
3	7	1200	1407.5
3	8	1050	1250.0

Structural business unit index	Investment project index	Investment spending (in nominal dollars)	Normalized earnings
3	9	1365	1527.5
3	10	1462	1875.0
4	11	720	1050.0
4	12	840	1112.5
4	13	925	1195.0
5	14	940	1207.5
5	15	863	1130.0
5	16	622	800.0
6	17	1041	1225.0
6	18	890	1187.5
6	19	1000	1225.0
7	20	1300	1450.0
7	21	960	1232.5
7	22	820	1080.0
8	23	1211	1427.5
8	24	1036	1212.5
8	25	954	1217.5
9	26	1441	1835.0
9	27	982	1240.0
9	28	1123	1300.0
9	29	1040	1245.0
10	30	1535	2050.0
10	31	1487	1975.0
10	32	1268	1585.0

Table 3. Investment resources of the XXX holding company's subdivisions

	Volume of the SBU's own funds and those attracted in the financial markets	Weighted average price of the SBU's own and attracted funds	Volume of the MC's transfer deductions	Weighted average price of the transfer deductions
1	1000	0.15	800	0.10
2	2000	0.17	1000	0.12
3	850	0.13	500	0.09
4	1200	0.14	700	0.11
5	500	0.12	500	0.10
6	1000	0.14	500	0.12
7	900	0.15	700	0.13
8	600	0.13	450	0.11
9	700	0.14	200	0.09
10	600	0.12	400	0.12

Table 4. Synergy matrix for investment projects

SBU index		SBU index									
	IP index	1	2	3	4	5	6	7	8	9	10
1	1	1		1							
	2	1	1								
	3	1					1				
2	4		1								
	5		1	1							
	6		1					1			
3	7			1							
	8			1							
	9			1							
	10			1	1						
4	11			1							1
	12			1	1						
	13			1							

SBU index	IP index	1	2	3	4	5	6	7	8	9	10
							SBU index				
5	14					1					
	15					1	1				
	16					1					
6	17						1	1			
	18						1			1	1
	19						1				
7	20							1	1		
	21							1			
	22							1		1	
8	23								1		
	24								1		
	25								1		1
9	26									1	
	27									1	
	28									1	
	29									1	
10	30										1
	31										1
	32										1

Table 5. Optimal investment strategy of the XXX holding company

Structural business unit index	Investment project index	Value of the desired variable (quantity of the projects implemented)
1	1	0
	2	0
	3	0
2	4	0
	5	0
	6	0
3	7	0
	8	0
	9	0
	10	0
4	11	0
	12	0
	13	0
5	14	1
	15	0
	16	0
6	17	0
	18	0
	19	0
7	20	0
	21	0
	22	0
8	23	0
	24	0
	25	1
9	26	0
	27	0
	28	0
	29	0
10	30	0
	31	0
	32	0

5. Discussion

It follows from the presented calculated data that a significant part of the centralized investment resources of the holding company is not involved. This is associated both with the insufficient efficiency of the investment projects proposed by the SBUs (the institutional factor of the problem under consideration) and with the presence of a restriction on the integrality of the optimal plan (a peculiarity of the numerical algorithm of the model).

The above-mentioned accounting for new alternative investment projects at the next iteration step, as well as the opportunity of redistributing the remainder of the centralized investment resources of the holding company in favor of the SBUs that significantly affect the synergies of the integrated group of enterprises are a possible direction for improving the model. This will enable to reduce the unused balances of the holding company's resources and increase the efficiency of its investment activities.

Conclusion

Risk assessment and accounting are important components of financial and investment management, and a risky approach to the tasks of financial and investment planning and management based on the use of mathematical tools adequately describes the nature of the risk and its impact on the results of market activity and the economic stability of a vertically integrated group of enterprises of a production holding company.

The paper presents a complex of economic and mathematical models and methods for assessing the risk of units of an integrated group of enterprises in the main spheres of market activity, clustering of the holding company's subdivisions in terms of risk level and selecting the optimal investment strategy of the holding company with regard to risk. The authors proposed an original method of two-level discrete optimization of the investment program of an integrated group of enterprises that implements the idea of the Dantzig-Wolfe method based on mutual information exchange (IP performance indicators are 'beamed down' by the holding units to the management company, and in the reverse order investment strategies that are effective from the viewpoint of the IGE are directed to the SBU groups differing by the risk level). In the model presented, the 'discrete estimates' which allow finding a close-to-optimal solution of upper-level discrete problem already at the first step are the estimates of the IP efficiency. In this case, it is not necessary to have in advance all probable IPs of individual groups of the SBUs. Moreover, these projects can be 'implemented' in the model by separate groups at each consecutive iteration.

The paper presents a control example that confirms the adequacy and practical significance of the developed models and methods for managing the investment activity of the holding company, taking into account the risks of individual structural divisions - SBEs: a set of investment projects satisfying the conditions of optimality and consistency has been obtained.

The strengths and weaknesses of the developed models have been identified and directions for their improvement have been proposed.

References

[1] Abbyasova, D.R., and Sabalina, U.M. 2016. Methods for assessing and clustering the subdivisions of the production holding company according to the level of market risk. *Fundamental Research*, 2 (2): 323-332.

[2] Apalkova, T., and Mishchenko, A. 2017. Models of investment management in logistics in conditions of uncertainty and risk. *Logistics and Supply Chain Management,* 1 (78): 82-97.

[3] Batkovsky, A.M., Semenova, E., Trofimets, V.Ya., Trofimets, E.N. 2015. Estimation of risks of investment projects on the basis of simulation statistical modeling. *Issues of Radio Electronics*, 4(4): 204-222.

[4] Belchenko, S.V. 2010. *Methods for managing transaction costs of an integrated production structure.* Author's abstract of PhD Thesis in Economics. Moscow: Plekhanov Russian University of Economics.

[5] Brealey, R., Myers, S., Allen, F. 2016. *Principles of Corporate Finance.* ISBN: 978-1259144387.

[6] Brodetsky, L., and Baibuza, E. 2015. Optimization of stocks of the distribution company by many criteria with regard to risks. *Logistics Today,* 3: 174-195.

[7] Chursin, A., Tyulin, A., Yudin, A. 2016. The model of risk assessment in the management of company's competitiveness. *Journal of Applied Economic Sciences*, Volume XI, Winter, 8(46): 1781-1790.

[8] Dubrov, A.M., Mkhitaryan, V.S., Troshin, L.I. 1998. *Multivariate Statistical Methods*: a textbook. Moscow: Finance and Statistics. (*in Russian*)

[9] Duran, B.S., and Odell, P.L. 1974. *Cluster analysis*. A survey. Springer-Verlag Berlin Heidelberg, ISBN: 978-3-642-46309-9, DOI: 10.1007/978-3-642-46309-9, 140 pp.

[10] Ehrhardt, M., and Brigham, Eu. 2009. *Financial management. Theory and practice.* ISBN-10:1428873295, 328 pp., Translated into Russian. Moscow: "Piter".

[11] Granaturov, V.M. 2010. *Economic risk: the essence, measurement methods, ways to reduce*: a textbook. 3rd ed. Moscow: Delo I Service, 687 pp.

[12] Khalikov, M.A. 2009. Methods for analyzing and assessing the risk of market activity of subdivisions of the hierarchical manufacturing structure. *Management in Russia and Abroad,* 1: 108-120.

[13] Khalikov, M.A., and Maximov, D.A. 2015. The Conception and Theoretical Basis of Management in the Production Sphere of Enterprise in Uncertainty of the Market Environment. *International Journal of Applied and Fundamental Research*, 10-4: 711-719.

[14] Kiselakova, D., Sofrankova, B., Horvathova, J. 2016. Impact of risks on the enterprise performance in the European Union by using enterprise risk models. *Journal of Applied Economic Sciences*, Volume XI, Spring, 3(41): 410 - 427.

[15] Knight, F.H. 1921. *Risk, Uncertainty, and Profit*. 1st Edition, Boston MA: Hart, Schaffner and Marx; Houghton Mifflin. Available at: http://oll.libertyfund.org/titles/306

[16] Maximov, D.A. 2011. *Models and methods for assessing and managing the economic security of an enterprise,* Author's abstract of PhD Thesis in Economics. Moscow, Plekhanov Russian University of Economics.

[17] Maximov, D.A., and Khalikov, M.A. 2016. Prospects of institutional approach to production corporation assets assessment. *Actual Problems of Economics*. 183 (9):16-25.

[18] Maximov, D.A., and Khalikov, M.A. 2012. *Assessment methods and strategies to ensure the economic security of the enterprise*. Moscow: Grif and Co. CJSC.

[19] Mishchenko, A.V., and Khalikov, M.A. 1993. Distribution of organic resources in the problem of optimizing the production of an enterprise. *Journal of Computer and Systems Sciences International,* 31(6): 113-118.

[20] Mishchenko, A.V., Ivanova, A.V., Nesterovich, L., Koshelev, P.S. 2017. Optimization models of financial resources management in logistics in conditions of uncertainty and risk. *Logistics Today,* 2: 82-100.

[21] Mynin, D.V. 2008. *Methods and models of comparative assessment and management of social and economic security of regions,* Author's abstract of PhD Thesis in Economics. Moscow, Plekhanov Russian University of Economics.

[22] Shabalina, U.M. 2017. The risk indicators in industrial and financial spheres of enterprises of the integrated group. *Entrepreneur's Guide*, XXXIV: 305-321.

[23] Shchepilov, M.V. 2004. Modeling of intra-firm management mechanisms of a machine-building enterprise, Author's abstract of PhD Thesis in Economics Moscow, Plekhanov Russian University of Economics.

[24] Sheremet, A.D. 2011. *Analysis and Diagnostics of Financial and Economic Activity of the Enterprise*. Moscow: Infra-M.

[25] Stupakov, V., and Tokarenko, S. 2005. *Risk Management*: a textbook. Moscow: "Financy I Statistika".

[26] Sycheva, I.N., Mezhov, I.S., Dronova, O.B. 2017. Organizational principles of industrial corporation management: the role of the conceptual model. *International Journal of Economic Research,* 14(8): 153-164. ISSN: 0972-9380. Available at: http://serialsjournals.com/serialjournalmanager/pdf/1499412421.pdf

[27] Tapman, L.N. 2002. *Risks in the economy*: a textbook for universities. Moscow: UNITY-DANA.

[28] Tikhomirov, N.P., and Tikhomirova, T.M. 2010. *Risk Analysis in Economics*. Moscow: Economics Publishing House CJSC.

*** Agribusiness companies' Rating. 2017, *Expert,* 40: 62-76.

*** BEFL. 2015. *Russian Agribusiness Companies' Rating following the results of 2014*. BEFL Auditor and Consulting Company. Available at: http://www.befl.ru/upload/iblock/436/436f54e851e23334a3d047e29a00ab2d.pdf

Risk Management and Optimization of Bank Loans Allocation in the Project Financing Program

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Abstract:

An additional selection criterion for the banks involved in the implementation of the Program for Support of Investment Projects is proposed in this article, and the formula for the optimal distribution of bank loans between the projects is derived. The loans are provided by the banks selected according to the criteria established by the state Program for Support of Investment Projects Based on Project Financing. The ratio of the bank loans granted to the value of the bank's own funds is economically justified and proposed by the authors as an additional selection criterion for the banks. The formula for the optimal bank loans distribution between the projects is derived to reduce the risks and improve the funds utilization efficiency. The risks are associated with a failure to fulfill timely the planned project implementation activities and with a significant allocation of the funds by one bank for several investment projects. The study results have shown that a failure to perform timely the planned activities results in the increase in the project costs, and have also indicated the presence of a local maximum (of?) financial result for the bank loans distribution between the investment projects. The example of the risk appraisal by points and calculation of the economic effect as a result of the optimal bank loans distribution between two investment projects are presented herein.

Keywords: project financing; bank lending; investment project; support program; own funds; bank loans granted; financial risks; optimal allocation; economic effect

JEL Classification: G21; G24; G32

Introduction

Since 2015, the state "Program for Support of Investment Projects Implemented in the Territory of the Russian Federation Based on Project Financing" (hereinafter – the Program) has been accomplished in Russia in order to finance the investment projects on the basis of project financing (The State Program for Support of Investment Projects Based of Project Financing, 2015). The program provides for the creation of a financial mechanism for long-term and preferential bank lending to economic entities in the real economy sector. For this purpose, several domestic banks and international financial organizations, issuing loans at a rate of 11% per annum, have been selected.

The Bank of Russia refinances the loans granted by commercial banks at a rate of 9% per annum and provides the state guarantees for these loans, but at a maximum rate 25% of the cost. The investment projects included in the Program meet the established selection criteria. These are a few paragraphs of general and additional requirements regarding the project implementation period, the volume and security of the obligations, the limits for the full cost of the loan, the loan currency, the restrictions on the volume of the loan, and the list of documents, including domestic credit organizations. As for the selection criteria for Russian credit institutions for participation in the Program as authorized banks, there are only four of them: the minimum amount of own funds equal to 100 billion rubles; the absence of an interdiction of the Central Bank to attract the monetary assets of individuals to the deposits and to open their bank accounts; the experience in the implementation of at least 10 projects over the past 3 years for at least 3 billion rubles each and the existence of a structural unit for lending the investment projects selected for participation in the Program. In our view, these requirements for the selection of credit institutions to participate in the Program are insufficiently clear, which can result in the risks of liquidity loss for the banks associated with the allocation of a large amount of cash by one bank for several investment projects. The realization of such risks negatively affects the allocation of the borrowed funds by the banks for the

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development and implementation of investment projects and the activities of the credit institutions themselves, withdrawing from circulation a certain, and, sometimes, significant, part of the monetary assets.

1. General Part

The world practice of financing and implementing investment projects shows that project financing in comparison with many other types of financing is riskier for several reasons. First, this can be explained by the long period of development and implementation of large-scale investment projects; second, by the uncertainty of external, and sometimes, domestic conditions of bank financing, as well as a low predictability of future results. Project financing involves the participation of many entities, their high responsibility and the mandatory implementation of all contractual terms. A financial mistake from the part of any participant may lead to the failure of the investment project. The project activity consists of a set of simple forms of activity – commercial, industrial, credit, settlement, scientific and technical, insurance and other operations. Separately, all these operations themselves are risky enough, and in combination they significantly increase the total financial risks. Such a feature of project financing as its international character (project financing can be provided by participants from different countries or project operations can be carried out in several countries at the same time), which increases the level of political and country risks, should also be noted. The implementation of investment activity in Russia has always been related to the conditions of increased uncertainty, which is due to the instability of the Russian economy, its low predictability and the processes of globalization. In order to prevent and improve the predictability of the consequences of implementation of the risks to finance investment projects, a general classification of possible risks is performed by the authors. In general, such risks can be divided into the following groups.

Construction risks. They can be associated with the delays in commissioning works and project start-up for the further operation. In this case, it is required to impose the penalties for the suppliers and contractors and oblige the borrower to cover all overhead costs, which should be reflected in the contract and taken into account in the process of investment projects financing by the banks.

Production risks. To protect the investment project from technical and economic risks, it is necessary to use proven technologies, advance additional technical expertise, to insure the unforeseen failure in delivery of raw materials and labor, the sales of the finished products.

Managerial risks. They can be caused by the incompetence and low level of qualification of the management personnel, top, and sometimes, middle managers. It is required to coordinate the personnel for the project in advance.

Sales risks. These risks are associated with the changes in prices and in the volume of the sales market. To avoid this type of risk, it is required to conclude the contracts in advance with potential buyers and insurance companies in order to insure the price risks and the risks of low sales of products.

Financial risks. The risks of this type are associated with the change in the interest rate on the loan; they may adversely affect the implementation of the investment project. The financial risks should be diversified, and the currency risks should be hedged.

Country risks. The political risks can be avoided by using the state guarantee program and the insurance by export-import agencies. The country risks can be reduced by using specially designed ratings.

Risks related to natural disasters. They are the most unpredictable risks – earthquakes, tsunamis, tornadoes, fires, etc. It is required to insure the investment project against the onset of such force majeure circumstances.

Thus, it can be concluded that the most significant mechanisms to reduce the investment project risks are the following: the careful preparation of the contractual framework in order to effectively distribute the risks among the participants; the use of the guarantees; the insurance, the diversification, the special ratings.

In general, it should be noted that the key to successful implementation of the investment project is a comprehensive monitoring of the investment process. Such monitoring should be handled by a specialized unit, which is determined by the creditor bank carrying out the project financing. The effective monitoring will ensure the prevention and minimization of the potential risks of investment projects.

2. Materials and Methods

A failure to complete timely the actions planned for the implementation of the investment project. The analysis of the projected risks of the investment project was carried out by the authors. At the first stage of the analysis, the possible risks were calculated. The project risks analysis was carried out based on the assessment of the experts employed by such companies as: LUKOIL; IBS Group Company; Liquefied Natural Gas; Deutsche Bank. The risk assessment scores are defined as follows:

$$E = P \times l \tag{1}$$

where: E (extent) is the degree of risk exposure; P (possibility) is the probability of occurrence of risks (in fractions of the unit); l (loss) is the amount of losses (in units).

Under this formula, the risks are ranked according to the following degree of their impact: from 1 to 2 points – the least risks that do not require special measures; from 2 to 4 points – ordinary risks, requiring the development of a number of measures to reduce their probability of occurrence; from 4 points and higher – high risks, significant probability of occurrence and impact on the investment project. In this case, it is advisable to take special measures. So, using the formula (1), the risks were calculated by the degree of their impact on the investment project, which were distributed as follows (Table 1).

Table 1. The appraisal of the investment project risks by points (Compiled by the authors)

	Risk types	Points
1	Increase in project costs	4.8
2	Delay in the completion of the stages	4.2
3	The insufficient qualification of project participants	3.5
4	The identification of the environmental problems in the course of production	3.5
5	The intervention of the state structures	3.0
6	The underestimation of competitors	2.8
7	The lack of required production capacity	2.7
8	High cost of related chemicals	2.5
9	The complexity of entering the market	2.4
10	The impossibility of technical implementation of the idea	1.8
11	Wrong assessment of the market	2.1
12	Wrong baseline calculations and estimates	1.8
13	Poor quality of performance of orders by subcontractors	1.8
14	The lack of the necessary technological base	1.5
15	The increase in the cost of wage labor	1.5
16	The insufficient efficiency of the work with potential clients	1.5
17	The inability to protect property rights	1.5
18	An erroneous strategy for working with potential clients	1.2
19	Negative result of theoretical substantiation of the idea	1.2
20	Improper product positioning	1.0

The main attention should be paid to such risk types as increased costs and delayed completion of the project stages. These risks are the most critical for the project, since the development of the oil field requires a large-scale work, which complicates the predictability of the unforeseen costs, and also threatens the performance of work in the established time. Due to the preliminary calculation of the risks, the participants in the investment project take all necessary measures to minimize the possibility of occurrence of these risks. However, this does not mean that there is no need to pay attention to the minor risks. Although the probability of their occurrence is not high, it is required to perform the constant monitoring of the probability of their occurrence to implement the project within the planned time frames and possibilities.

For the purposes of effective risk management and the improvement of the selection of the requirements to the lending institutions participating in the Program, the authors propose to supplement the absolute indicator of the own funds availability by the relative parameter of the ratio of the volume of the loans granted by the banks to finance investment projects to banks' own funds (K):

$$K_1 = \frac{Vl}{Fo} \tag{2}$$

where: K_1 is the ratio of the volume of loans granted by the banks to finance investment projects and the own funds of the banks; Vl is the volume of loans granted, mln rub.; F_0 is own funds of the bank, bln rub.

Based on the data of the "Register of Investment Projects Selected for Participation in the Support Program for the Investment Projects Implemented in the Territory of the Russian Federation Based on Project Financing," the coefficient for the banks represented by the Program is calculated by the authors (Table 2).

Table 2. Calculation of the coefficient for the banks represented in the Program (*Official Website of the Ministry of Economic Development of the Russian Federation*, n.d.) (Compiled by the authors)

Bank	The volume of monetary assets granted for the investment project, mln rub.	The volume of the own funds of the bank, bln rub.	Ratio $K_1\ 10^3$
1. VTB Group	58,066.880	718.150	80.86
2. Rosselkhozbank	30,830.420	280.172	110.04
3. Sberbank	53,111.370	2,265.730	23.44
4. Alfa-Bank	12,650	258.624	48.91
5. Gazprombank	55,117.530	502.990	109.58
6. Otkrytie Bank	8,777.500	147.340	59.57
7. Vneshekonombank Group	16,991.570	5,960.600	2.85

Table 2 shows that the ratio of the volume of loans granted to the own funds of the banks is different. Rosselkhozbank has the largest ratio, which indicates a lesser risk; Vneshekonombank Group has the least coefficient. The risks for these banks are higher. It is proposed by the authors to include the selection criteria of the banks for funding the investment projects in the Program. K_1 is the ratio of the volume of the loans granted for the investment purposes to the bank's own funds?

While lending to the borrowers implementing the investment projects, banks try to minimize, for example, the credit risks, and it is advisable to take into account the credit rating position of the borrower (Foshkin 2015, Foshkin 2015) and the technology of banking risk management (Rusanov and Rusanova 2014). In order to minimize the risks, to reduce the losses, to increase the financial stability and reliability of commercial banks, the optimal allocation of the bank loans granted to the investment projects of the Program among the banks the task should be set, taking into account the positive financial results of the use of the bank funds by the customers and repayment of the loans with interest.

The formalized version of the task assumes the analytical expressions of the Y-functions, the arguments of which are the volumes of investments (x) allocated by the banks for the implementation of the investment projects, and the resulting values of the functions determine the financial results for each bank as a result of successful use of the bank loan:

$$Y = f(x) \tag{3}$$

To obtain the correct form of such functions, it is advisable to take into account some of their properties. It is known that in the simulation of the economic processes these functions are unimodal and convex upwards (Sharp 1997, Rocafellar 1973). Assume that the initial value of the financial result in the absence of bank financing in the investment project is significant or negative. The function of the result of the bank funds development can be represented as the difference between the revenues received and the bank financing, so the function formula should include a negative sign of the amount of money invested by the banks. This function is the sum of the exponent and the linear function:

$$Y_i = f_i(x_i) = A_i - B_i e^{-k_i x_i} - x_i \tag{4}$$

where: x_i – is the volume of the investment projects financing by the banks to achieve the desired value of the financial result of the *i*-th project; "A", "B" and "k" parameters for each investment project are subjects to determine.

As an example, consider the *case study* of investment projects and the volumes of their lending by the banks for the four analyzed periods in the Program (Tables 3, 4):

Table 3. Dynamics of the functions of the volume of the bank lending and the financial results of development of the bank funds for the investment project 1

Period	1	2	3	4
Volume of bank lending	92.11	167.38	503.74	729.68
Financial results of development of the bank funds	514.98	596.98	676.05	770.16

Table 4. Dynamics of the functions of the volume of the bank lending and the financial results of development of the bank funds for the investment project 2

Period	1	2	3	4
Volume of bank lending	46.12	112.61	413.32	521.06
Financial results of development of the bank funds	123.39	247.97	548.59	153.43

The unknown parameters of the function (4) can be determined for each investment project according to the data of the first three periods with the subsequent verification of the result of the fourth period. For this purpose, the system of three equations with three unknowns can be used:

$$
\begin{cases}
A - Be^{-kx_1} = Y_1 + x_1 \\
A - Be^{-kx_2} = Y_2 + x_2 \\
A - Be^{-kx_3} = Y_3 + x_3
\end{cases}
\tag{5}
$$

In the course of system (5) solving, assume that the unknown parameters "A" and "B" are included in it linearly. Here it is expedient to exclude them and to obtain one nonlinear equation with one unknown "k". First, exclude the parameter "A" and get a system of two equations with two unknowns:

$$
\begin{cases}
B(e^{-kx_2} - e^{-kx_1}) = Y_1 - Y_2 + x_1 - x_2 \\
B(e^{-kx_3} - e^{-kx_2}) = Y_2 - Y_3 + x_2 - x_3
\end{cases}
\tag{6}
$$

Next, exclude the parameter "B" by dividing the first equation by the second:

$$
\frac{e^{-kx_2} - e^{-kx_1}}{e^{-kx_3} - e^{-kx_2}} = \frac{Y_1 - Y_2 + x_1 - x_2}{Y_2 - Y_3 + x_2 - x_3}
\tag{7}
$$

Knowing the parameter "k", the solution to the equation (6), the parameters "A" and "B" can be defined:

$$
B = \frac{Y_1 - Y_2 + x_1 - x_2}{e^{-kx_2} - e^{-kx_1}}
\tag{8}
$$

$$
A = Y_1 + Be^{-kx_1} + x_1
$$

To solve the equation (7), let us introduce a function that is equal to the difference between the left and right sides of the equation (7). To find the zero of this function, a special program "INVEST 1" was compiled, which solved this problem by the method of passive search. Due to the small step of the parameter, the calculation accuracy is achieved (Table 5).

Table 5. Parameters of the economic-mathematical model for the investment project 1 and the investment project 2

Investment project 1	Investment project 2
B_1 = 1,093.038	B_2 =1,648.07
A_1 = 1,458.4	A_2 =1,662.82
k_1 = 0.0027135	k_2 =0.0020591

The mathematical formulation of the problem of the optimal allocation of the bank lending to investment projects is as follows. It is necessary to optimize the total positive financial result (P) of development of the bank funds by the customers of the investment projects:

$$
P = A_1 - B_1 e^{-k_1 x_1} - x_1 + A_2 - B_2 e^{-k_2 x_2} - x_2 \to \max
\tag{9}
$$

With the restriction $x_1 + x_2 = S$ (9), the x_1 and x_2 are supposed to be non-negative. The non-linear programming problem (9) is the problem of optimal resource allocation (Bellman 1960).

It can be solved by the method of dynamic programming. At small volumes of bank lending, the return from the financing by credit organizations of the investment projects per unit will be greater for that project, the derivative function of which is greater. These derivatives are, respectively: $B_1 k_1 e^{-k_1 x_1} - 1$ and $B_2 k_2 e^{-k_2 x_2} - 1$. Substitute the condition $x_2 = S - x_1$ into the function (9). To determine the points of a possible extremum of the function, equate the derivative of the function (9) to zero and obtain the equation:

$$B_1 k_1 e^{-k_1 x_1} = B_2 k_2 e^{-k_2 (s - x_1)} \tag{10}$$

From the equation (10), we can determine the volumes of bank lending in the investment project 1.

$$x_1 = \frac{1}{k_1 + k_2} (\ln \frac{B_1 k_1}{B_2 k_2} + k_2 S) \tag{11}$$

The volumes of bank lending in the investment project 2 are determined by subtracting from of the total volume of the bank lending S the results for the investment project 1. For each value of the parameter S, there is a unique optimal allocation of the investment capital for the two investment projects under consideration. Moreover, there is a point S_{opt} – the global maximum of the sum of the two specified functions. It can be attained at the points x_{1opt} and x_{2opt} at which the derivatives of the unimodal functions f_1 and f_2 are equal to 0. Then we calculate x_{1opt} by solving this equation:

$$B_1 k_1 e^{-k_1 x_1} - 1 = 0 \tag{12}$$

Making simple transformations, get:

$$x_1 = \frac{\ln \dfrac{1}{B_1 k_1}}{-k_1} \tag{13}$$

The analogous formula is also true for x_2. Substitute the known values of the parameters k and obtain the following values for x_{1opt} and x_{2opt}:

$$x_{1opt} = 400.66$$
$$x_{2opt} = 591.63 \tag{14}$$

Find S_{opt}: $S_{opt} = x_{1opt} + x_{2opt} = 992.29 \tag{15}$

Accordingly, for these investment projects, the maximum economic efficiency will be:

$$P = f_1(x_1) + f_2(x_2) = f_1(400.66) + f_2(591.63) = 1,274.75 \tag{16}$$

3. Results

Thus, the riskiness of each project depends on many internal factors, such as the choice of participants, the company, the methods and techniques of financing. First of all, the project financing is associated with high risks for the payables of the project – the credit risks can lead to the failure of the project, the damage of which will affect many or all participants in the project. The companies involved in project financing allocate a significant part of their resources to the risk analysis, development and implementation of the risk management program, making it one of the main directions of the company management. Based on the calculations, the following conclusions can be drawn:

- in the course of implementation of the investment projects in the initial period, bank loans are required, as with very small amounts of loans, the financial result will be insignificant;
- the dependence of the economic effect on the total volume of bank lending can be truly described by the upward convex unimodal function having a specific extremum point, since the economically unjustified significant volumes of the bank lending to the investment projects reduce the economic effect;
- according to the Program, the selected bank lends to several investment projects, in the course of implementation of the program it is possible to choose the optimal allocation of bank funds among the investment projects, which will reduce bank lending risks and increase the efficiency of using credit institutions. The results obtained by the authors do not contradict the main provisions of the theory of optimal allocation of resources, used by domestic and foreign scientists and practitioners, for example, in terms of investing (Polterman 2012, Vechkanov 2015).

4. Discussion

Evaluating critically the conclusions and the results obtained during this study, it has been possible to identify the problems and incomplete justifications for discussion, such as:

- the selection of financial instruments for risk management accompanying the investment projects is based on the classification of the risks. However, the efficiency of risk management is greatly influenced by the precise timely completion of the actions planned for the project;
- the appraisal of the investment project risks by points allows identifying the risks that increase the project costs. To increase the objectivity of the results obtained, it is necessary to use the method of appraisal by points in conjunction with other quantitative and qualitative methods of project risks management;
- the compliance with the all the criteria, including the proposed additional criterion, by the commercial banks selected for the Program, does not guarantee the effectiveness of the financial support, since the Bank of Russia refinances only one quarter of the loans provided by the banks;
- the optimization of the volume of bank lending in the project finance system minimizes the risks and reduces the losses from possible implementation, but does not exclude them completely. The optimization reveals the existence of a local extremum that corresponds to the maximum economic effect, but at the same time there are problems of identifying such an extremum, the accuracy of calculations and the compliance with the timing of all planned actions for the investment project.

The risk management analysis, including the risk of liquidity loss by the bank that finances two or more investment projects, makes it possible to determine the main directions for the further research and focus on the following:

- to expand the classification of risks associated with the investment project, taking into account the specifics of the industry projects; the directions of the sources of financing, the quantitative and qualitative characteristics of successful activity of the banks, affecting the allocated volumes of financing of the investment projects;
- to develop the limit values of the ratio of the loans granted in the system of project financing to the value of the banks' own funds, the violation of which is associated with the occurrence of risks and additional losses for the banks;
- to supplement the criteria for the appraisal of the investment projects by points, taking into account the developed limit values of the additional criterion;
- to offer the alternative options for investment projects financing in cases of risk of loss of the liquidity of credit institutions in the process of financing of two or more investment projects by one bank.

Conclusion

The study has made it possible to obtain the following results and a number of conclusions and proposals:

- there is an objective need to increase the number of the banks selection criteria for the state Program for Support of Investment Projects Based Project Financing in order to prevent the emergence of the risk of loss of liquidity of the banks in the course of financing of two or more investment projects;
- the classification of the risks accompanying the investment project does not allow taking into account the industry specifics of the participants implementing these investment projects; it does not give a clear and reliable picture of the causes of occurrence of the investment projects' risks and methods of their management;
- the appraisal of the investment projects risks by points should be carried out in conjunction with other risk assessment methods accompanying the investment projects to improve the objectivity of the results;
- the existence of the local extremum corresponding to the maximum economic effect in the process of the optimization of the allocation of the volumes of bank lending between investment projects is proved.

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References

[1] Bellman, R. 1960. *Dinamicheskoe programmirovanie* [Dynamic Programming]. Moscow: Inostrannaya literature, 400 pp.

[2] Foshkin, A.E. 2015. Kreditno-reitingovaya pozitsiya zaemshchika kak instrument upravleniya kreditnym riskom banka [The Credit and Rating Position of the Borrower in the Credit Risk Management of the Bank]. *Bankovskie uslugi, 9*: 29-33.

[3] Foshkin, A.E. 2015. Rol kreditno-reitingovoi pozitsii zaemshchika v upravlenii kreditnym riskom banka [The Role of the Credit and Rating Position of the Borrower in the Credit Risk Management of the Bank]. *Bankovskoe delo,* 5: 70-75.

[4] Polterman, V.M. 2012. Teoriya optimalnogo raspredeleniya resursov A.V. Kantorovicha v istorii ekonomicheskoi mysli [Kantorovich Theory of Optimal Resource Allocation in the History of Economic Thought]. *NEL,* 1(13): 176-180.

[5] Rocafellar, R. 1973. *Vypuklyi analiz* [Convex Analysis]. Moscow: Mir, 470 pp.

[6] Rusanov, Yu.Yu., and Rusanova, O.M. 2014. *Chistye riskii shansy v realizatsii vnutrennei bankovskoi politiki. Monografiya* [Net Risks and Chances in Implementing the Domestic Banking Policy. Monograph]. LAP LAMBERT Academic Publishing, 128 pp.

[7] Sharp, U. 1997. *Investitsii* [Investments]. Moscow: Infra-M, 1024 pp.

[8] Vechkanov, G.S. 2015. Pamyati A.V. Kantorovicha. Teoriya optimalnogo raspredeleniya resursov [Dedicated to A.V. Kantorovich. Theory of the Optimal Allocation of Resources]. *Obschestvo. Sreda. Razvitie,* 3: 200-202.

*** Official Website of the Ministry of Economic Development of the Russian Federation. (n.d.). Available at: www.econom.gov.ru (accessed October 13, 2017)

*** Programma podderzhki investitsionnykh proektov, realizuemykh na territorii Rossiiskoi Federatsii na osnove proektnogo finansirovaniya ot 21.02.2015 (izm. 23.07.2017) [The State Program for Support of Investment Projects Based of Project Financing (as amended on July 23, 2017)]. (2015, February 21).

APPENDIX - *Example*

The determination of the economic effect achieved as a result of the optimal allocation of the bank loans among the investment projects. To illustrate the dependence of the financial result on the volume of invested loan funds, see Table 6.

Table 6. The allocation of the bank loans among the investment projects 1 and 2, mln rub.

Total bank loans	The bank loans volume in the investment project 1	The bank loans volume in the investment project 2	Economic effect
50.00	0.00*	50.00	496.75
100.00	15.69	84.31	593.36
150.00	37.26	112.74	681.40
200.00	58.84	141.16	761.59
250.00	80.41	169.59	834.37
300.00	101.98	198.02	900.18
350.00	123.55	226.45	959.40
400.00	145.12	254.88	1,012.41
450.00	166.70	283.30	1,059.57
500.00	188.27	311.73	1,101.20
550.00	209.84	340.16	1,137.62
600.00	231.41	368.59	1,169.13
650.00	252.98	397.02	1,196.01
700.00	274.56	425.44	1,218.51
750.00	296.13	453.87	1,236.89
800.00	317.70	482.30	1,251.38
850.00	339.27	510.73	1,262.21
900.00	360.84	539.16	1,269.58
950.00	382.42	567.58	1,273.68
1000.00	**403.99**	**596.01**	**1,274.71**
1050.00	425.56	624.44	1,272.84
1100.00	447.13	652.87	1,268.23
1150.00	468.70	681.30	1,261.04
1,200.00	490.28	709.72	1,251.42

Note: * Due to the insignificant amount of financing, the estimated value of the indicator x_1 is negative, thus we assume it is equal to 0.

Figure 1 Dependence of the financial result on the volume of the bank loans granted to the investment project 1 and the investment project 2
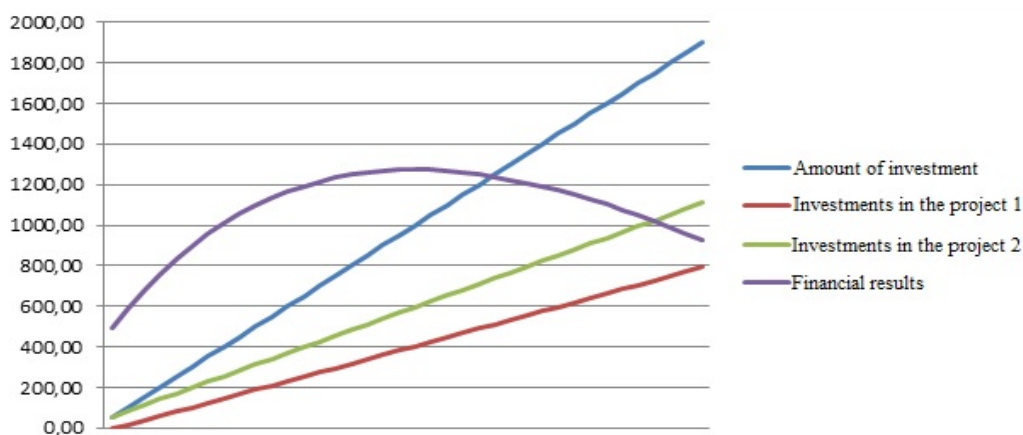
The data presented in Table 6 show that the maximum financial result indicator for the indicators S under consideration, taken in steps of 50, is located in the neighborhood of S_{opt}. With a loan volume of 1,000 million rubles and the allocation of the bank funds between the investment project 1 in the amount of 403.99 million rubles and the investment project 2 in the amount of 596.01 million rubles, the maximum economic effect will be 1,274.71 million rubles. An illustration of the results obtained is presented by the graph of the financial result versus the indicators of the bank loans granted to the first and the second investment projects (S , x_1 and x_2) (Figure 1).

The Use of Selected Payment Instruments by Companies Operating in Foreign Markets

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Abstract:

The paper focuses on payment terms companies opt for when trading on international markets. More specifically, it analyses the use of different payment instruments that were dealt with among companies based in the Czech Republic in a five-year period (2012–2016). In total, five payment instruments were included in the survey: bill of exchange (B/E), documents against payment (D/P), documents against acceptance (D/A), letter of credit (L/C), and bank payment obligation (BPO). The goal of the research was to discover to which extent and for which main motives these five selected payment instruments, used nowadays in international business environment, were introduced by companies into their international sales contracts. The main finding of the investigation is that most companies from the survey did not prefer to use any of the five proposed payment instruments, as they used others that can be considered as easier to handle.

Keywords: payment instruments; international business; Czech Republic; risks

JEL Classification: B27; F14.

Introduction

A risk and uncertainty are an important attribute of most human activities, especially of business activities (Hnilica, Fotr 2009). For companies, being present and doing business on foreign markets represents a large array of risks that can be classified into different categories. However, risks can be classified from many aspects (Hnilica, Fotr 2009), and thus different classifications are findable both in scientific and business literature. For example, Salcic (2014) claims that the risks covered by export credit agencies (ECAs) "are usually defined in ECA standard terms as political and commercial risks". The Salcic's presented division into two categories only can however be seen as abridged, since it is taken from the point of view of ECAs that provide credit, insurance or guarantee services, but usually more categories of risks are identified, depending on how broad authors' views are.

If continuing with commercial risks, these can also be understood differently. Dinu (2015) argues that "commercial risk refers to probable losses arising from the market or the transaction partners". However, probable losses arising from the market can be seen or called as market risks: the division of risks into different categories among which commercial risks and market risks figure is indeed performed by some authors, such as McNaull and Loy (2008) or Machková *et al.* (2014). In turn, commercial risks as per the Commonwealth Bank of Australia's understanding include exchange risk, risk of non-delivery/performance, credit risk and transfer risk (Commonwealth Bank of Australia 2006).

The examples just provided are enough to show that commercial risks can be indeed understood differently. In this text, we will consider commercial risks as such that concern specific commitments between two parties, usually between a seller and a buyer, i.e. in the narrow sense of the term. However, regardless of how far one considers the term "commercial risks", inability to pay (usually due to insolvency) and unwillingness to pay traditionally belong to this category and are those risks that originate at the latter party, *i.e.* buyer. From now on, we will focus only on the fact that a price agreed in a contract must be settled.

To protect seller's interest to be paid for goods or services delivered to a customer, it is possible to recommend different strategies. The first of them can be to find enough information on the counterparty before signing anything so as to learn whether the counterparty is reliable enough, but this tool, no matter how much it is

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helpful and recommended, may not be sufficient. The second way is to insure the probability that the buyer will not eventually pay – this option however can cost the seller a lot, the chosen insurance company may not be willing to cover all the commercial risks or not to cover them fully, and the main problem is that the insurance usually rather "fights the fire", sometimes very inefficiently (prevention can be seen only in the form of a deductible if this applied). The third strategy to adopt is to receive money from someone who is willing to take over seller's accounts receivables before these reach their maturity, e.g. it may be a factor or a forfaiter, but not all of such persons or institutions will accept to bear the *del credere* risk, so if the debtor refuses to pay after several reminders received, the seller will be asked to reimburse the money, thus not getting anything from the sales contract. Moreover, handing over seller's accounts receivables means some part of the money involved is sacrificed to a third party. The fourth way can be to address a debt collecting agency, but such an agency may not accept all uncollectible debts and if it accepts, the deduction on the debt sold will represent quite a high share of the value originally set in the sales contract. The fifth option does not require someone's assistance and this is to agree with a customer appropriate terms of payment at the moment of drafting a sales contract, thus limiting the risk of non-payment from the beginning, while enabling to adjust the wishes of both parties involved in a contract.

The real life teaches us that usually a combination of some or even all of the just mentioned strategies will turn out inevitable, but if terms of payment are clearly and well defined, then the risk of non-payment (as well as other commercial risks) can be significantly limited. While one setting terms of payments of a future contract, the use of different payment instruments can be agreed so as to enhance the quality of the commitment, not only from the seller's point of view, but also from the buyer's point of view.

In this paper, we decided to analyze how different companies settled in the Czech Republic currently use some of the existing payment instruments. We have chosen five of them: *bill of exchange (B/E), documents against payment (D/P), documents against acceptance (D/A), letter of credit (L/C), and bank payment obligation (BPO).* In literature and practice, some of the instruments may not necessarily be called instruments, but methods or arrangements, nonetheless for the purpose of the article we call all of them "instrument". This is possible, since for example:

- a bill of exchange is named as an instrument by a team from the Department of Mercantile Law of University of South Africa (2009);
- documentary collections, *i.e.* documents against payment and documents against acceptance, are named instruments by Giovannucci (2007);
- a letter of credit is named as an instrument by the US Department of Commerce (2008) or Seyoum (2009);
- bank payment obligation is named as an instrument by SWIFT (2016).

Before continuing, it makes sense to provide brief definitions of the payment instruments in question.

A bill of exchange can be defined as "an unconditional written order by one party (the drawer) that orders a second party (the debtor or drawer) to pay a certain sum money to the drawer or a designated third party (Seyoum, 2009)." In a contract of sale, it is common to draw a bill of exchange on the buyer or on his bank (in a L/C) that will pay at the maturity to the drawer, *i.e.* seller.

A letter of credit is „a promise by a bank on behalf of the buyer (customer/importer) to pay the seller (beneficiary/exporter) a specified sum in the agreed currency, provided that the seller submits the required documents by a predetermined deadline" (Credit Suisse 2017). There are two types of documentary collection: documents against acceptance (of a draft/bill of exchange) and documents against payment. Generally said, documentary collection is "a payment instrument whereby the exporter (seller) sends documents to the importer (purchaser) through the bank in order to get payment. The bank does not assume any payment obligation and plays the role of an agent/document remitter only" (Ararat Bank 2017).

Bank payment obligation is the newest payment instrument and can be characterized as "an irrevocable undertaking of one bank to pay another bank upon the successful matching of predefined datasets using a data matching engine such as SWIFT's Trade Services Utility (TSU). The BPO enables companies to conduct open account trade with risk mitigation and liquidity benefits similar to that of a letter of credit (LC)" (Morgan 2013).

In four of the five herein presented instruments, the participation of banks is always inevitable. The first mentioned instrument, *i.e.* bill of exchange, can be used independently, but can also be used in a L/C and in both types of documentary collections. B/E is therefore a useful tool that is able to enhance a commitment alone, but can also be used with other instruments wherein it can play a securing or acknowledging role of an obligation, among others.

It can be said that most of the existing payment instruments are useful in the sense they provide (or under some conditions can provide) some level of protection and do not serve as a channel for transfer of money only.

We intentionally chose those instruments where it was clear that they are used in practice in order to provide some protection to the seller as regards his interest to get paid. However, we did not work with advance payment/cash with order, because these are rather methods that – even if providing some kind of (or even 100 %) protection for the seller – do not require any work with additional written documents and do not require any special knowledge from companies using them. So, the sense of our investigation is to learn how companies can handle more complicated payment instruments to be protected against the risk of non-payment, and to learn if they use them.

This curiosity arises mainly from the fact that trading, and consequently the use of payment instruments, in the world in 2017 is different than it was 10 years ago and is much different than it was 20 or 50 years ago. As early as in 2007, National Westminster Bank in one of its leaflets found that "traditional methods of payment, such as issuing cheques or drafts are used less in today's business world as faster, cheaper and more efficient means of paying for goods and services are now available." However, at the time where this statement appeared, the bank payment obligation was not defined yet by the International Chamber of Commerce – this happened in 2013 – and there was hardly anyone who could imagine this step would come. The demand for an instrument such as BPO which would ease commerce by reducing administrative and financial burden and at the same time would keep a high level of security for companies was provoked by the recent global crisis (Sato *et al.* 2014). So said, our statement on the changing environment is true and shows that it is worth investigating how several payment instruments are nowadays used among companies.

At this point it is worth stressing that terms of payment defined in a contract are usually a result of mutual negotiation and not dictated unilaterally by the seller. In many cases, it is the buyer that has the main word in the final appearance of the terms of payment put in a sales contract. Furthermore, it is necessary to point out that the five selected instruments, even if protecting the seller against the risk of non-payment, can at the same time protect some of the interests of the buyer, too (protection against wrong performance, delays in delivery, etc.), and that their use also requires some knowledge from the buyer, too. For these two latter reasons, we decided not to exclude importing companies (buyers) from our survey.

1. Literature Review

As results from our review of literature, such research among companies has never been performed. If there has been some investigation of the issue of payment instruments, it usually considered the use of cash, bank cards, checks and/or electronic payments. Some examples of it can be a chapter of an older publication of the Reserve Bank of India (1998), an article of Gerdes and Walton published in the Federal Reserve Bulletin (2005), a research discussion paper written by Ossolinski *et al.* (2014), a paper prepared by Quinn a Roberds (2008), a paper written by Bounie and François (2006) or a paper published by Australian Payments Clearing Association (2011). Probably the most extensive research was performed by Koulayev *et al.* (2015) who centered their attention on eight instruments (cash, checks, debit cards, credit cards, prepaid cards, online banking bill payment, bank account deduction, and income reduction). However, they goal was to develop and estimate a structural model of adoption and use of payment instruments by US consumers, not companies.

There is also a paper of Hoefele *et al.* (2013) on payment choice in international trade. The paper showed that country characteristics are central determinants of payment contract choice, however, it compared open account with cash in advance only. As known, open account is a suitable method of payment for the buyer, not protecting the seller anyhow, so it is a full contrast to 100% advance payment. Thus, open account is not applicable in our research either.

Despite the fact that open account is not of our interest, we should mention a recent presentation of SWIFT (2016), because there the use of open account was compared with the use of a L/C in export transactions between 1978 and 2014. With regard to the orientation of our paper, SWIFT provided a relevant piece of information that today "world trade volumes have seen a startling increase in open account transaction over the recent years. Already today more than 80% of the total world trade volume (export) is settled by clean payment."

Glady and Potin (2011) presented the first analysis of comprehensive data on the bilateral flows of letters of credit in order to quantify the effect of country-level characteristics on the flows of letters of credit. During their research, the authors used statistics from SWIFT through which most LCs messages in the world are sent and they indicated that the total number of L/Cs in 2006 sent via SWIFT was over 6.502 million messages, in 93% cases between countries and only 7% within countries. Although the authors in their conclusion say that *"countries with underdeveloped banking sectors rely less on letters of credit"*, the comparison of the use of L/Cs itself with the use of any other payment instrument was not subject of their attention and, again, there was no investigation on which motives companies may have to use L/C (Glady and Potin 2011).

There remain therefore probably only two articles that should be stressed. The first of them was written by Antràs and Foley (2011) from Harvard University. These authors tried to analyze the financing terms that support international trade and shed light on how and why these arrangements affect trade. They worked with transaction level data from a US based exporter of frozen and refrigerated food products, primarily poultry, and these data covered roughly $7 billion in sales to more than 140 countries over the 1996–2009 period and contained comprehensive information on the financing terms used in each transaction.

Antràs and Foley (2011) on the basis of the data received from that firm commented three important facts (among others): first, the most commonly used financing terms did not involve direct financial intermediation by banks. They were cash in advance terms and open account. Over the sample period, only 5.8% of the value of transactions occurred on letter of credit terms and 11.0% on documentary collection terms. At the same time, cash in advance terms and open account terms were used for 44.0% and 39.2% of the value of transactions, respectively. These figures show us that although L/C and documentary collections were not used a lot, in more than 60% of the value of transactions there was some level of protection.

Second, Antràs and Foley (2011: 1) claimed that "*location of the importer has a large impact on the financing terms that are used. Sales to locations with weak contractual enforcement are more likely to occur on cash in advance terms than sales to other locations. This pattern holds for a variety of measures of contractual enforcement, and the differences are large. For example, 63.8% of exports to countries with a civil law legal origin occur on cash in advance terms, but* only *4.0% of exports to countries with a common law legal origin do.*" At the same time Antràs and Foley claimed that survey evidence suggested that these patterns were not unique to the firm-specific data used in their paper.

The third main fact commented was „*that as the exporter establishes a relationship with an importer through repeated interaction, transactions are less likely to occur on cash in advance terms. As the level of cumulative transactions with a customer increases from values of less than $25,000 to more than $5 million, the share of transactions that occur on cash in advance terms falls from 60.3% to 10.9%*" (Antràs and Foley 2011, 2). In other words, the more a seller interacts with someone, the less cash in advance is demanded.

The research of Antràs and Foley did not investigate more than one company, but we can see how frequently some financing terms were used in a determined period of time. For our research, it is worth pointing out the low participation of letters of credit and documentary collections, moreover the latter exclusively meant in the paper with the use of sight drafts, *i.e.* D/P, and not D/A.

The second article left that should be mentioned is of Niepmann and Schmidt-Eisenlohr (2014). These authors analyzed the role of banks in reducing the risk of exporting in international trade and discussed four payment contract types: cash-in-advance, open account, documentary collection and letter of credit. The authors presented a model that explains the trade-offs for firms when they choose between different payment contracts and at this opportunity they showed the extent to which US exporters use trade guarantees in the form of letters of credit (L/Cs) and documentary collections (D/Cs) to protect their interest when shipping to foreign markets. Specifically, they learnt that in 2012, US banks provided L/Cs and D/Cs for about 10%, or $153 billion, of US exports, so the share of L/C and D/C is again small, as in the case of the findings of Antràs and Foley.

After they research, Schmidt-Eisenlohr and Niepmann claimed that "*whether exporters use L/Cs and D/Cs principally depends on the degree to which contracts are enforced in the destination country and on how far the country is from the United States. Notably, almost 100 percent of US shipments to some destinations are settled with L/Cs*" (Schmidt-Eisenlohr and Niepman 2014, 37).

Both Antràs and Foley's, and Niepmann and Schmidt-Eisenlohr's texts already discover some motives companies may have when using letters of credit and documentary collections (D/C), *i.e.* several of the five payment instruments this paper pays attention to. Some more texts on payment instruments can be found, but their claims on how much some instruments are used are very vague and do not present any tangible figures. We can conclude that our review of literature has shown that the research we decided to perform only finds some parallels in the past scientific endeavour, but not a close predecessor.

2. Methodology

By a survey we wanted to learn how five different payment instruments are used between companies in operations that concern at least two different countries. Moreover, we wanted to learn how often each instrument was used in the period 2012–2016 and what the main motives for the use of these instruments were. We also wanted to learn the companies' opinion on the instruments and what they think of their use in a near future (2017–2021).

We decided to launch a questionnaire. Respondents to the questionnaire were companies doing their business in the Czech Republic. There are different legal forms of business, such as joint-stock companies, limited liability companies, limited partnerships or public companies.

The sample of respondents was obtained from the Albertina database (MagnusWeb interface which is working over the corporate database Albertina and owned by the Bisnode company) and the link to the questionnaire was sent to e-mail addresses which were stored in the database. Since we had no information on the use of the instruments among companies based in the Czech Republic and could only read the aforementioned pieces of research, we decided, with the help of the questionnaire, to test one hypothesis only.

*Hypothesis***:** In the period 2012–2016, most companies have used at least one of the five selected instruments: bill of exchange, letter of credit, documents against payment, documents against acceptance, bank payment obligation.

The population of interest were all companies included in the Albertina database. We have found there were 33,082 companies, but only at 21,320 companies we could find available email addresses. The number of addresses was higher, because some of the 21,320 companies were provided with more than one email address. The sampling method was a random sampling when we used every 10th company from the database. Where we had multiple email addresses leading to the same company, we tended to use them, but addressees were always requested to fill only one questionnaire per one company. The companies we addressed could be exporters, importers, or both exporters and importers. The reason for it was explained in the first part of this text. Since it is practically impossible to learn which company is purely of Czech origin, we decided to address any company based in the territory of the country without any discrimination. The Albertina database does not always provide details on which exact activities companies carry out, so we first had to learn whether the companies trade with foreign countries or not.

Firstly, in January 2017 we contacted a selected sample of 10 companies to learn whether our drafted questionnaire must be improved or not. We realized that the questionnaire needed to be enhanced, so we modified its contents before it was launched. The improved and final questionnaire was distributed to 2,132 companies in late February 2017. During the first addressing, we realized that some of the contacts were not working anymore or that some companies stopped operating. Both cases were quite frequent. This forced us to exclude 197 companies, so finally we realized that we contacted 1,935 unique companies. After two weeks from the launch, we sent a reminder to improve the return of filled out questionnaires and in late March we sent the reminder once again.

In the questionnaire, we kindly asked companies to address someone who is experienced in area of our interest (payment terms, instruments, *etc*.) so as to be sure the questionnaire is filled out by companies accordingly.

Finally, we have obtained 126 replies, the return rate being significantly low, *i.e.* 6.51% only.

Of the 126 companies that decided to fill the questionnaire, 37 answered that are not involved in trading with abroad. Thus, the questionnaire finished for them as early as after the first question answered. The remaining 89 companies proceeded to the question 2. In this step, 80 of them answered that they did not use any of the five selected instruments in the indicated five-year period, so the questionnaire finished for them, too. Only 9 companies continued and also finished the questionnaire, but this number is so low that it does not allow us to perform any relevant interpretation. We will thence avoid providing extensive details on the answers from the nine companies.

Our research came therefore to a deadlock due to the limited number of respondents that finished the whole questionnaire. Below, we present several tables with all the questions and options that were offered to the respondents, plus the answers provided by the respondents (full text of the questions is in Appendix 1).

3. Results

The sample of companies that filled out our questionnaire consisted of 46.8% of companies which both export and import, 12.7% which only export, 11.1% which only import, and the rest of companies, 29.4% (37), does not trade with abroad.

Table 1. Cross-border activities of companies based in the Czech Republic (N = 126)

Companies' activities	Both export and import	46.8%
	Only export	12.7%
	Only import	11.1%
	Do not trade with abroad	29.4%

When we further asked companies that do international trade (exports, imports or both), only 9 of them used at least one of the following instruments in the period 2012–2016: bill of exchange (B/E), documents against payment (D/P), documents against acceptance (D/A), letter of credit (L/C), and bank payment obligation (BPO). These companies continued with answering the questionnaire.

Based on the survey's sample, a typical company using at least one of the analyzed instruments has up to 50 employees, the company is from Prague, its industrial area cannot be defined and the turnover in the last year was between 51 and 250 million CZK (1€ = 26CZK). Companies with more than 50 employees have not a high representation in our survey and we have not received answers from all Czech regions.

The highest frequency of Prague-based companies in our survey reflects the fact that most companies are based in the Czech capital in general.

Table 2. Structure of companies which do business with foreign partners. (N = 9, 1 € = 26 CZK)

Number of employees	Up to 50	66.7%	Industrial area	Textile industry	22.2%
	51–250	11.1%		Machinery	22.2%
	251–1,000	11.1%		Hospitality	22.2%
	Over 1,000	11.1%		Retail	11.1%
Region	Prague	33.3%		Process manufacturing	22.2%
	Southern Bohemia	11.1%	Turnover in last year	Up to 50 mio CZK	22.2%
	Southern Moravia	11.1%		51–250 mio CZK	44.4%
	Hradec Králové	22.2%		251–1,000 mio CZK	11.1%
	Central Bohemia	11.1%		1,000–4,000 mio CZK	11.1%
	Ústí n/L	11.1%		Over 4,000 mio CZK	11.1%

As results from Table 3, in the observed period, letter of credit was the most frequent in all cross-border deals (55.6%), documents against payment were used the most only in selected cross-border deals (77.8%), documents against acceptance and bill of exchange were never used in 55.6% of the cases and in 22.2% of the cases L/C was never used. Documents against acceptance and bill of exchange had the same share of the utilization in the all cross-border deals as well as in selected cross-border deals (22.2%). The most frequent primary reason for use of letter of credit was the wish of the counterparty (33.3%), documents against payment were used the most because of the nature of the deal (44.4%). The utilization of all instruments is considered as rather desirable (33.3% for letter of credit, 55.6% for documents against payment, and 22.2% for documents against acceptance, as well as for bill of exchange and bank payment obligation). The most likely instrument to be used in the next five years is documents against payment 33.3%.

Table 3. Utilization of selected payment instruments (N = 9)

		L/C	D/P	D/A	B/E	BPO
Utilization in 2012–2016	In all cross-border deals	55.6 %	22.2%	22.2%	22.2%	22.2%
	Only in selected cross-border deals	22.2%	77.8%	22.2%	22.2%	66.7%
	Never	22.2%	0%	55.6%	55.6%	11.1%
Primary reason for use	The value of the deal		11.1%		11.1%	
	Obtained information on the quality of the counterparty	11.1%	11.1%	11.1%	11.1%	22.2%
	The territory in which the counterparty is located	11.1%	11.1%	11.1%	11.1%	22.2%
	The wish of the counterparty	33.3%	22.2%	11.1%		11.1%
	The nature of the deal	22.2%	44.4%			
	Irrelevant (we did not use this instrument)	22.2%		66.7%	66.7%	44.4%
The use of the instruments is usually considered by companies as	Necessary	11.1%	11.1%		11.1%	11.1%
	Desirable	33.3%	55.6%	22.2%	22.2%	22.2%
	Reasonable	44.4%	22.2%	22.2%	22.2%	22.2%
	Enforced		11.1%	22.2%		
	Useless	11.1%		11.1%	11.1%	11.1%
	We cannot judge			22.2%	33.3%	33.3%
Instrument most likely to be used in 2017–2021		11.1%	33.3%	11.1%	22.2%	22.2%

Based on the research, instruments where companies perceive the highest level of security for their business interests are documents against payment (33.3%) and documents against acceptance (33.3%). The

highest administrative burden of the instrument was perceived at letter of credit (33.3%) and at documents against acceptance (33.3%). The highest financial burden of the instrument was perceived at documents against payment (44.4%). In 33.3 % of the cases, companies found it difficult to judge which of the five instruments represented for them the lowest level of security for their business interests, as well as the lowest administrative burden and the lowest financial burden.

Table 4. Perception of selected payment instruments (N = 9)

		Level of security for their business interests	Administrative burden of the instrument	Financial burden of the instrument
Instruments where companies perceive the highest	L/C		33.3%	
	D/P	33.3%	11.1%	11.1%
	D/A	33.3%	33.3%	44.4%
	B/E			
	BPO	22.2%	11.1%	22.2%
	We cannot judge	11.1%	11.1%	22.2%
Instruments where companies perceive the lowest	L/C	11.1%		33.3%
	D/P	22.2%	33.3%	22.2%
	D/A	11.1%		
	B/E	22.2%	33.3%	11.1%
	BPO			
	We cannot judge	33.3%	33.3%	33.3%

The results we may interpret are significantly limited, yet of interest. We supposed that most companies used at least one of the five instruments in the selected period of time and would thus complete our whole survey, but only 9 answered they did use at least one. Therefore, our hypothesis cannot be confirmed, since most of the companies trading with foreign partners, 80 of 89 (89,9 %), did not use any of the instruments.

This means the following:

- most companies from our survey did prefer to use other payment instruments/methods of payments, but we do not know which ones. This could be investigated in further research;
- since most companies did not use any of the five selected instruments we focus on, it means they certainly prefer easier instruments to work with, for example in terms of a possible administrative or financial burden;
- the result on the low use of instruments which require some knowledge about the way they are used, as well as bank involvement in at least four of the five cases, is not too far from the low results for the use of L/Cs and D/Cs found by Schmidt-Eisenlohr and Niepmann (2014), and Antràs and Foley (2011).

Conclusion

The goal of our research was to discover to which extent and for which main motives five selected payment instruments used nowadays in international business environment are introduced by companies into their international sales contracts. Such research has never been conducted before. In particular, we chose those payment instruments which help the seller limit the risk of non-payment, which is definitely one of the basic commercial risks regardless of how much one considers the broadness of the group of commercial risks. The use of these instruments, among others, may enable the seller the attainment of positive cash flow, thus reducing his need to turn to bank loans. Nonetheless, the instruments we selected lay between open account and cash in advance/cash with order trading in the sense they do not protect exclusively only the seller or only the buyer against the commercial risk they perceive. At the same time, the selected instruments are tied to the transfer of some document(s), at least of a mere bill of exchange (draft). This, of course, requires some kind of advanced business knowledge from the companies that decide to use these instruments.

In the research, we worked with companies based in the Czech Republic and used a specialized database where thousands of contacts are stored. The survey ran from late February to late March 2017. Although we expected to find figures that would be relevant enough to disclose the motives that are behind the choice of a specific payment instrument, we finally only found out that the use of the five instruments we selected is low and that we would need much more respondents to interpret some relevant conclusion on the investigated motives.

However, our research can result in the finding that today most companies avoid using instruments where extra business knowledge is needed and where administrative and financial burden is potentially higher than in other payment instruments. This finding appears to be in accordance with the findings of the authors presented

herein, specifically of Niepmann and Schmidt-Eisenlohr (2014), and Antràs and Foley (2011) who pointed out the relatively low use of L/Cs in D/Cs in today's business world.

Acknowledgement

References

[1] Antràs, P., and Foley, C.F. 2011. *Poultry in Motion: A Study of International Trade Finance Practices*. Working Paper 17091, 1050 Massachusetts Avenue, Cambridge, National Bureau of Economic Research. Available at: http://www.nber.org/papers/w17091.pdf.

[2] Bounie, D., and François, A. 2006. *Check or Bank Card? The effects of transaction characteristics on the use of payment instruments.* Telecom Paris Economics and Social Sciences Working Paper, ESS-06-05. Available at: http://ses-perso.telecom-paristech.fr/francois/publications/WP/transaction%20v2.pdf.

[3] Dinu, A. 2015. Risk Types in International Trade. *Knowledge Horizons – Economics*, 7(1): 92-94. Available at: http://orizonturi.ucdc.ro/arhiva/khe7nr1/dinu.pdf

[4] Giovannucci, D. 2007. *Basic Trade Finance Tools: Payment Methods in International Trade*. In "A Guide to Developing Agricultural Markets and Agro-enterprises". Available at: http://www.ruralfinanceand investment.org/sites/default/files/1153746522276_Doc_7_1_Trader_Finance_Pay_Methods.pdf

[5] Glady, N., and Potin, J. 2011. *Bank Intermediation and Default Risk in International Trade – Theory and Evidence*. Available at: http://www.etsg.org/ETSG2011/Papers/Potin.pdf

[6] Hnilica, J., and Fotr, J. 2009. *Aplikovaná analýza rizika.* Praha: Grada, ISBN: 978-80-247-2560-4, 264 pp.

[7] Hoefele *et al.* 2013. *Payment Choice in International Trade: Theory and Evidence from Cross-country Firm Level Data.* Working paper 2013-11. Loughborough University. Available at: ftp://ftp.repec.org/opt/ReDIF/RePEc/lbo/lbowps/LBOWPS_2013_11_Hoefele.pdf

[8] Morgan, J.P. 2013. *Bank Payment Obligation*. Available at: https://www.jpmorgan.com/_cm/BlobServer?blobkey=id&blobnocache=true&blobwhere=1320615847712&blobheader=application%2Fpdf&blobcol=urldata&blobtable=MungoBlobs&blobheadername1=Contentdisposition&blobheadervalue1=attachment;filename=SWIFT_BankPaymentOblig ation%20-%202013-07.pdf

[9] Koulayev, S*. et al.* 2015. *M. Explaining adoption and use of payment instruments by US consumers.* Working Paper 2015-004. Working Papers Series from Boston University. Available at: http://sites.bu.edu/mrysman/files/2015/05/paychoice.pdf

[10] Machková *et al.* 2014. *Mezinárodní obchodní operace.* Praha: Grada, ISBN: 8024748746, 9788024748740, 256 pp.

[11] McNaull, P., and Loy, L. 2008. *Risk Management.* Edinburgh: Heriot-Watt University. Available at: http://www1.hw.ac.uk/insurance/risk-management-policy.pdf

[12] Niepmann, F., and Shmidt-Eisenlohr, T. 2014. *No Trade: How Banks Affect Export Patterns*. CESIFO Working Paper No. 4650. Federal Reserve Bank of New York, Center for Economic Studies and Ifo Institute. Available at: https://ssrn.com/abstract=2407892

[13] Ossolinski *et al.* 2014. *The Changing Way We Pay: Trends in Consumer Payment.* Reserve Bank of Australia, RDP 2014-05. Available at: https://www.rba.gov.au/publications/rdp/2014/pdf/rdp2014-05.pdf

[14] Quinn, S., Roberds, W. 2008. The Evolution of the Check as a Means of Payment: A Historical Survey. *Economic Review* 93 (4). Available at: https://www.frbatlanta.org/-/media/documents/research/publications/economic-review/2008/vol 93no4_quinn_roberds.pdf

[15] Salčić, Z. 2014. *Export Credit Insurance and Guarantees: A Practitioners Guide.* Palgrave Macmillan Ltd., ISBN : 978-1-137-36681-8, 228 pp.

[16] Sato *et al.* 2014. *Mezinárodní obchodní operace.* Praha: Grada, ISBN: 8024748746, 9788024748740 256 pp.

[17] Seyoum, B. 2009. *Export-Import Theory, Practices and Procedures.* New York: Routledge, ISBN-10: 0415818389, 656 pp.

*** Ararat Bank. 2017. *Documentary Collection*. Available at: https://www.araratbank.am/upload/ up_files/collection _eng.pdf

*** Australian Payments Clearing Association. 2011. *Payment, clearing and settlement system in Australia.* Available at: https://www.bis.org/cpmi/publ/d97_au.pdf

*** Commonwealth Bank of Australia. 2006. *TradeGuide*. Available at: https://www.commbank.com.au/content/ dam/commbank/business/pds/tradeguide.pdf

*** Credit Suisse. 2016. *Letters of Credit*. Credit Suisse Group AG. Available at: https://www.credit-suisse.com/media/assets/ private-banking/docs/ch/unternehmen/kmugrossunternehmen/akkreditive-en.pdf

*** Department of Mercantile Law of University of South Africa. 2009. *Law of Negotiable Instruments, Intellectual Property and Competition*. Pretoria, University of South Africa.

*** Federal Reserve Bulletin. 2005. *Trends in the Use of Payment Instruments in the United States*. Available at: https://www.federalreserve.gov/pubs/bulletin/2005/spring05_payment.pdf

*** Reserve Bank of India. 1998. *Payment Systems in India.* Mumbai: Reserve Bank of India.

*** SWIFT. 2016. *Bank Payment Obligation: A New Payment Method*. La Hulpe: Society for Worldwide Interbank Financial Telecommunication. Available at: https://www.swift.com/node/35051

*** US Department of Commerce. 2008. *Trade Finance Guide: A Quick Reference for US Exporters*. Washington, DC: International Trade Administration. Available at: https://www.trade.gov/publications/pdfs/tfg2008.pdf

Appendix 1. Summary of the questionnaire

Question No.	Wording of the question	Possible answers
1	Your company (only one possible answer):	• Only exports • Only imports • Both exports and imports • Does not trade with abroad
2	Indicate, please, if your company during trading with abroad used in the past five years (2012–2016) at least one of the following instruments: B/E, L/C, D/P, D/A, BPO.	• Yes • No
3a	Your company used the named instruments in the period 2012–2016 (for every instrument, respondents could answer only one of the four possible options):	• In all cross-border deals • In most cross-border deals • Only in selected cross-border deals • Never
3b	Your company proceeded to the use of the named instruments in that period especially with respect to (for every instrument, respondents could choose only one reason):	• The value of the deal • The nature of the deal • The wish of the counterparty • Obtained information on the quality of the counterparty • The territory in which the counterparty is located • Other reason(s) • Irrelevant (we did not use this instrument)
4a	Mark instruments where you perceive the highest (only one instrument for every searched aspect could be chosen):	• Level of security for your business interests • Administrative burden of the instrument • Financial burden of the instrument
4b	Mark instruments where you perceive the lowest (only one instrument for every searched aspect could be chosen):	• Level of security for your business interests • Administrative burden of the instrument • Financial burden of the instrument
4c	You usually consider the use of the named instruments as (for every instrument, respondents could choose only one reason):	• Necessary • Desirable • Reasonable • Enforced (e.g. by the counterparty) • Useless • We cannot judge
5	Which of the five instruments listed below will most likely be used by your company between 2017 and 2021 (only one possible answer)?	• B/E • L/C • D/P • D/A • BPO • Other • We are not able to determine in advance
6	In which region is your company (or Czech representation) based (only one possible answer)?	14 Czech regions were offered as per the official administrative division
7	To which field of business activity do you dedicate yourselves (only one possible answer)?	21 fields were offered as per NACE Database.
8	What was the (net) turnover of your company in the last closed accounting period (in the case of an international company, the turnover of the Czech representation is meant) (only one possible answer)?	• Up to 50 mil. CZK • From 51 million CZK to 250 million CZK • From 251 million CZK to 1,000 million CZK • From 1,001 million CZK to 4,000 million CZK • Over 4,001 million CZK
9	How many employees does your company have (only one possible answer)?	• Up to 50 employees • From 51 to 250 employees • From 251 to 1,000 employees • Over 1,000 employees

System Approach to Diagnostics and Early Prevention of a Financial Crisis at an Enterprise

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Abstract:

The article is devoted to the development of a system approach to diagnostics and early prevention of a financial crisis at an enterprise. It was found that the early detection of signs of a financial crisis at enterprises was the priority objective of financial diagnostics. It was determined that the analysis of the system of financial parameters on which the potential viability of the enterprise depends was required within the framework of financial diagnostics. It was proved that failure to account for qualitative parameters of the enterprise's activity was the main drawback of integral financial diagnostics. It was found that value-based indicators did not allow to fully alarm about the threat of default. It was stated that the approach based on forecasting the debt coverage indicator ignored capital expenditures and the performance indicators achieved. It was substantiated that an insufficient level of assessment of the potential solvency of the enterprise was a weak point in both integral and value-based financial diagnostics.

Keywords: diagnostics; finance; crisis; process; approach; system.

JEL Classification: G01; G10; G17

Introduction

Application of the system approach allows to solve the problem of crisis diagnostics to a certain extent. In general, the system approach describes the direction of the research method, which consists in studying the object as an integral set of elements in their totality and the links between them, *i.e.* consideration of the object as a system.

The authors share the point of view of the authors (Ershov and Kuzin 2016, Pichugin 2015, Chen, Chi and Kuo 2014), who understand the system approach as the study of economic processes as complex systems that are in a causal relationship and should belong to the basic requirements for the enterprise diagnostics.

The system approach to the analysis of the activities of economic entities is based on the understanding that each such entity represents a complex system of elements united by a multitude of links both with each other

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and with the external environment. It is impossible to analyze particular aspects of the enterprise activity in isolation – this should be done only taking system links into account.

This allows not only to comprehensively assess the state of the object in the context of incomplete information, but also to reveal the problems in its functioning, as well as to find ways to solve them, taking fluctuations in the system parameters into account. From the standpoint of this approach, it is possible to study the system functioning modes in general (Savenko 2013, Uspenskaya 2013, Ajupov, Kurilova and Kovalenko 2015). At the same time, the methodical system approach to financial diagnostics has been undeveloped until now.

1. Methods

The system approach assumes a complete and reliable description of the analyzed object (Nosova 2016, Kutnjak, Miljenović and Radović 2014). However, the completeness should not be understood literally in this case: it is not necessary to conduct a comprehensive analysis of all types of enterprise activities at the same time, as this is not always appropriate. All factors and elements that can influence the final conclusions and which are important for the development of recommendations for the future should be taken into consideration.

It is important to clearly differentiate a comprehensive analysis of the financial position of the enterprise and a system approach to financial diagnostics. The system approach implements the system principle in the process of research, while the comprehensive approach implements the comprehensive principle. The comprehensive approach can be considered as a variety of the system approach, which represents a set of methods and tools used to study a particular system in general and its individual elements in particular.

The system approach becomes comprehensive in the case when it is a question of researching the systems including the elements functioning in other systems. The financial position of the enterprise is analyzed in the process of financial diagnostics, which results from the interaction between the elements of the financial system and is determined by a combination of financial and economic factors that are expressed in the system of financial indicators.

Practice has revealed that comprehensive analysis in its traditional sense does not meet the principles that relate to the system of financial diagnostics. In the framework of financial diagnostics, it is necessary to analyze the system of financial parameters on which the potential viability of the enterprise depends. Such parameters include: liquidity and solvency (including the long-term); capital and asset structure; capital and asset circulation; enterprise profitability and efficiency; qualitative financial parameters of the enterprise – financial risks, in particular; enterprise valuation and its dynamics.

2. Results

The system approach to financial diagnostics consists in the comprehensive study of the system of factors and parameters of the financial position of the enterprise. In contrast, the comprehensive study means using a complex of analytical methods.

Table 1 provides indicators of the success of financial and economic activities of enterprises from the sample and the quality of their financial position, which represent various methodical approaches to financial diagnostics: traditional approach, ranking analysis of the integral indicator and the value-based approach.

Besides, the values of net assets are provided, which can also be considered as quite informative indicators of the financial position of enterprises. It can be seen from the data that virtually all enterprises show an unambiguous picture of a deep financial crisis. Traditional indicators of financial position (coverage ratio, financial independence ratio, return on equity and circulation of current assets) are unsatisfactory.

Analysis of the values of the integral indicator of the financial position also allows to make similar conclusions: the level of default threat of the vast majority of enterprises is extremely high, while ranking classes are low.

A similar picture is observed in the analysis of value-based indicators: the absolute indicator of economic added value has a negative value, while the relative profitability index of the enterprise capital is lower than the capital cost rate. Only two companies are exceptions: Alfasnab LLC and Maxwell LLC, which have fairly high financial indicators in general.

Table 1. Financial diagnostics of enterprises of the population under study using various methodical approaches 2016

Enterprise	Coverage ratio	Capital structure ratio	Return on equity ratio	Asset turnover ratio	Probability index of the threat of possible bankruptcy	Weighted average cost of capital, %	Return on the employed capital, %	Net assets, mln rub.	Economic added value, mln rub.
Alfasnab LLC	1.51	0.18	0.61	5.67	1.75	24.37	34.64	8,476	3,330.1
Avangard LLC	1.42	0.14	-0.05	0.78	-0.28	21.81	0.27	-20,868	-30,171.0
JSC ESKIS	0.98	0.03	-2.58	0.36	-0.77	25.13	8.68	-268,175	-132,579.0
EMR LLC	0.25	-0.85	-2.78	13.58	-3.18	22.63	-115.1	-6,734	-3,696.5
JSC Kiparis	0.31	-0.13	-0.31	4.51	-0.91	21.82	-187.2	-1,202	-1,530.7
Nais-Volga LLC	0.65	-0.73	0.16	0.74	-2.38	24.56	2.96	-434,285	-180,861.0
CJSC Labtools	0.93	-0.26	-0.21	0.14	-2.28	22.48	-10.07	-26,135	-18,696.0
ALPROM NO.5 LLC	0.41	-1.11	-0.45	3.05	-4.11	23.81	-2.68	-125,404	-48,294.0
CJSC Dielektrik	0.75	-0.04	-0.54	0.67	-0.93	23.32	-10.15	-23,655	-22,052.0
JSC UralKomplekt	0.76	-0.16	-0.95	2.77	-1.44	23.18	-2.23	-8,341	-10,305.0
VDL Company LLC	0.65	-0.36	-0.09	3.72	-1.61	22.74	1.92	-1,978	-1,436.6
Aura LLC	0.16	-1.15	-1.08	1.28	-5.48	22.21	-52.28	-41,563	-16,708.0
NZETO LLC	0.84	-0.27	-0.57	0.09	-1.43	24.43	2.55	-27,695	-10,647.0
JSC RPE AVERAL	1.05	0.11	-0.74	0.79	-1.01	23.45	-22.27	-3,139	-22,285.0
NiKa LLC	1.86	-0.13	0.01	0.51	-0.76	23.61	0.26	-50,578	-84,535.0
JSC Tezura	0.56	-0.05	2.22	3.41	-0.67	25.18	32.08	-11,324	1,602.18
CJSC DIN-ENERGO	1.49	0.01	-0.25	1.65	-1.79	19.95	-8.61	-13,096	-86,572.0
Signum LLC	0.08	-0.48	-0.55	2.35	-2.85	23.44	5.39	-8,588	-5,216.6
JSC Megawatt	1.17	-0.25	-0.58	0.84	-1.66	23.18	4.48	-40,792	-13173.0
Reon-Techno LLC	1.11	-0.15	-2.97	0.47	-1.33	24.96	2.36	-54,455	-30,768.0
INKOMM LLC	0.77	-0.02	-0.38	0.61	-0.68	24.22	21.58	-7,073	-2,088.6
Kran-Ek LLC	0.59	0.18	0.08	1.01	-0.35	23.55	-17.06	1,658	-2,5133
CJSC Spektr	0.45	0.21	-0.45	3.28	-0.26	24.26	-44.95	-342	-3,113.5
JSC KVET	3.01	0.03	-1.45	0.96	-0.48	24.97	15.21	-43,978	-85,322.0
Novye Technologii	1.49	-1.68	0.02	3.08	-4.97	21.18	4.56	-100,796	-64,785.0
Terkont Company LLC	2.18	-0.03	-0.02	0.66	-0.72	24.96	0.11	-13,495	-95,871.0
JSC Module-Technos	1.25	-0.06	-0.15	3.42	-0.81	21.75	6.82	-11,842	-21,003.0
Smart Micron LLC	0.47	-0.38	-0.30	1.03	-2.47	20.78	-19.68	-15,536	-11,085.0
CJSC	0.54	0.02	-0.48	0.61	-0.81	20.67	-26.12	-11,043	-15,443.0
JSC Reon-Techno	14.51	-1.14	-0.37	1.62	-3.22	24.58	-6.75	-41,789	-26,126.0
Maxwell LLC	3.68	0.84	0.02	3.59	1.92	22.99	2.01	-97,437	-31,921.0

At the same time, there is undoubtedly zero crisis at the top of these enterprises, since almost all approaches lead to positive conclusions regarding the quality of the financial position. However, value-based indicators are unsatisfactory for Maxwell LLC, while all others indicate zero crisis. Additional analysis using the logic of the system approach is necessary for such enterprises in the absence of an unambiguous picture when using various methodical approaches. Table 2 provides an analysis of key indicators of the financial position of Maxwell LLC over time.

Table 2. Indicators of early prevention of a financial crisis at Maxwell LLC for 2012-2016

Indicators	2012	2013	2014	2015	2016
Coverage ratio (third degree liquidity)	3.02	3.47	3.57	3.67	3.68
Intermediate coverage ratio	1.75	1.96	2.13	1.98	1.51
Financial independence ratio	0.29	0.25	0.29	0.87	0.82
Ratio of non-current assets coverage by own capital	0.57	0.51	0.62	1.86	1.83
Return on equity ratio	0.18	-0.05	0.18	0.02	0.2
Return on sales revenue by financial results from	0.04	0.02	0.07	0.02	0.02
Return on sales revenue by financial results from	0.08	0.04	0.09	0.05	0.05
Return on assets ratio by net profit	0.06	-0.03	0.05	0.02	0.01
Current assets turnover ratio	2.75	3.08	3.27	3.57	3.6
Debt turnover ratio by financial results from ordinary	0.18	0.07	0.22	0.45	0.6
Probability index of the threat of possible bankruptcy	0.46	0.21	0.48	1.92	-

Indicators	2012	2013	2014	2015	2016
Ranking class	3	4	3	1	-
Return on the employed capital, %	4.5	-1.03	8.18	-0.16	2.1
Return on the employed capital – Weighted average	-28	-37.09	-25.15	-15.32	-20.9
Economic added value, mln rub.	-30.64	-45.31	-33.65	-21.34	-31.9
Growth of economic added value, mln rub.	-	-14.68	+11.64	+12.32	-10.5

Analysis of the information provided in the table allows to conclude that the financial position indicators that describe traditional financial diagnostics indicate a fairly high level of financial stability of the enterprise. As such, the indicators of liquidity and solvency are quite high. They describe positive dynamics.

The indicators describing the capital structure are satisfactory. At the same time, return and turnover indicators before interest, tax and depreciation are moderate. At the same time, the autonomous analysis of financial indicators according to the traditional approach does not allow to make unambiguous conclusions about the crisis processes at the enterprise.

Besides, the integral indicator of the financial position indicates positive dynamics and describes the financial position as stable, not threatened by the financial crisis. The ranking class of the enterprise increased from the 4th class in 2013 to the first in 2015, which indicates a rather low level of probability of the enterprise default.

3. Discussion

The reliability of the presented approaches to diagnostics and early prevention of the financial crisis at the enterprise is confirmed by the fact that it is possible to identify certain symptoms of the financial crisis in advance with their help, but it is quite difficult to identify some financial parameters using the value-based diagnostics. First of all, this is about the circulation of resources, liquidity and solvency of the enterprise.

To a certain extent, this problem can be solved using the integral index of the financial position (Bivainis and Garškaite 2010, Zavalko, Panina, Kovalev, Zhakevich and Lebedev 2017). At the same time, this indicator is calculated based on the reporting data and allows to assess that past recorded trends will be preserved in future periods only indifferently, on the basis of the provision.

Besides, the drawback of the integral indicator of the financial position is that it takes into account only the quantitative characteristics of the enterprise activities that arise from the financial statements. Qualitative parameters, implicit costs of capital and projected estimates are disregarded.

The insufficient level of assessment of the potential solvency of the enterprise is a weak point in both integral and value-based financial diagnostics. This is a consequence of not taking the actual and potential indicators of net cash flows of enterprises into account in the process of analysis.

Practice has shown that indicators of cash flows significantly influence the level of solvency of enterprises. One way to solve this problem is to calculate the projected debt coverage ratio values. The ratio can be calculated as the ratio of the net movement of funds from operating and investing activities to the requirements for servicing and repaying the debt for the relevant financial year.

The indicator describes the ability of the analyzed enterprise to service borrowed loans in the future, *i.e.* describes the projected level of solvency. It is required to develop projections of the enterprise cash flows to calculate the projected values of the debt coverage ratio. It is clear that the enterprise is able to service its debt if the projections of net cash flows from operating and investing activities exceed scheduled payments for meeting the obligations to banks and commercial lenders.

The ratio is deemed sufficient if its value exceeds 1.0. Forecasts should be carried out in increments of one quarter and the forecast horizon of four quarters. It is also recommended to take the projections of raising funds on the basis of additional contributions from investors into account in the calculations, as well as the state of funds in bank accounts by the beginning of the forecast period, taking possible financial loans into consideration.

When the forecast indicators are reached, the enterprise will be able to secure a high level of solvency. However, an approach based on solvency forecasting does not take into account the implicit costs of capital, as well as other financial parameters that describe the enterprise performance and its ability to fulfill obligations in the long term.

Conclusion

The lack of consideration of qualitative parameters of the enterprise activities and implicit costs of capital are the main drawback of the integral financial diagnostics. Value-based indicators do not allow to fully and promptly alarm about threat to default. Besides, the value-based approach does not take all the parameters of the financial position of the enterprise into account.

At the same time, the approach based on forecasting the debt coverage indicator ignores the implicit costs of capital and the achieved performance indicators, and takes the key financial parameters of the enterprise into consideration only partially. This means that with stand-alone use, none of the approaches will provide an objective picture of the threat of a financial crisis.

Therefore, each of the justified approaches only partially fulfills the tasks set for financial diagnostics. In the case of financial diagnostics of Maxwell LLC, two of the described methodical approaches (integral indicator of financial position and projected debt coverage ratio) revealed no threats to the enterprise, but the value-based diagnostics revealed threats for the enterprise.

References

[1] Ajupov, A.A., Kurilova, A.A., and Kovalenko, O.G. 2015. Financial recovery organization on the basis of cash flow management. *Mediterranean Journal of Social Sciences*, 6(3): 710-713.

[2] Bivainis, J., and Garškaite, K. 2010. The system of diagnostics of bankruptcy threat to the enterprises. *Business: Theory and Practice*, 11(3): 204-212.

[3] Chen, F.H., Chi, D.J., and Kuo, C.Y. 2014. *Using rough set theory and decision trees to diagnose enterprise distress – consideration of corporate governance variables. Lecture Notes in Computer Science*, 8589 LNAI: 199-211 pp.

[4] Ershov, R.S., and Kuzin, V.I. 2016. Faktory, vliyayushchiye na finansovuyu ustoychivost predpriyatiya v usloviyakh ekonomicheskogo krizisa [Factors that influence the financial stability of an enterprise in the context of an economic crisis]. *Bulletin of the Youth Science*, 2 (4): 18-28.

[5] Kutnjak, G., Miljenović, D., and Radović, M. 2014. Defing financial strategies of an enterprise at times of crisis. *Mediterranean Journal of Social Sciences*, 5(19): 553-563.

[6] Nosova, D.A. 2016. Planirovaniye na predpriyatii v period finansovo-ekonomicheskogo krizisa [Planning at the enterprise amid the financial and economic crisis]. *Theory and Practice of Modern Science*, 3 (9): 365-368.

[7] Pichugin, A.V. 2015. Finansovoye ozdorovleniye kak instrument sderzhivaniya krizisa na predpriyatii [Financial recovery as a tool to curb the crisis at the enterprise]. *Bulletin of the Academy*, 1: 16-21.

[8] Savenko, V.S. 2013. Upravleniye debitorskoy i kreditorskoy zadolzhennostyami v period finansovogo krizisa na predpriyatii [Managing receivables and payables amid the financial crisis at the enterprise]. *SWorld Academic Papers*, 38(4): 17-20.

[9] Uspenskaya, N. 2013. Finansovo-ekonomicheskiy krizis kak faktor negativnogo vozdeystviya na potentsial promyshlennykh predpriyatiy [Financial and economic crisis as a factor of the negative impact on the potential of industrial enterprises]. *Relevant Issues of Innovation Economy*, 4: 27-36.

[10] Zavalko, N.A., Panina, O.V., Kovalev, V.A., Zhakevich, A.G. and Lebedev, K.A. 2017. Improving financial control over the government system. *Espacios*, 38(29): 15-22.

Evaluating the Success Factors for Development and Sustenance of Low-Cost Regional Airports in India using Fuzzy Multi-Criteia Decision Making Method

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Abstract:

The current study attempts to evaluate the success factors for development and sustenance of low-cost regional airports in India. The Fuzzy multi-criteria decision making (MCDM) method has been utilized for the above pertaining. The findings of the study exhibit the importance to keep low investment cost in the development, low levies from the airport users' efficient airport operations and due diligence prior to development to measure the demand for air transport effectively. The paper fulfills the gap in the literature by integrating the stakeholder's view in low-cost regional airport development. Methodically, the paper contributes by developing and demonstrating the application of the Fuzzy based MCDM model for evaluation of the success factors for low-cost regional airport development.

Keywords: low-cost airport; low-cost airlines; success factors; fuzzy multi-criteria decision making; airport strategic planning

JEL Classification: C52; C44; C61; R40; R58

Introduction

The unprecedented growth of Indian aviation has mandated for the capacity addition in airport infrastructure. Based on Naresh Chandra committee's policy framework Government of India (GOI), introduced Public-Private Partnership (PPP) model to modernize, develop and operate the brownfield Delhi and Mumbai airport in 2006 (ICAO 2015). Two Greenfield airports of Bangalore and Hyderabad has also been operationalized since 2008 on the same model (ICAO 2015). While the Cochin International Airport has been the first Greenfield airport under PPP mode which has been founded in 1994 and has been operational since 1999 (ICAO 2015). The five major airports under PPP mode are catering to the need of 60% of the country's air traffic (Nayar 2013). The Airport Authority of India has modernized and expanded Kolkata and Chennai airport (Nayar 2013). Also, 35 non- metro airports have been modernized with capacity enhancement under the 11th Five-year plan (Nayar 2013).

Keeping in view the success of airport operating under PPP mode, GOI has decided to transfer four existing airports Chennai, Kolkata, Ahmedabad and Jaipur and two Greenfield airport projects at Navi Mumbai and Goa into PPP model in order to attract investments from private players. In May 2015, GOI has further approved 15 Greenfield airports under PPP mode.

At present, out of 464 airstrips/ airports in India, only 116 are operational (AAI 2017). Recently GOI has announced the construction and development of 200 low cost 'No-Frills' airports within the budget of USD 7 million

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to USD 15 million each with the purpose to enhance the regional air connectivity (Ministry of Civil Aviation India 2016). In line with the stated plan, 160 non-functional airports were announced to be developed at a cost of INR 50-100 crore each in partnership with state government under the Union Budget of 2016. As GOI is planning to develop low-cost airports on a massive scale, it is essential to understand the key requirement of Low-Cost Airlines and other key stakeholders in the airport.

Regional airport development is critical for India's economic development and regional integration but it should be given a thoughtful consideration of meeting the needs of key stakeholders. Since 2009, GOI has spent over USD 50 million on eight non-functional airports with intent to develop it as no-frill airports; however, after development, they were unable to attract and retain their airline customer (Reuters 2015). Airports such as Jaisalmer, Sahnewal, Gondia, Mysore, Pondicherry, Kanpur, Juhu, Kolhapur, Sholapur, Akola, Jalgaon, Bhatinda, Pathankot, Malda, Cooch Behar, Warangal andCuddupa are some of the examples of developed but non-operational airports in India (The Telegraph 2015). The industry experts opine that the above failure has occurred due to lack of a well-structured, demand driven and airline oriented plan in the low-cost airport development (CAPA 2017). *In sum and substance lack of integration of key stakeholder's interest in low-cost regional airport development is contributing in existence of developed but non-operational airport in India.*

The current paper attempts to identify and evaluate key success factors for development and sustenance of Low-Cost Regional airport in India using Fuzzy MCDM method. The current study would be addressing the gap of integrating the stakeholder's view in low-cost regional airport development in India. There is an immense need for investigation with systems based thinking that aligns the airport strategies with its key stakeholders. There is earnest need to understand the key success factors required to attract and retain the key stakeholders of the non-operational regional airports in India.

1. Literature Review

A theme based approach is used to search various sources of literature conducted in the past on the topic success factors for the development of low-cost regional airports. Sources which were reviewed included research articles and papers, newspaper articles, and industry reports. Three major themes indicated below have been evolved from a review of the literature: Requirement of Low-Cost Airline (LCA) from airport; Design characteristics and strategy of Low-Cost Airport; Framework and strategy for Airport development.

1.1. Requirements of Low Cost Airline from the Airport

Berechman and de Wit (1996) identified that the requirements of the full-service carrier in airport selection varies from LCA for which the criteria varies from airport charges, demand and airport capacity. Adler and Berechman (2001) found that airport quality has a strong influence on airport choice factor of LCA. Gillen and Morrison (2003) also emphasized on the different requirement of LCA which necessitate the airport managers to tailor their strategy to suit their need. Francis *et al.* (2003) explored that airports attract LCA on basis of hub routes offerings and rely more on aeronautical revenues. Gillen and Lall (2004) endorsed the existence of competition between airports based on LCA requirement and stated that airport tailors its offering as per the need of LCA. Barrett (2004) has identified seven factors for airports to attract LCA namely low airport charges, quick turnaround time, single story airport terminal, quick check-in, good catering and shopping at the airport, good facilities for ground transport, and no executive/business lounge. However, the identified factors need to be verified in the current context of Indian low-cost regional airport development.

The secondary airport is located away from urban area increasing the car rentals to airport resulting an increase in non-aeronautical revenue compensated by a decrease in aeronautical charges levied to LCA (Barrett 2004). Airport charges and night curfew influence airport selection decision of LCA (Gardiner, Ison and Humphreys 2005). Eight LCA in Europe were surveyed revealing the differences in airport choice factor of LCAs' and the key result stated the core requirement of LCA has focussed on low-cost services. Lawton and Solomko (2005) observed that efficient operating condition is the most required expectation of LCA from the airport decreasing of turnaround time and resulting in higher aircraft utilization rate. Fifteen airport choice factors of which the fundamental factors related to quick and efficient turnaround facilities, convenient slot time and good aeronautical discount were identified (Warnock-Smith and Potter 2005). Chang *et al*. (2008) modeled a framework in which airport charges, operations hours, surface transport, terminal floor area, navigational aid and estimated demand for the destination were pertinent factors for LCA choice of airport. LCA seeks to optimize profitability of their network by choosing an appropriate airport (Graham 2013). Graham (2013) reviewed the academic literature pertaining to the relationship between airports and development of LCA and identified that the LCA's choice of airport is determined by its

business model. The passengers to secondary airports are willing to endure inconvenient airport location in exchange for a lower fare (Lu and Mao 2015).

As the most of the literature reviewed contend that low-cost airport development should mirror the strategy being practiced by LCA and other key stakeholders in the prevalent market. Since there is lack of academic literature to the pertaining to the requirements of LCA in Indian aviation context hence the current study would fulfill the existing gap in the literature.

1.2. Design Characteristics of the Low-Cost Airports

The rise of LCA resulted in the development of low-cost airports and their related facilities (De Neufville 2008). De Neufville (2008) has identified the features of Low-Cost Airports which rely on the business motto of deriving economy through operational efficiency and minimum frill in parallel with the strategy of LCA. Low-cost airports have simple design, avoiding the grandiose building; the passenger building has less space per person emphasizing on higher utilization and productivity for every resource deployed in the airport; Retail and commercial space is limited in low-cost airport as building and operating retail area is expensive and cumbersome (De Neufville 2008). Low-cost terminal refers to the terminal developed with low capital investment cost offering limited facilities due to space restriction, favoring simplified and efficient services (Sabar 2009). Sabar (2009) identifies two types of terminal, converted and newly-built; and enumerate some typical characteristics as basic terminal facilities, avoidance of jet bridges, limited retail and catering, single story terminal, no executive or business lounges, only road services and coach services to nearest cities and short taxiing distances to and from terminal building. The low-cost terminal provides an opportunity to the airport to target the LCA segment however it has been criticized for duplicating the resources which are mandatory irrespective of the market focus (Njoya and Niemeier 2011). Also, it cannibalizes the traffic from other terminals and lacks the ability to expand (Blackman 2011), (Toh 2013). Recently, Hanaoka and Saraswati (2011) contend that the efficiency of the low-cost terminal is more dependent on its location rather than its configuration. The location with respect to runways affects the aircraft taxiing distance while simple terminal configuration helps to minimize the passenger walking distance. The Low-cost airports are characterized by simplified terminal building, limited and needful check-in facilities, extensive use of self-service check-in kiosks, luxury lounges are eliminated, the departure gate area with limited seating facilities and the arrival area with one or two conveyor belt (Hanaoka and Saraswati 2011).

European Low Fare Airline Association (2004) contended that Low-Cost Airport emphasizes more on non-aeronautical revenue by increasing the terminal shopping area. Conversely, Kalakou and Macario (2013) analyzed the business model of different airport categories and contended that low-cost airport does not emphasize much on retail activities. The volume and type of traffic have a strong influence on airport business model (ELFAA 2004). However, the feature of the low-cost facilities of secondary airports has not been elaborated in the study leading towards the scope of the future investigation.

Singh, Dalei and Raju (2015) have contended that Low cost, no-frills airport will focus on quality and efficiency of services. Airport Design is to permit 25-30 minutes of turnaround time. The net result is that the airlines operating at these airports often require around half the space per passengers as the legacy airlines. A general feature of low-cost airports is also the absence of a large amount of expensive commercial space. These airports will be developed in a phased manner, initially to cater the needs of 20/40/80 seater aircrafts depending on traffic forecast. Smaller aircraft should be treated as the main demand driver for the future growth of low-cost airports. Initially, these airports may function on the basis of VOR only with or without Night Operations facilities. These airports can have a Runway Length of 1400m to 1700m with 2 parking bays. The perimeter may be provided with chain link fencing instead of the permanent wall.

Graham (2013) contends that Low-cost airport facilitates for quick turnaround time, convenient slot time, lack of congestion, low aeronautical charges and another user cost, small airport size and encompasses larger catchment area. Dziedzic and Warnock-Smith (2016) defined that characteristics of the low-cost airport as an airport levying low cost to its users, higher catchment area, quick and efficient airport operations, proximity to the primary city and convenient slot availability.

Despite the increasing dominance of LCA in the aviation market, the academic literature is inconclusive about the design characteristics of low-cost airports.

1.3. Framework and strategy for Airport Development

Prior to liberalization, the world of non-competing airlines was mirrored by a world of the non-competing airport (Barrett 2000). The advent of deregulation catalyzed the competitiveness of the airports. As airlines are free to choose their destination and hub airports, hence the airports design their strategy to lure them, resulting in

increasing competitiveness among airports. The changes in the organizational structure are also contributing to increasing competitiveness of airports (Starkie 2002).

Earlier the airport competitions emphasized catchment area of city as more than one airport was planned in the metropolitan area (Lian and Rønnevik 2011). In the liberalized market the competition between airports has been intensified and evidence of competition have been identified in few studies (Starkie 2008, Forsyth *et al.* 2010, Copenhagen Economics 2012). However, to devise an effective strategy for an airport it is necessary for an airport to understand their competitive environment and the way airport relate to their multiple stakeholders to align their strategies. To fulfill the above gap, Schaar and Sherry (2010) presented a model that attempts to describe the interrelationship between highly diverse entities of airports in terms of their responsibilities and needs for the United States. However, the model becomes too complex for role analysis of airport operator as it segregates the planning process among several entities of the airport. Jarach (2001) develop the air transport pipeline model to analyze the business relations among all entities of the airports. Tretheway and Kincaid (2010) utilized 'four Ps of marketing' to develop the strategy to cater the specific need of the airport customer. Graham (2010) performed competitive analysis for the airport based on Porter's five forces framework. However, the model has not been effective in airport context as airport involves multiple buyers and suppliers interacting simultaneously. Frank (2011) analyzed the business model of airports and concluded that the business model of airports is highly dependent on the context in which they operate. Kalakou and Macário (2013) evidenced the existence of diversity in the business model of 20 low-cost airports.

As evident from the most literature that the suitable business model of the low-cost airport is context dependent, which points the need to address the gap underlying for development of Indian Low-cost regional airports.

2. Methodology

The importance perception of the success factors of low-cost airport development is a subjective measurement. When it is measured on the basis of a numerical linguistic variable often results in incomplete, inconsistent, vague and imprecise results (Lupo 2015, Pandey 2016). On the contrary, it would be preferable to furnish interval value judgments rather than crisp value judgment (Chan and Kumar 2007). Since the measurement of success factor encompasses with intrinsic complexity related to nature of service, hence Fuzzy set theory render an effective approach to measure the expectation based on an interval-based linguistic variable (Lupo 2015, Pandey 2016).

Therefore, the current study employed Fuzzy Multi-Criteria Decision Making (MCDM) to evaluate key success factors for development and sustenance of Low-Cost Regional airport in India. The study has incorporated the following steps for the attainment of research objective: designing of the questionnaire, a collection of data, fuzzification of importance scores for evaluation of success factors of low-cost airport development and finally its defuzzification and interpretation which is depicted in Figure 1. Further, an overview of Fuzzy set theory and principles and the main steps of the research process are detailed.

Figure 1. Research Process of Fuzzy Multi-Criteria Decision Making
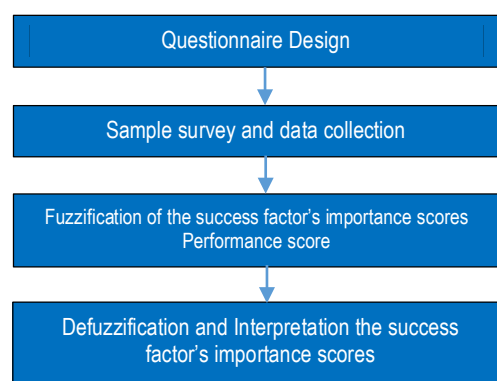
2.1. Fuzzy Set Theory and linguistic-fuzzy evaluation scales

The concept of the fuzzy set was propounded by Zadeh (1973) with the purpose to measure the human judgments or preferences more pragmatically by the help of linguistic terms. As the preferences expressed by human cannot be estimated with an exact numerical value, hence interval based linguistic term are used to describe the desired value (Zadeh 1973, Bellman and Zadeh 1970, Zadeh 1975, Hwang and Yoon 1981, Liang and Wang 1991, Hsu and Chen 1997, Chiadamrong 1999, Chien and Tsaia 2000, Chen 2001, Enrique 2004). The fuzzy set theory

provides a strict mathematical framework in which vague conceptual phenomena can be precisely and rigorously studied (Zimmermann 2001). Fodor and Roubens (1994) derived mathematical details of Fuzzy MCDM analysis. Altrock (1995) applied fuzzy logic to describe the 30 case studies emphasizing wide application as a decision-making tool. A fuzzy set is a set without a crisp, clearly defined boundary and contains elements with only a partial degree of membership (Mathworks 2012). Mathworks (2012) defines a membership function (MF) as a curve that explains how each point in the input space is mapped to a membership value (or degree of membership) between 0 and 1. The concepts of a linguistic variable can be quantified by fuzzy numbers using suitable membership functions. In the current research linguistic variable were used to represent the experts' assessment of the success factors importance and positive triangular fuzzy numbers were employed to gauge the linguistic variable as depicted in Table 1.

Table 1. Linguistic variables for measurement of weight of success factors

Not at all important	(0.0, 1.0, 2.0)
Slightly Important	(1.0, 2.0, 3.0)
Moderately Important	(2.0, 3.0, 4.0)
Very Important	(3.0, 4.0, 5.0)
Extremely Important	(4.5, 5.0, 5.0)

The previous literature has already established the basic arithmetic operations on fuzzy numbers. If $A_1 = (l_1, m_1, u_1)$ and $A_2 = (l_2, m_2, u_2)$ are representing two distinct triangular fuzzy numbers then their algebraic multiplication operations can be expressed by equation 1.

$$A1 \otimes A2 = (l1, m1, u1) \otimes (l2, m2, u2) = (l1l2, m1m2, u1u2) \tag{1}$$

The two main steps below shall describe the proposed method to conduct the current study:

Step 1: Data Collection and Sampling Framework

A questionnaire was designed on the basis intensive review of literature which contains seven Dimension and 32 success criteria for the development of low-cost airport which are indicated in Figure 2.

The data was collected from the expert team comprising of the senior executives employed with the key stakeholders of the airports in India. The key stakeholders included airlines, airports, regulators, consultants, policy makers and service providers. The survey was conducted throughout the month of December 2017 by employing purposive sampling method. A sample of 160 executives was undertaken for the study which is adequate for study in line with Norman and Streine (2003) who have stated that the adequate sample size to be five-fold of number of variables.

Step 2: Method Utilized for Fuzzification and Defuzzification of Success Factors Importance Score

For a ranking of fuzzy numbers graded mean integration representation method was explored by Chen and Hesieh (1998). Further, Chou (2003) has identified a canonical representation of multiplication operation on two triangular fuzzy numbers by graded multiple integration representation methods. Chou (2006) applied inverse function arithmetic representation for multiplication operation of multiple trapezoidal fuzzy numbers and the framework was employed to solve MCDM problem by Chou (2007). Chien-Chang (2012) developed a fuzzy MCDM model for evaluating the service quality of the airports where the service quality criteria and importance weight both were transformed into a triangular fuzzy number.

Figure 2. Hierarchical analysis structure for the success factor evaluation of Low-Cost Regional Airport
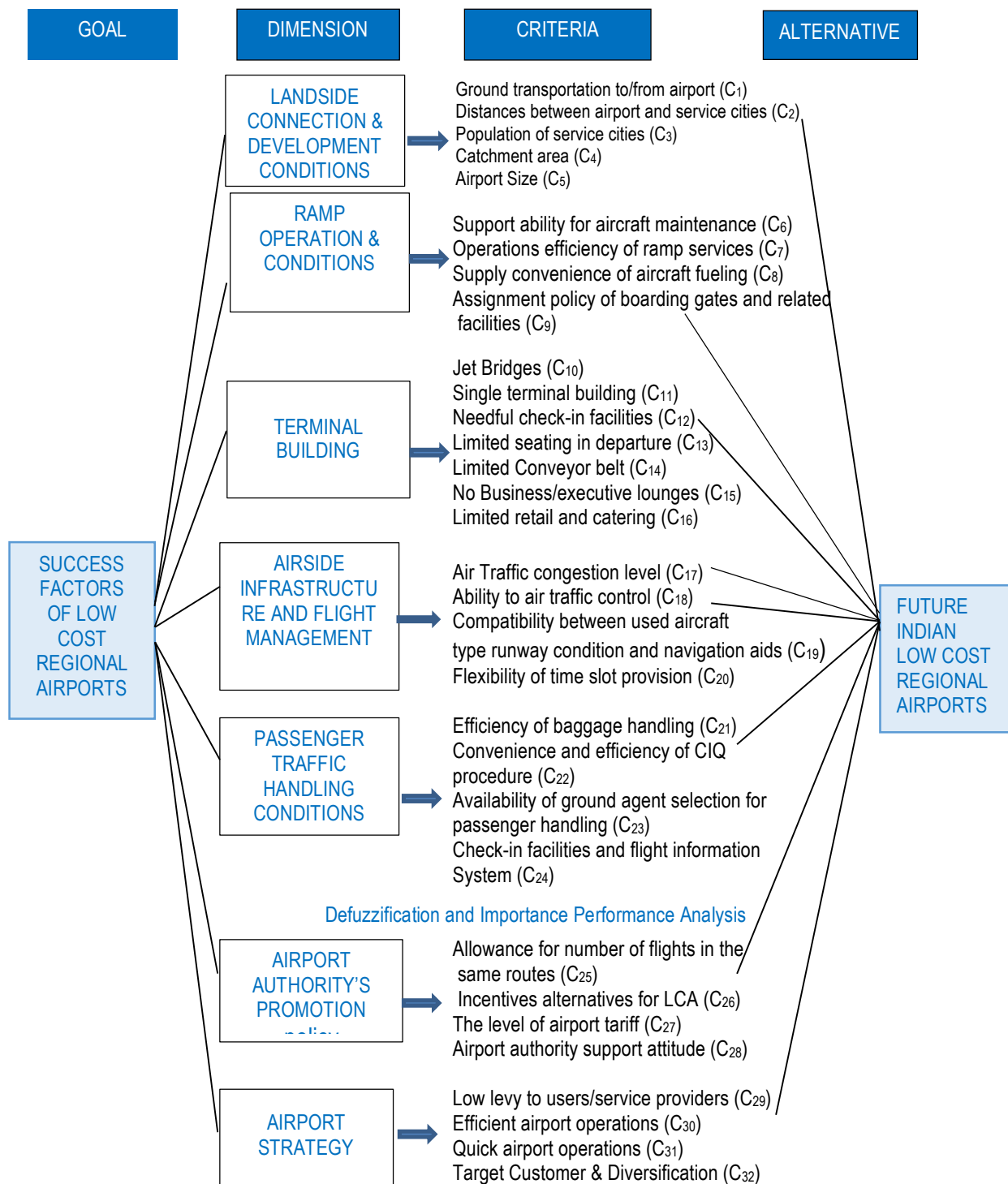
This paper constructs fuzzy MCDM model for evaluating the success factor of Low-Cost Regional airport utilizing a canonical representation of TFN based on graded mean integration method which is in line with the study of Chien-Chang (2012). Later the defuzzification of the scores is done using Inverse Arithmetic representation method. By employing the graded mean integration method a TFN $Y_1 = (c_1, a_1, b_1)$ is represented utilizing equation 2. The same representation is employed on all importance scores obtained from executives and then the average of the respective criteria is aggregated.

$$P(Y1) = \frac{1}{6}(c1 + 4a1 + b1) \tag{2}$$

The normalized weight of respective criteria is obtained by employing equation 3, where w_{in} represents the importance scores of ith success factor (i=1, 2, ... w) rendered by the nth respondent (n=1, 2, ...n) and AW_i represents the aggregate normalized weight of ith success factor.

$$AWi = \frac{\sum_{n=1}^{N} win}{\sum_{i=1}^{I} \sum_{n=1}^{N} win} \qquad (3)$$

Table 2. Evaluation result of the success factors for Low-Cost Airport Development in India

Goal	Dimension	Criteria	Criteria Score	Dimension Score	Criteria Weight	Dimension Weight
Success Factors of Low Cost Airport Development	Landside Connection & development conditions	C1		4.10	2.95%	3.10%
		C2	3.91		2.87%	
			3.80			
		C3	4.26		3.22%	
	Ramp Operation & Conditions	C4	4.30		3.25%	
		C5	4.20		3.18%	
		C6	3.86	3.86	2.92%	2.92%
		C7	4.32		3.27%	
		C8	4.07		3.07%	
		C9	3.22		2.43%	
	Terminal Building	C10	4.50		3.40%	
		C11	4.46		3.37%	
		C12	4.35		3.29%	
		C13	4.32	4.39	3.27%	3.31%
		C14	4.27		3.23%	
		C15	4.34		3.28%	
		C16	4.46		3.37%	
	Airside Infrastructure & flight management	C17	3.43		2.59%	
		C18	4.22	4.04	3.19%	3.05%
		C19	4.31		3.26%	
		C20	4.19		3.16%	
	Passenger traffic handling conditions	C21	4.44		3.36%	
		C22	3.88	3.96	2.93%	3.00%
		C23	3.50		2.65%	
		C24	4.03		3.04%	
	Airport authority's promotion policy	C25	4.07		3.07%	
		C26	4.33	4.36	3.27%	3.30%
		C27	4.54		3.43%	
		C28	4.52		3.41%	
	Airport Strategy	C29	4.27		3.22%	
		C30	4.34	4.05	3.28%	3.06%
		C31	4.06		3.07%	
		C32	3.55		2.68%	

3. Findings and Discussion

Based on the Fuzzy MCDM method, the analysis summarized in Table 2 reveals the evaluated construct for the development and sustenance of Low-Cost Regional Airports in India. Out of the seven dimensions, the terminal building and airport's promotion policy were most important with a weighted score of 3.31% and 3.30% respectively. The remaining dimensions, Landside Connection and development, airport strategy, airside infrastructure and flight management, passenger traffic handling conditions and ramp operation conditions have attained the weight of 3.10%, 3.06%, 3.05%, 3% and 2.92% respectively.

The high weight of the dimension terminal building is attributed to the importance designated by the respondents to all the factors of the dimension. It is observed that all the criteria of the dimension terminal building have attained high importance score. The criteria 'No Jet Bridges' (C10), 'Single terminal building' (C11), 'Needful check-in facilities' (C12), 'Limited seating in departure' (C13), 'Limited Conveyor belt' (C14), 'No Business/executive lounges' (C15) and 'Limited retail and catering' have scored 4.50, 4.46, 4.35, 4.32, 4.27, 4.34 and 4.46 respectively. The high weight obtained for all the factors of the dimension signifies the need to keep the low investment cost and efficient operations in airport development.

The dimension airport's promotion policy stands at second highest rank because of the exceptionally high importance score of the criteria 'level of airport tariff (C27)' and 'Airport authority support attitude'(C28) with 4.54 and 4.52 respectively. The criteria Allowance for a number of flights in the same routes (C25) and Incentives alternatives for LCA (C26) have scored 4.07 and 4.33 respectively. The low levy of airport tariff and airport authority support attitude act as an enabler for the airport users. The supportive attitude of airport operator helps the airlines to maintain their efficiency apart from low levies which eventually catalyze the development of regional air transportation.

The third highest weight has been attained by dimension 'Landside Connection and development' which is attributed to high importance obtained from criteria 'Population of service cities' (C3), 'Catchment area' (C4) and 'Airport Size' (C5) with scores of 4.26, 4.30 and 4.2 respectively. While the criteria Ground transportation to/from the airport (C1) and Distances between airport and service cities (C2) have obtained the importance score of 3.91 and 3.80 respectively. It is inferred that demand for air travel is the key criteria for success of low-cost regional airports hence the factors such as C3, C4 and C5 have obtained a good weight. The identified criteria should be assessed effectively for the success of low-cost regional airports in India.

The dimension 'Airport Strategy' has obtained the fourth rank with high weight achieved from criteria 'Low levy to users/service providers' (C29) and 'Efficient airport operations' (C30) with a score of 4.27 and 4.34 respectively. While the criteria 'Quick airport operations' (C31) and 'Target customer and diversification' (C32) has attained the score of 4.06 and 3.55 respectively. It can be inferred that the key stakeholders opine that low levy from airport users and efficient airport operations are a key success factor for the low-cost regional airport in India.

The fifth-ranked dimension is 'Airside Infrastructure and flight management' with high importance achieved by criteria 'Compatibility between used aircraft type, runway condition and navigation aid' (C19) and 'Flexibility of time slot provision' (C20) with a score of 4.31 and 4.19 respectively. The criteria 'Air traffic congestion level' (C17) and 'ability of air traffic control' (C18) has scored 3.43 and 4.22 respectively. It can be inferred that efficient air traffic control services are required at Low-cost regional airport. Also, the congruency between aircraft type of the prospective LCA and airside facilities need to be established.

The dimension 'Passenger traffic handling conditions' has obtained the sixth rank with high weight achieved from criteria 'Efficiency of baggage handling' (C21) with a score of 4.44. While the criteria 'Convenience and efficiency of CIQ procedure' (C22), 'Availability of ground agent selection for passenger handling' (C23) and 'Check-in facilities and flight information system' (C24) has attained the score of 3.88, 3.5 and 4.03 respectively. It can be inferred that the efficient baggage handling system is one of the most pertinent factors for the success of low-cost airport. As the low-cost airport stakeholders desire quick passenger flow in the terminal.

The dimension 'Ramp operation and condition' has obtained the seventh and last rank for which the criteria 'operations efficiency of ramp services' (C7) has weight of 4.32. The remaining criteria 'support ability of aircraft maintenance' (C6), 'Supply convenience of aircraft fuel' (C8) and 'Assignment policy of boarding gates and related facilities' (C9) have scored 3.86, 4.07 and 3.22 respectively. Hence efficiency of ramp services remains the key success factor of the current dimension.

Conclusion

The current paper identifies and evaluates the key success factors for development and sustenance of Low-Cost Regional airport in India using Fuzzy MCDM method. The findings of the study point that the design of terminal building and Airport's authority promotion policy are the most important dimension for low-cost airport development. High weight has been obtained for all the factors of the dimension terminal building signifying the need to keep the low investment cost and efficient operations in airport development.

The factor low levy of airport tariff and airport authority support attitude has gained high weight in the dimension Airport Promotion Policy signifying them to be the key enablers for the development and sustenance of low-cost regional airports. The factors related to 'demand for air travel' have also attained high weight necessitating the need to assess and evaluate them effectively prior to the development of low-cost regional airport development.

The factor efficient air traffic control services and compatibility of aircraft type of prospective LCA and airside facilities have also obtained high weight. It can be inferred that the key stakeholders opine that low levy from airport users, efficient airport operations, efficient baggage handling system and efficient ramp operations have emerged as a key success factor for the low-cost regional airport in India.

This paper furnishes the evaluated success factors for low-cost regional airport development and sustenance in India which fulfills the gap in the literature by integrating the stakeholders view in low-cost regional airport development. Methodically, the paper contributes by developing and demonstrating the application of the Fuzzy based MCDM model for evaluation of the success factors for low-cost regional airport development.

As to contribute to future research in this domain, comprehensive functional success factors need to be explored and included in the evaluation model. Also, some more strategic critical factors related to airport development should be explored through expert interview may be included in the further study.

References

[1] Adler, N., and I. Berechman. 2001. Measuring airport quality from the airlines view-point: an application of data envelopment analysis. *Transport Policy,* 8 (3): 171-181.

[2] Altrock, Von, C. 1995. *Fuzzy Logic and Neurofuzzy Application Explained.* New Jersey: Prentice Hall, ISBN: 0-13-368465-2, 350 pp.

[3] Barrett, S.D. 2004. How do the demands for airport service differ between full serice carrier and low cost carrier? *Journal of Air Transport Management,* 10 (1): 33-39.

[4] Barrett, Sean, D. 2000. Airport Competition in the deregulated European aviation market. *Journal of Air Transport Management,* 6(1): 13-27.

[5] Barros, C.P., and Diseke, U.C.P. 2007. Performance evaluation of Italian airports: A data envlopement analysis. *Journal of Air Transport Management* ,13(4): 184-191.

[6] Bellman, R.E., and Zadeh, L.A. 1970. Decision-making in a fuzzy environment. *Management Science,* 17: 141-164.

[7] Berechman, J., and de Wit, J. 1996. An analysis of the effects of European aviation deregulation on an airline's network structure and choice of a primary west Europpean hub airport. *Journal of Transport Economic and Policy,* 30 (3): 251-272.

[8] Blackman, S. 2011. *Under one roof – designing low-cost terminals*. Airport Technology. Available at: http://www.airport-technology.com/features/feature129047/

[9] Brans, J.P., and Vincke, P. 1985. Preference ranking organization method: The PROMTHEE method for multiple criteria decision making. *Management Sciences,* 31: 647-656.

[10] Chan, F.T.S., and Kumar, N. 2007. Global supplier development considering risk factors using fuzzy extended AHP based approach. *Omega,* 35: 417-431.

[11] Chan, L.K., and Wu, M.L. 2002. Quality function deployment: A literature review. *European Journal of Operations Research,* 143(3): 463-497.

[12] Chang, Y.C., Hsu, C.J., Williams, G., and Pan, M.L. 2008. Low cost carriers' destination selection using a Delphi method. *Tourism Management,* 29(5): 898-908.

[13] Chen, C.T. 2001. A fuzzy approach to select the location of the distribution center. *Fuzzy Sets and Systems,* 118: 65-73.

[14] Chen, M.F., and Tzeng, G.H. 2004. Combining grey relation and TOPSIS concepts for selecting an expatriate host country. *Mathematics Computational Model,* 40(13): 1473-1490.

[15] Chen, S.H., and Hesieh, C.H. 1998. *Graded mean integration representation of generalized fuzzy number*. Proceedings of 1998 sixth conference on fuzzy theory and its application. *Taiwan: Chinese Fuzzy System Association*, 1-6 pp.

[16] Chiadamrong, N. 1999. An integrated fuzzy multiple criteria decision making method for manufacturing strategies selection. *Computer and Industrial Engineering,* 37: 433-436.

[17] Chien-Chang, C. 2012. Evaluating the quality of airport service using the fuzzy multi-criteria decision-making method: A case study of Taiwanese airports. *Expert Systems,* 29(3): 246-260.

[18] Chou, C.C. 2003. The canonical representation of multiplication operation on triangular fuzzy numbers. *Computers and Mathematics with Applications,* 45: 1601-1610.

[19] Chou, C.C. 2006. Representation of multiplication operation on fuzzy numbers and application to solving fuzzy multiple criteria for decision making problems. *Lecture Notes in Artificial Intelligence,* 4099: 161-169.

[20] Chou, C.C. 2007. A fuzzy MCDM method for solving marine transshipment container port selection problems. *Applied Mathematics and Computation* 186: 435-444.

[21] Chou, C.C., Liu, L.J., Huang, S.F., Yih, J.M., and Han, T.C. 2011. An evaluation of airline service quality using fuzzy weighted SERVQUAL method. *Applied Soft Computing,* 11(2): 2117-2128.

[22] Correia, A.R., Wirasinghe, S.C., and de Barros, A.G. 2008. Overall level of service measures for airport passenger terminals. *Transport Research Part A,* 42(2): 330-346.

[23] De Neufville, R. 2008. Low-Cost Airports for Low-Cost Airlines: Flexible Design to Manage the Risks. *Transportation Planning and Technology,* 31: 35-68.

[24] Ding, J.F., and Liang, G.S. 2005. Using Fuzzy MCDM to selct partners od strategic alliances for linear shipping. *Information Sciences,* 173 (1-3): 197-225.

[25] Dziedzic, M., and Smith, D.W. 2016. The role of secondary airports for today's low-cost carrier business models: The European case. *Research in Transportation Business and Management*, 21:19-32.

[26] Enrique, H.V. 2004. *Fuzzy qualitative model to evaluate the quality on the web*. Modeling decisions for artificial intelligence: First International Conference. Barcelona, Spain: Springer-Verlag: Berlin Heidelberg, 15-27 pp.

[27] Fodor, J., and Roubens, M. 1994. *Fuzzy Preference Modelling and Multicriteria Decision Support.* Theory and Decision library Series D, System theory, knowledge engineering, and problem solving, ISBN: 978-94-017-1648-2, 256 pp.

[28] Forsyth, P., Gillen, D., Müller, J., and Niemeier, H.M. 2010. *Airport Competition: The European Experience.* Ashgate Publishing, Ltd., 462 pp.

[29] Francis, G., Fidato, A., and Humphreys, I. 2003. Airport-airline interaction: the impact of low cost carriers on two European airports. *Journal of Air Transport Management,* 9(4): 267-273.

[30] Frank, L. 2011. Business models for airports in a competitive environment one sky different stories. *Research in Transportation Business and Management,* 1(1): 25-35.

[31] Gardiner, J., Ison, S., and Humphreys, I. 2005. Factors influencing cargo airlines' choice of airport: An international survey. *Journal of Air Transport Management,* 11(6): 393-399.

[32] Gillen, D., and Lall, A. 2004. Competitive advantage of low cost carrier:some implications for airports. *Journal of Air Transport Management,* 10(1): 41-50.

[33] Gillen, D., and Morrison, W. 2003. Bundling, Integration and the delivered price of air travel. Are low cost carriers full service competitors? *Journal of Air Transport Management,* 9(1): 15-23.

[34] Graham, A. 2010. *Airport Strategies to Gain Competitive Advantage*. In Airport Competition: The European Experience, Ashgate, Farnham, ISBN 9780754677468, 89-102 pp.

[35] Graham, A. 2013. Understanding the low cost carrier and airport relationship: A critical analysis of the salient issues. *Tourism Management,* 36: 66-76.

[36] Hanaoka, S., and Saraswati, B. 2011. Low cost airport terminal locations and configurations. *Journal of Air Transport Management*, 17 (5): 314–319.

[37] Hsu, H.M., and Chen, C.T. 1997. Fuzzy credibility relation method for muliple criteria decision making problems. *Information Sciences,* 96 (1-2): 79-91.

[38] Humphreys, I., and Francis, G. 2000. Traditional airport performance indicators a critical perspective. *Transport Reserach Record* 1703 (1) : 24-30.

[39] Humphreys, I., and Francis, G. 2002. Performance measurement: a review of airports. *International Journal Transport Management*, 1 (2): 79-85.

[40] Hwang, C.L., and Yoon, K. 1981. *Multiple Attribute Decision Making: Methods and Application.* New York: Springer-Verlag, ISBN: 978-3-642-48318-9, 269 pp.

[41] Jarach, D. 2001. The evolution of airport management practices: towards a multi-point, multi-service, marketing-driven firm. *Journal of Air Transport Management,* 7 (2): 119-125.

[42] Kalakou, S., and Macario, R. 2013. An innovative framework for the study and structure of airport business models. *Case Studies on Transport Policy* 1 (1-2): 2–17.

[43] Kannan, G., Pokharel, S., and Kumar, P.S. 2009. A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider. *Resources, Conservation and Recycling,* 54 (1): 28-36.

[44] Kayapina, S, and Erginel, N. 2017. Designing the airport service with fuzzy QFD based on SERVQUAL integrated with a fuzzy multi-objective decision model. *Total Quality Management & Business Excellence:* 1-20, DOI: 10.1080/14783363.2017.1371586

[45] Konidari, P., and Mavrakis, D. 2007. A multi-criteria evaluation method for climate change mitigation policy. *Energy Policy,* 35(12): 6235-6257.

[46] Lawton, T.C., and Solomko, S. 2005. When being the lowest cost is not enough:building a successful low fare airline business model in Asia. *Journal of Air Transport Management*, 11(6): 355-362.

[47] Lee, C.K.M., Tan Ying Ru, C., Yeung, C.L., Choy, H.L., and Ip, W.P. 2015. Analyze the healthcare service requirement using fuzzy QFD. *Computers in Industry,* 74 : 1-15. DOI: 10.1016/j.compind.2015.08.005

[48] Lian, J.I., and Rønnevik, J. 2011. Airport competition – Regional airports losing ground to main airports. *Journal of Transport Geography,* 19(1): 85-92.

[49] Liang, G.S. 1999. Fuzzy MCDM based on ideal and anti ideal concepts. *European Journal of Operations Research,* 112 (3): 682-691.

[50] Liang, G.S., and Wang, M.J. 1991. A fuzzy multiple criteria decision making method for facilities site selection. *International Journal of Production Research,* 29: 2313-2330.

[51] Liang, G.S., Han, T.C., and Chou, T.Y. 2005. Using a fuzzy quality function deployment model to identify improvement points in airport cargo terminals. *Information Systems and Technology*, 1935(1): 130-140.

[52] Liou, J.J.H., Ching-Hui, Tang, Wen-Chien, Yeh, and Chieh-Yuan, Tsai. 2011. A decision rules approach for improvement of airport service quality. *Expert System With Applications,* 38(11): 13723-13730.

[53] Lu, Hua-An, and Yun-Ru, Mao. 2015. Evaluation of airport conditions to attract foreign low cost carriers: A case study of Taiwan. *Journal of Air Transport Management,* 42(C): 297-305.

[54] Lupo, T. 2015. Fuzzy servperf model cobined with ELECTRE III to comparatively evaluate service quality of international airports in Sicily. *Journal of Air Transport Management,* 42: 249 – 259. DOI: 10.1016/j.jairtraman.2014.11.006

[55] Nayar, Satyan. 2013. *APAO Presentations. Associaion of Private Airport Operators.* (APAO). Available at: http://www.apaoindia.com/wp-content/uploads/2012/06/APAO-Presentation_26-March-2013.pdf

[56] Njoya, E.T., and Niemeier, H.M. 2011. Do dedicated low-cost passenger terminals create competitive advantages for airports? *Research in Transportation Business & Management,* 1 (1): 55–61.

[57] Norman, G.R., and Streine, D.L. 2003. *PDQ statistics.* Toronto: BC Decker Inc., ISBN-10: 1550092073, 218 pp.

[58] Opricovic, S. 1998. *Multicriteria Optimization of Civil Engineering Systems.* Belgrade: Faculty of Civil Engineering, 302 pp.

[59] Opricovic, S., and Tzeng, G.H. 2004. Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS. *European Journal of oprations Research,* 156 (2): 766-776.

[60] Pandey, M.M. 2016. Evaluationg service quality of airports in Thailand using Fuzzy Multi-Criteria Decision Making Method. *Journal of Air Transport Management,* 57 (C): 241-249.

[61] Saaty, T.L. 2008. Decision making with the analytic hierarchy process. *International Journal of Service Science* 1(1). Availbale at: http://www.rafikulislam.com/uploads/resourses/197245512559a37aadea6d.pdf

[62] Sabar, R. 2009. *An evaluation of the provision of terminal facilities for the design of low cost airport terminals.* U.K.: Cranfield University. Availbale at: https://dspace.lib.cranfield.ac.uk/bitstream/handle/1826/4412/Rohafiz_Sabar_Thesis_2009.pdf?sequence=1&isAllowed=y

[63] Schaar, D., and Sherry, L. 2010. Analysis of airport stakeholders. *Integrated Communications Navigation and Surveillance Conference.* IEEE, J4-1 J4-17.

[64] Singh, D.P., Dalei, N.N., and Bangar Raju, T. 2015. Economics of Air Connectivity in India during Post Regulation and Post Privatization Era. *International Journal of Applied Research,* 1(11): 673-679.

[65] Starkie, D. 2002. Airport regulation and competition. *Journal of Air Transport Management,* 8(1): 63-72.

[66] Starkie, D. 2008. *The airport industry in a competitive environment: A United Kingdom perspective.* OECD Publishing, OECD/ITF Joint Transport Research Centre Discussion Papers 2008/15

[67] Toh, Ma. 2013. *Analysis: Dedicated low-cost terminals not the best bet*. Flight Global. Available at: https://www.flightglobal.com/news/articles/analysis-dedicated-low-cost-terminals-not-the-best-391525/

[68] Tretheway, M., and Kincaid, I. 2010. *Competition between airports: Ocurrence and strategy*. In Airport Competition: The European Experience, by P. Forsyth, D., Müller Gillen, J. and H.-M Niemeier. Surrey: Ashgate Publishing, Ltd.

[69] Velasquez, M., and Hester, P.T. 2013. An Analysis of Multi-Criteria Decision Making Methods. *International Journal of Operations Research,* 10(2): 56-66.

[70] Wang, J.W., Cheng, C.H., and Huang, K.C. 2009. Fuzzy hierarchical TOPSIS for supplier selection. *Applied Software Computing,* 9(1): 377-386.

[71] Warnock-Smith, D., and Potter, A. 2005. An exploratory study into airport choice factors for European low cost airlines. *Journal of Air transport Management,* 11(6): 388-392.

[72] Yang, Y.Q., Wang, S.Q. Mohammad, D., and Low, S.P. 2003. A fuzzy quality function deployment systemfor buildabledesign decision makings. *Automation in Construction,* 12(4): 381-393.

[73] Zadeh, L.A. 1973. Outline of a New Approach to the Analysis of Complex Systems and Decision Processes. *IEEE Transactions on Systems, Man, and Cybernetics*, 3 (1): 28-44.

[74] Zadeh, L.A. 1975. The concept of a linguistic variable and its application to approximate reasoning. *Information Sciences,* 8 (3): 199-249.

[75] Zhang, L.Y., and Chin, K.S.2005. QFD based optimal process quality planning. *International Journal of Advanced Manufacuring Technology,* 26 (7-8): 831-841.

[76] Zimmermann, H.J. 2001. *Fuzzy set theory and its applications.* 4th. Newyork: Springer Seience; Business Media, ISBN: 978-94-010-0646-0, 514 pp.

*** AAI. 2017. *Airport Authority of India*. Available at : https://www.aai.aero/en/taxonomy/term/1080

*** Copenhagen Economics. 2012. *Airport competition in Europe*

*** Department of Civil Aviation. 2015. *Air Transport Statistics.* Department of Civil Aviation Thailand

*** ELFAA. 2004. *Liberalisation of European Air Transport: The Benefits of Low Fares Airlines to Consumers, Airports, Regions and the Environment.* ELFAA

*** ICAO. 2015. *Public Private Partnership (PPP) – Case study*. International Civil Aviation Organization, Montreal Canada

*** MathWorks. 2012. *Fuzzy logic toolbox user's guide.* Natick: The MathWorks, Inc.

*** Ministry of Civil Aviation India. 2016. *National Civil Aviation Policy*. Ministry of Civil Aviation India

*** Reuters. 2015. *Ghost airports highlight risks as Modi spends to grow.* Reuters, India

*** The Telegraph. 2015. *Ghost Airport.* Telegraph, India

Work Intensity in Slovakia and its Dependence on Selected Factors

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Abstract:

One of the indicators currently used in relation to labor market is a share of people living in households with very low work intensity. The size of the population living in low work intensity households is also being followed with a goal to reduce poverty and social exclusion under the EU 2020 Strategy. The socio-economic structure of an individual or a household (education, type of household, income and work status) and also the demographic structure (gender, birth region) have a significant impact on this indicator. The goal of this article is to describe and also to assess the influence of selected factors on the work intensity of households in Slovakia with the use of multiple correspondence maps. The analysis is based on the categorized data obtained from the EU-SILC 2015 Statistics on Income and Living Conditions. The SAS 9.3 statistical software is used for calculations.

Keywords: labor market; poverty and social exclusion; work intensity; EU SILC; correspondence analysis

JEL Classification: I32; C39; J82

Introduction

The labor market is influenced by the same factors as other types of markets, but it shows specific features that arise from the specifics of labor as a factor of production. Work does not exist alone and only people - the labor force - are the creators of the so-called human capital. It is important to keep in mind that there is a general consensus about the idea that investment in human capital is a key source of labor productivity and economic growth (Schultz 1961, Becker 1964).

This statement confirms many other publications that are consistent with theoretical models of the importance of human capital in the process of economic growth. Human capital can also influence long-term economic growth by adopting technologies produced abroad (Nelson and Phelps 1960). On the other hand, human capital not only increases the productivity of one specific worker, but also the productivity of his colleagues (Lucas 1988). In a similar way Tanzi and Howell, 1995, note that improvement in worker´s qualifications leads to increased economic activity and allows efficient use of new machinery and technologies.

Human capital is equally important in terms of successful functioning of the labor market in line with the Europe 2020 strategy whose goal is to increase the employment rate of the population aged 20 to 64 up to 75%, the level of total investment in research and innovation - up to 3% of GDP and, last but not least, reduce the share of early school leavers to less than 10% and, on the contrary, achieve at least a 40% share of 30-34 year-olds with completed college education. The ultimate goal, which is also the focus of this article, is to reduce poverty and social exclusion. This means the reduction of the proportion of Europeans living below the poverty line in each country by 25%, which would mean that more than 20 million people would go above the poverty line[15].

The main objective of the article will be a description and an assessment of the influence of selected factors on the work intensity of households, which is one of the indicators of labor market activity as well as the indicator of poverty level. We performed the analysis of the categorized data obtained from the EU-SILC 2015 database. We used the statistical software SAS 9.3 for calculations (tool Market Research).

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[15] https://ec.europa.eu/info/strategy/european-semester/framework/europe-2020-strategy_en (accessed August 15, 2017)

1. Poverty, social exclusion and their components

In 2013 and 2014 the share of people at risk of poverty or social exclusion has stabilized with a steady increase between 2009 and 2012. In line with the Europe 2020 strategy whose goal is reduction of poverty and social exclusion, this proportion is measured by the risk of poverty or social exclusion (AROPE) which is calculated from the data of EU-SILC surveys by the national statistical offices and published by Eurostat. The AROPE expresses the share of:

- people at risk of poverty (AROP), *i.e.* people living in a household with an equivalent disposable income (after deducting social transfers and pensions) below 60% of the median national disposable income of a household calculated according to the equivalence scale[16] that is listed here,
- and / or persons suffering from serious material deprivation[17],
- and / or people living in homes with very low work intensity[18].

Figure 1. People at risk of poverty and social exclusion

Source: Eurostat[19]

For a better understanding of the description of the AROPE indicator, we used Figure 1, which shows the impact of other factors, such as people on the poverty line after deducting the share of social transfers, materially deprived people and people with very low work intensity. These factors are influenced by income inequality, the risk of poverty for employed people, social welfare expenses, socio-economic structure (education, type of household, income and work status) and, as the last factor - by demographic structure (gender, country of birth).

1.1. Low work intensity as part of the AROPE indicator

Monitoring of an individual´s relation to labor market at the level of individuals has, in addition to the obvious advantages, some limits, which are mainly due to the fact that the information on the economic status of a person may not be a sufficient indicator of his or her living standard or future prospects. Those also depend on the social

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[16] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_rate (accessed August 15, 2017)

[17] It expresses the share of people who cannot afford 4 of the 9 items that characterize the economic burden and long-term consumption items, such as arrears in relation to items: rent and mortgage, energy, purchase on payments and other loans, the ability to maintain adequate heat at home, ability of the household to face unexpected expenses, the ability to afford one week vacation away from home once a year, the ability to afford meals with meat, chicken, fish or vegetarian equivalent every other day or home furnishing with a color TV, washing machine, car or telephone. http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Material_deprivation (accessed August 15, 2017)

[18] http://ec.europa.eu/eurostat/statisticsexplained/index.php/Glossary:Persons_living_in_households_with_low_work_intensity (accessed August 15, 2017)

[19] http://ec.europa.eu/eurostat/statisticsexplained/index.php/File:Indicators_and_concepts_and_their_links_to_the_headline_indicator_on_the_poverty_target_Fig1.JPG (accessed August 15, 2017)

context of this individual, in particular the characteristics of the household where he lives. This is true for poverty and social exclusion as well as for the relation to labor market. Of course, a concentration of persons with the same or closely related individual statuses (if possible) is at the center of our interest. The correlation between the status of economic activity for household members can be explained by several facts that relate to the processes of formation / founding of households, their composition, the impact of public policy interventions, *etc*. (Hungler 2012), (Kretowicz *et al.* 2012), (Leskošek and Dragoš 2014), (Mysíkov, Večerník and Želinský 2015) and (Šoltés 2016).

Currently, two indicators (Gerbery 2013) are used in relation to the labor market: the share of jobless household members and the share of people living in very low work intensity households. In our article we will focus more closely on the second of the above-mentioned indicators, namely the very low labor intensity as well as its comparison with the other categories of work intensity from the perspective of selected factors.

The intensity of work reflects the extent to which the work potential is used in the household - how much of the theoretically available work time (as defined in countries legislation) the household members of working age actually work. The work intensity of a household can be evaluated from 0 (or 0% - no one works) up to 1 (or 100% - all members work). On this basis, the indicator "Share of people living in very low work intensity households" was developed, which refers to people aged 0-59 living in households in which adults aged 18-59 work less than 20%[20] of their total potential (in the case of persons aged 60+, it is assumed that they do not live in a non-employment household). Our data source is the Statistics on Income and Living Conditions (the SILC) from which a variable that describes the status of economic activity over a longer period of time (during the reference year) is used.

The relationship between poverty risk, very low work intensity associated with it, and employment rate is illustrated in Figure 2. The strength of the linear dependence between poverty risk and employment rate in EU countries in 2014, measured by the Pearson correlation coefficient, is statistically significant, relatively high and indirect (-0,79) it is similar to the dependence between the poverty risk and very low labor intensity in the household (-0.64). The ability to combine people's entry into the labor market while maintaining low levels of poverty is typical with some exceptions for most EU countries.

Figure 2. Very low work intensity, poverty risk and employment rate (%) in EU countries in 2014
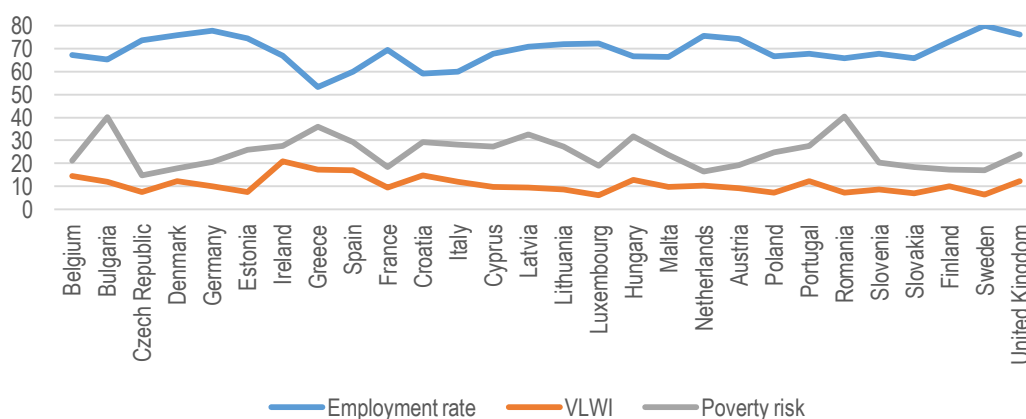
Source: Eurostat, self-processed in SAS Enterprise Guide 5.1

1.2. European Union Statictiscs on Income and Living Conditions 2015

Data from the database that we used in the analytical part of the article come from the Statistics on Income and Living Conditions (EU SILC 2015). Statistics on income and living conditions of households (EU-SILC) is a tool to collect current and comparable cross-sectional and longitudinal (long-term) data on: income; poverty; social exclusion and living conditions.

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[20] The choice of 20% (or 0.2) was not random, although it lacked a stronger justification. One of the reasons for setting a very low work intensity to a maximum of 20% of the total work potential was to "capture situations where household members work so little during the year that they cannot expect to earn enough to survive only from participation in the labor market" and the chosen 20% threshold "corresponds to an average work intensity of less than one day a week or two and a half months for one year, which are very low values" (European Commission 2011, 106).

The reference unit of this survey is a private household with its current members. The reference period is considered to be the calendar year preceding the year of the survey, *i.e.* year t-1 (*e.g.* EU-SILC 2015 survey is from 1 January 2014 to 31 December 2014).

At present, work intensity is often the subject of discussion, and, therefore, in the practical part we decided to explore the factors that have a significant impact on it. Depending on the degree of work intensity, it can be divided into intervals from (0-0.2) - very low work intensity (0.20-0.45) - low work intensity, (0,45-0,55) - medium work intensity, (0.55-0.85) - high work intensity, (0.85-1) - very high work intensity[21]. From the EU SILC 2015 database we selected 8 variables and used them to monitor the dependence of their individual categories on the category of variable labor intensity ("WORK_INT"):

- Status of Basic Economic Activity -a category variable ("EAS");
- Type of household - a category variable (hereafter "HT");
- Family Status - category variable ("MARITAL_STATUS");
- Education - a category variable (hereinafter "EDUCATION");
- Urbanization - a category variable ("URBANISATION");
- Health - a category variable (hereafter "HEALTH");
- Region - a category variable ("REGION");
- Sex - a category variable ("GENDER").

The list of individual categories of selected variables is given in Appendix 1.

2. Methodology used - correspondence analysis

There is a special method for detecting groups of similar categories, namely correspondence analysis. This method proceeds directly from the source data matrix, and a pivot table does not need to be created. By using two variables, the correspondence analysis shows the association of categories of the two variables at the same time, in addition this approach can be extended to the analysis of more than two variables (Řezánková 2007, Greenacre 2016).

Correspondence analysis allows to display categories in a reduced coordinate system, which we call a *correspondence map*. Relationships between the categories of the two variables are examined by *the simple correspondence analysis* and the relationships between the categories of more than two variables are examined by *the multiple correspondence analysis*.

Correspondence analysis sequence (Meloun and Militky 2012):

Step 1: Select the goal of the correspondence analysis

Correspondence analysis differs from other methods because of its intrinsic ability to process non-metric data and non-linear relationships. Dimensional reduction by type of subjective mapping or factor analysis can take place. It is used to examine associations between row or column categories. The categories are compared in the way that two can be combined if they are close at the subjective map or if they provide a sorting if they are located separately. It also examines the association between row and column categories.

Step 2: Formulate the correspondence analysis task

Requires a non-negative matrix (Contingency Table). It may even apply that rows and columns may not have a predefined meaning. Row or column categories may not be a single variable, but, for example, a randomly chosen set of relationships. Consequently, the cross table will equal the total number of characters multiplied by each object.

Step 3: Assumptions of correspondence analysis

The use of very non-metric data presents in its simplest form linear or non-linear relationships equally well. Lack of assumptions, however, does not mean that the user has forgotten to ensure the comparability of objects because it is a composition technique, it is a necessary condition for the completeness of characters

Step 4: Finding the solution and the achieved distribution tightness

Calculated values χ^2 are standardized and converted to distance metrics, and the multidimensional scaling process presents the data in a two-dimensional plane. These factors draw lines and columns into one common chart which results in a presentation of rows or columns categories or both at the same time. In order to obtain the total distribution tightness, the user must first identify the appropriate number of dimensions. The maximum number of dimensions that can be used equals the smaller number from the number of rows n or the number of columns m

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[21] http://www.ceit.sk/IVPR/images/IVPR/vyskum/2012/Gerbery/2265_gerbery_web.pdf (accessed July 15, 2017)

reduced by 1. The eigen values derived for each dimension indicate the relative contribution of each dimension to the explanation of variability in the categories.

Step 5: Interpreting results

Based on proximity, we can, after determining the dimension, identify the association of a specific category with other categories. We need to choose the appropriate type of standardization and determine whether the comparison is done between row, column, or both categories. Attention is usually focused only on rows or columns. Some programs also use standardization that allows direct comparison.

Step 6: Verifying results

As with multidimensional scaling techniques, the emphasis must be put on finding out the universality of multidimensional analysis. The sensitivity of the results for adding or removing objects can be evaluated in the same way as the sensitivity of adding or removing characters. The goal is to find out if the analysis is sensitive to only a few objects, few characters, or both. In any case, it is necessary to understand the results in terms of objects and characters.

3. Assessment of the dependence of the work intensity category on selected factors

The labor market is significantly influenced by the region it belongs to in the country. For this reason, we first focused on a regional graphical analysis of the work intensity category.

Figure 3. Work intensity of households in Slovakia by region[22]
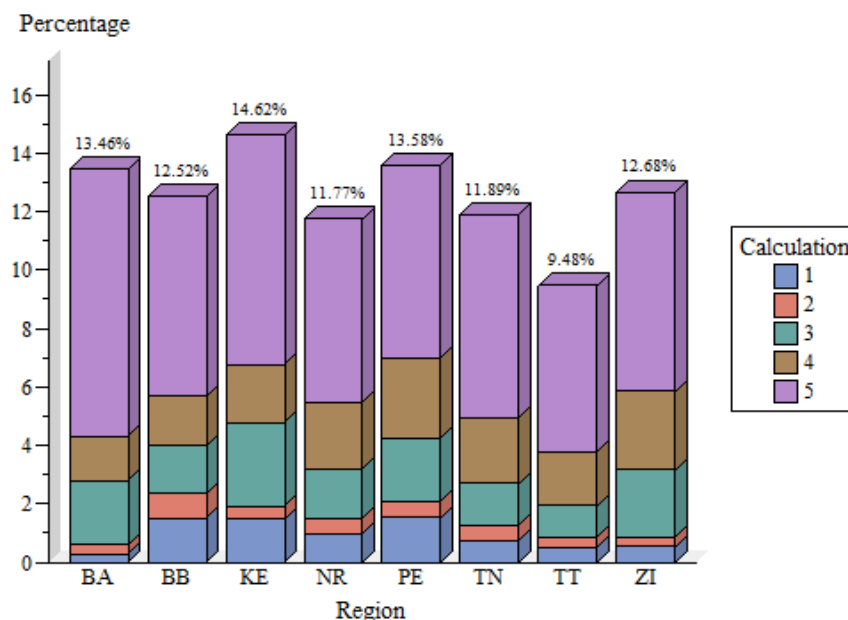
Source: EU-SILC 2015, self-processed in SAS Enterprise Guide 5.1

In the column chart (Figure 3), we see the relative numbers of individual categories of household work intensity expressed in%. The highest number between the households in which the work intensity was monitored (14.62%) was observed in Košice region (KE), 13.58% - in Prešov region (PE) and the lowest (9.48%) - in Trnava (TT) The work intensity is broken down by individual groups: *very low labor intensity* is marked in blue and is the highest in Košice, Banská Bystrica and Prešov region (about 1.5%) These are the regions that are considered the poorest in Slovakia. This can be justified by a lower supply of work in these regions. The chart is followed by pink color, which labels the group of *low work intensity* that is roughly the same in all regions and slightly higher in Banskobystrický region. The *average work intensity* indicated by green color is considerably higher in Košice region. The brown color labels *high labor intensity* which is roughly the same in all regions. The last group, *very high work intensity,* is marked by purple and is the most numerous of all work intensity groups. This group is most represented in the Bratislava region, which can be justified mainly by the high concentration of job offers and the highest employment in the vicinity of the capital of the Slovak Republic.

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[22] Explanations: 1 - very low work intensity, 2 - low work intensity, 3 - middle work intensity, 4 - high work intensity, 5- very high work intensity

In the next section, we decided to monitor the relationships between the specific categories of two variables, in our case the *WORK_INT* variable and the *REGION* category variable in combination with the other categories of the variables that we selected by correspondence analysis. Correspondence analysis can only be used for categorical variables. The result of the analysis is the so-called correspondence map which represents the axis of the reduced coordinate system, in which the individual categories of the selected variables are graphically represented.

Figure 4. Correspondence map of dependence of work intensity indicator on specific region
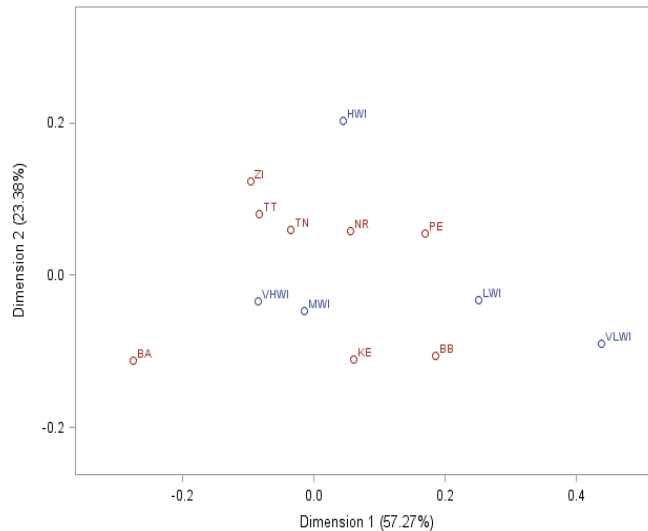
Source: EU-SILC 2015, self-processed in SAS 9.3

In the first correspondence map, the dependency of the region variable and the work Intensity variable (Figure 4) is shown, it is divided into 5 categories. The very low-intensity household category (VLWI) is the most remote from other work intensity categories, which can be interpreted as it not having much dependence on location in any of these regions. The LWI category is mostly associated with households in the Banskobystrický or Prešov region, as can be confirmed by the previous graph in Figure 3. Households from the Nitriansky and Košický regions are mostly associated with medium work intensity households (MWI) unlike high-intensity household (HWI) that can be observed in the Zilina region. The last category of households with very high work intensity (VHWI) can be seen in the Trnava, Trenčín and Bratislava regions.

Figure 5. Correspondence map of work intensity indicators dependence on region and urbanization (left), work intensity, region and type of household (right)
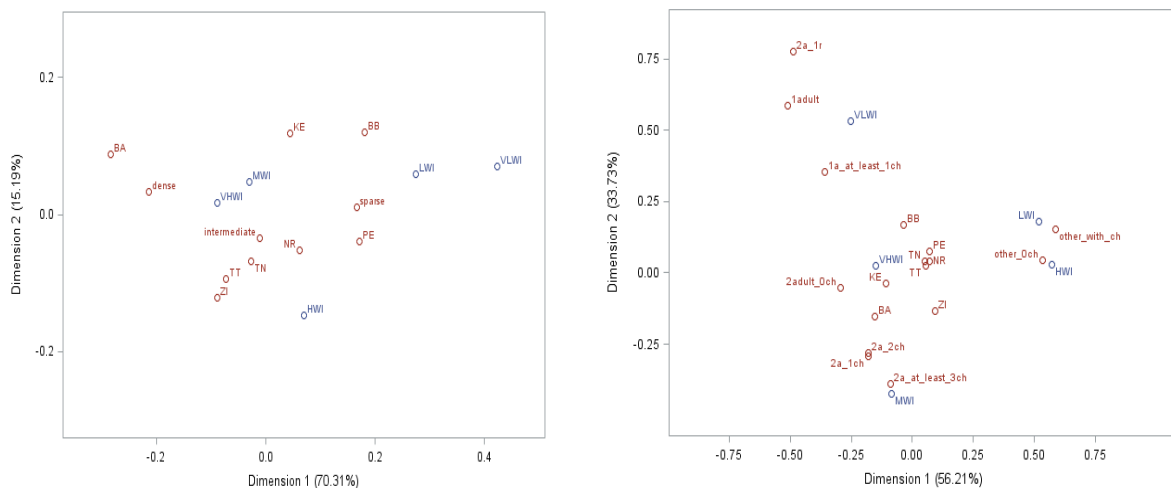
Source: EU-SILC 2015, self-processed in SAS 9.3

Figure 6. Correspondence map of dependence of work intensity, region indicators and indicator of economic activity of the main household member (left), work intensity, region and family status of the main household member (right)
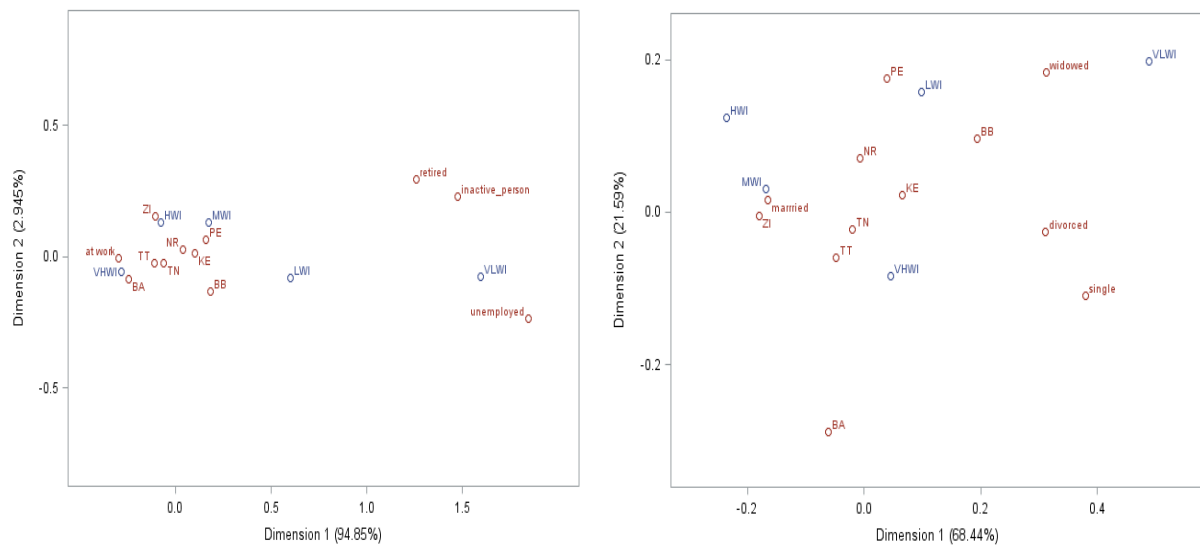
In the left-hand part of the correspondence map in Figure 5, there is a dependence of work intensity on region but also on urbanization. Low work intensity households (LWIs) are mostly related to the Banskobystrický region and the sparsely populated area where there is logically less work, so the work potential is used less. Households living in overall densely populated areas show the highest correlation with households that use their work intensity to the middle degree (MWI) and are living in the Trenčín region. The category of very high work intensity households (VHWI) is most closely associated with households living in the Bratislava region and in densely populated areas.

In the right part of the correspondence map (Figure 5) we monitor the work intensity dependence on the region and the type of household. Projection of the original contingency table to the surface retained 89.9% of the information. Households with very low work intensity (VLWI) are mostly associated with 2 adult households, of which at least 1 is aged 65+ *(2a_1r)*, with one-member household *(1adult)*, and single-parent households with at least 1 dependent child *(1a_at_least_1ch)*. The categories of households with low (LWI) and high (HWI) work intensity are most dependent on other dependent-child households *(other_with_ch)*, but also with other non-dependent households *(other_0ch)*, which is surprising that these two work intensity categories are closely associated. Households of 2 adults with 3+ dependent children *(2a_at_least_3ch)*, households of 2 adults with 1 dependent child *(2a_1ch)* and households of 2 adults with 2 dependent children *(2a_2ch)* have the greatest dependence on the medium work intensity household (MWI) category. The households with VHWI are mainly associated with 2 adult households, both of whom are under the age of 65 *(2adult_0ch)*, where the concentration of regions can be also seen. With the further projection of the original contingency table to the surface of the correspondence map, in this case there was a high preservation of information up to 97.8%.

In Figure 6, on the left, we can see the dependence between the categories of the work intensity variable, the region and the economic activity variables. Very low work intensity households (VLWIs) are most dependent on the household category with the unemployed head of household, which is logically related. Households with a head of household being retired or otherwise inactive are highly associated. In regions such as Prešovský, Žilinský and Košický, households with medium work intensity (MWI) are mostly concentrated. HWI and VHWI households are mostly dependent on households with an employed head of household *(at _work)*.

In Figure 6 on the right we see the dependence between work intensity, region and family status variables. Very low work intensity (LWI) and low work intensity households (LWI) are mostly associated with a widowed head of household and at the same time with households in the Banskobystrický, Prešovský and Nitriansky regions. Households where the head is married are concentrated in the middle between HWI, MWI and VHWI, especially in the Žilina and Trenčín regions. The households with the head being divorced or single are similar to each other, and the map shows that they are the closest to the VHWI household categories.

Figure 7. Correspondence map of dependence between work intensity, region and head of household health indicators (left), work intensity, region and head of household education indicators (right)
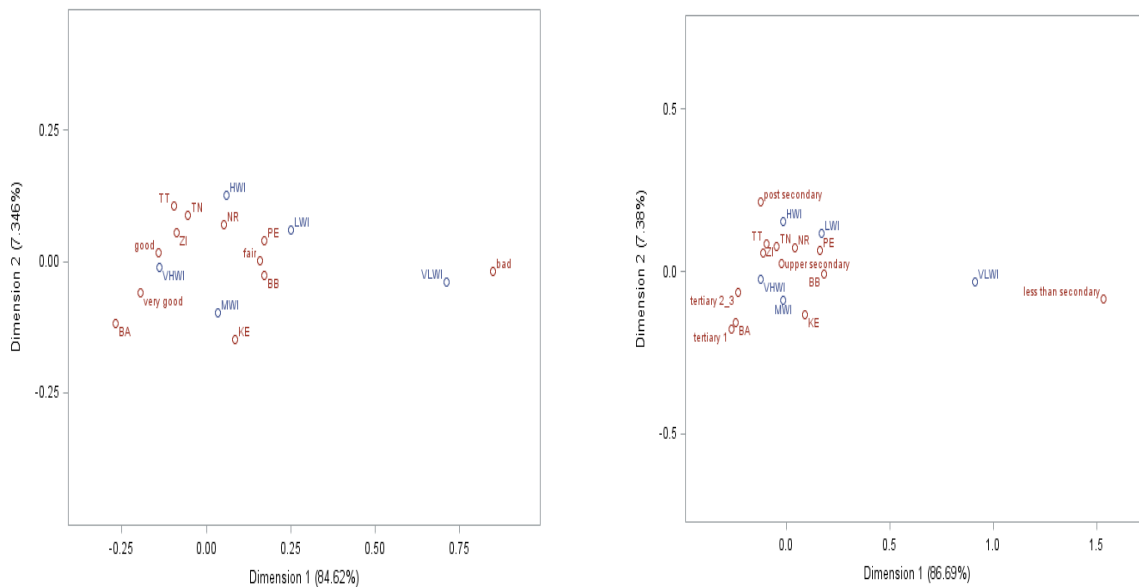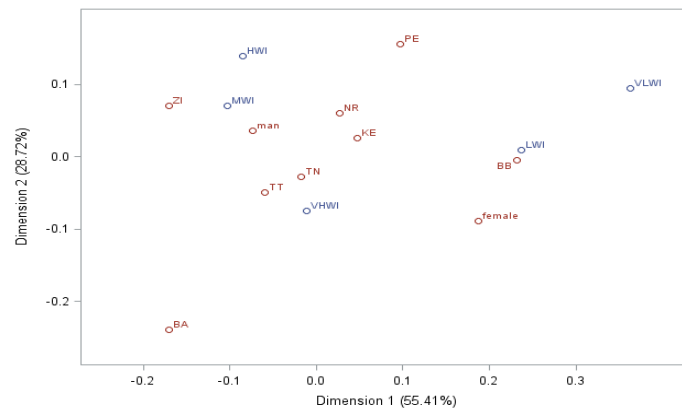

Source: EU-SILC 2015, self-processed in SAS 9.3

The correlation map in Figure 7 on the left shows the dependence between work intensity, region and health variables. It is clear that very low- work intensity households (VLWI) and bad health are closely related. Households with low work intensity (LWI) and high work intensity (HWI) show the highest dependence with households in the category of average health (fair) in the Prešov, Nitra and Trenčin regions. Households with good and very good health are mainly dependent on the VHWI households which is also confirmed by the modeling of work intensity dependence on the health variable.

In Figure 7 on the right, we can see the dependence between work intensity, region and education variables. The map clearly shows that very low work intensity households (VLWIs) are mostly associated with a household category where the head of household has lower than primary, primary or lower than secondary education (less_than_secondary). Households where the head has upper secondary education are mostly associated with LWI households, particularly in the Banskobystrický and Prešov regions. Households with a head with post-secondary education education are closely related to HWI households in the Trenčín and Trnava regions. Households from the Bratislava region show the greatest dependence on households where the head has a short cycle of tertiary education and bachelor education (tertiary_1) as well as master, doctoral education or their equivalents (tertiary2_3). Households with these types of higher education are most dependent on households with very high work intensity (VHWI) and medium work intensity (MWI).

We also interpret the apparent dependences (Figure 8) between the work Intensity, region, and gender variables. Households with a woman as a head are dependent on low work intensity households (LWI), which is also true in practice that women work less. This can be seen from the map, especially in the Banskobystrický region. This can be also caused by women's maternity obligations because women do not use their work potential during this period. On the other hand, households with a man as the head are more dependent on the middle (MWI) and high work intensity (HWI) households, so the map shows that men use their work potential to a greater extent.

Figure 8. Correspondence map of dependence of work intensity, region indicators and indicator of the head od household gender

Source: EU-SILC 2015, self-processed in SAS 9.3

Conclusion

In the analysis of multidimensional data, we often face the problem of "quantifying qualitative data" which is found, for example, in the form of factors that influence some event. Correspondence analysis is diferent from other internal dependence techniques by its ability to process such non-metrical data as well as non-linear relationships. Although it is similar to factor analysis, it exceeds it. With the help of this method we can accomplish dimensionality reduction through subjective mapping. On the other hand, it is a graphical survey method that does not include statistical hypothesis testing.

The results of the multiple correspondence analysis in this article allow to monitor the real dependence of selected categories of factors from the work intensity of Slovak households in the reference year by means of correspondence maps. Work intensity was divided into 5 intervals, and we came to the following conclusions:

- from the regional point of view, the highest incidence of very low work intensity was observed in the Banskobystrický region and the lowest incidence of very high work intensity was in the Prešov region. These are regions with a lower number of job offers which has an impact on the use of their work potential. The least vulnerable to very low work intensity were the households in the Bratislava region where higher concentration of job offers could be seen because of its location near the capital;
- in regard to urbanization, the labor potential in the households living in sparsely populated areas was the least used, while densely populated areas are associated with very high work intensity;
- the number of children may be, on the one hand, as an incentive factor, on the other hand, childcare does not allow the full use of parents' work potential. Very high and high work intensity are associated predominantly with households of two adults, but also with other households without dependent children;
- there was a statistically significantly higher work intensity in households headed by the employed person than in households headed by an inactive, retired or unemployed person;
- the best used work potential is between married couples. However, the category of very high work intensity is mostly associated with households of single or divorced persons;
- households with a healthy head have statistically significantly higher work intensity than households with a head in poor or average health;
- correspondence analysis only confirmed the importance of education and its impact on the use of a household's work potential. The better use of their work potential is in households headed by a person with a first to third degree of higher education;
- households in low population density area can be again seen in the Banskobystrický and Prešov regions with the already mentioned very low and low work intensity. On the contrary, a high population density area is associated with the Bratislava region and a very high work intensity;
- better use of work potential can be seen more in men. Women, due to their maternity duties, often work shorter working hours.

Indeed, work intensity range of 0 to 0.2 characterizes households with very low work intensity, which is considered to be one of poverty indicators. According to the indicator of very low work intensity, in 2014 in Slovakia a household can be considered at risk of poverty if it meets one or several of the criteria: it is a household from the Banskobystrický and Prešov region, it is located in a low population density area, it is an incomplete household or

a household with higher number of children, a head of household is a woman, unemployed, widow with bad health and lower level of education.

Surprisingly[23], Slovakia in the year 2014 was among the countries with a relatively low value of very low work intensity (7.1%) and, on the other hand, with one of the highest unemployment rates (13.2%). When we compare these data with international findings in 2014, the total EU-28 population of working age lived in households with very low work intensity of 11.2%. The rate of low work intensity was 17% between foreigners that were born outside the EU-28. Unemployed people live in households with a very low work intensity (49.5%) and also in households with one parent (28.8%).

Households as a source of workforce constitute a supply of workers while companies determine a demand for work. Households as consumers that depend on retirement (wages are a substantial part of it), are forced to enter the labor market and look for jobs. It is, therefore, important, while deciding on the job offer to which the work intensity is related, to consider not only the wages for this job but also the factors that affect the level of wages.

References

[1] Becker, G. S. 1964. *Human Capital*: *A Theoretical and Empirical Analysis, with Special Reference to Education.* 3. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship. Available at: https://ssrn.com/abstract=1496221

[2] Gerbery, D. 2013. *Low work intensity and poverty risk among workers following the assessment of poverty and social exclusion.* Institute for Labor and Family Research, Bratislava. Available at: http://www.ceit.sk/IVPR/images/IVPR/vyskum/2012/Gerbery/2265_gerbery_web.pdf (accessed July 11, 2017).

[3] Greenacre, M. 2016. *Correspondence Analysis in Practice.* 3rd Edition. NW: Chapman and Hall/CRC. ISBN 9781498731775, 310 pp.

[4] Hungler, S. 2012. The poor, the unemployed and the public worker – a comparative essay on national unemployment policies contribution to deepening poverty. *International and Comparative Law Review*, 12(1): 117–134.

[5] Kretowicz, P., Chaberko, T., Grad, N., and Łebek, S. 2012. Geographical distribution of poverty In Poland. *Prace Geograficzne*, 130: 43-54. DOI: 10.4467/20833113PG.12.019.0660

[6] Leskošek, V, and Dragoš, S. 2014. Social inequality and poverty in Slovenia – policies and consequences. *Družboslovne Razprave*, 30(76): 39-53.

[7] Lucas, R.E. 1988. On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22 (1): 3 – 42.

[8] Meloun, M., and Militký, J. 2012. *Compendium of Statistical Data Processing.* 3rd Edition. Prague: Charles University in Prague - Karolinum Publishing House.

[9] Meloun, M., and Militky, J. 2012. *Interactive Statistical Analysis of Data.* 3rd Edition Prague: Charles University in Prague - Karolinum Publishing House.

[10] Mysíkova, M., Večerník, J., and Želinský, T. 2015. Impact of the Low Work Intensity on Poverty in the Czech Republic and the Slovak Republic. *Ekonomický Časopis / Journal of Economics,* 63(6): 555-575.

[11] Nelson, R.R., Phelps, E.S. 1966. Investment in Humans, Technological Diffusion, and Romer, P.R. (1989): Human capital and growth: Theory and evidence. *The American Economic Review*, 56 (1/2): 69 – 75.

[12] Řezánková, H. 2007. *Analysis of data from questionnaire surveys.* Prague: Kamil Marik - Professional Publishing.

[13] Schultz, T.W. 1961. Investments in Human Capital. *American Economic Review*, 51(1): 1-17.

[14] Šoltés, E., and Hájosová, R. 2016. *Comparison of the impact of relevant factors on the risk of poverty and social exclusion of Slovak households in 2010 and 2014.* An Almanac of research publications. Statistical analysis of poverty and social exclusion in the context of Europe 2020 strategy. 1st part. Bratislava - Ekonom, 26 – 43 pp.

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[23] http://ec.europa.eu/eurostat/documents/3217494/7566774/KS-EZ-16-001-EN-N.pdf (accessed July 11, 2017)

[15] Tanzil, V., Howell, H.Z. 1995. *Human Capital Accumulation and Public Sector Growth*. IMF Working Paper, No. 95/95 (September), 14 pp.

*** Eurostat. 2016. *Smarter, greener, more inclusive?* : *Indicators to support the Europe 2020 Strategy*. Luxembourg: Publications Office of the European Union. Available at: http://ec.europa.eu/eurostat/documents/3217494/7566774/KS-EZ-16-001-EN-N.pdf (accessed July 11, 2017).

*** https://ec.europa.eu/info/strategy/european-semester/framework/europe-2020-strategy_en (accessed August 15, 2017)

*** http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_rate (accessed August 15, 2017)

*** http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Material_deprivation (accessed August 15, 2017)

*** http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Persons_living_in_households_with_low_work_intensity (accessed August 15, 2017)

*** http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Indicators_and_concepts_and_their_links_to_the_headline_indicator_on_the_poverty_target_Fig1.JPG (accessed August 15, 2017)

Appendix 1. Examined variables selected from the EU-SILC 2015 database for Slovakia

Variable in EU SILC	Variable name and nomenclature	Variable categories	Variations	Explanations
RB210	Status of basic economic activity EAS	at work	1	Employed
		Unemployed	2	Unemployed
		Retired	3	Old-age pensioner, early retirement pensioner
		inactive_person	4	other inactive person
HT	HT Type of household	1adult	5	single-person household
		2adult_0ch	6	Household 2 adults, both aged 65 years
		2a_1r	7	Household of 2 adults, at least 1 at age 65+
		other_0ch	8	Other households without dependent children
		1a_at_least_1ch	9	Household 1 parent with at least 1 dependent child
		2a_1ch	10	Household of 2 adults with 1 dependent child
		2a_2ch	11	Household of 2 adults with 2 dependent children
		2a_at_least_3ch	12	Household of 2 adults with 3+ dependent children
		other_with_ch	13	Other households with dependent children
PB190	MARITAL_STATUS	Single	1	Single
		Married	2	Married
		Widowed	4	Widowed
		Divorced	5	Divorced
PEO40	The highest level of education achieved (ISCED) EDUCATION	less_than_secondary	0	less than primary
			1	primary
			2	lower secondary
		upper_secondary	3	upper secondary
		post_secondary	4	post secondary (not tertiary)
		tertiary_1	5	short cycle of tertiary education
			6	bachelor education
		tertiary_2_3	7	master's degree or equivalent
			8	doctoral education or its equivalent
DB100	URBANISATION	Dense	1	region with dense population
		intermediate	2	region with overall dense population
		Sparse	3	region with sparse population
PH010	HEALTH	Good	1	really good
			2	good
		Fair	3	average
		Bad	4	bad
			5	very bad
REGION	REGION	BA	1	bratislavský
		TT	2	trnavský
		TN	3	trenčiansky
		NR	4	nitriansky
		ZI	5	žilinský
		BB	6	banskobystrický
		PE	7	prešovský
		KE	8	košický
RB090	GENDER	Male	1	
		Female	2	

Source: EU-SILC 2015, author´ own creation

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Managing Human Resources Using the Best Practice. Best Fit Approach

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Abstract:

Based on the results of the authors' research cooperation, the goal of the paper is to summarize the theoretical basis of the best practice/best fit approach to human resource management and demonstrate what system of human resource management, how and why managers should apply to effectively attract, employ and develop enough qualified and motivated employees to perform agreed work, achieve desired performance and reach expected goals of the organization. Achieving the goal of the paper is based on both the analysis of available scientific literature and academic journals focused on human resource management and the results of the authors' questionnaire survey focused on the application of best practices in human resource management. The respondents of the questionnaire survey were HR directors, HR managers and HR specialists of well-known and successful organizations in the Czech Republic. The relevant data were obtained from 100 organizations. The results support the suggestion that from the perspective of meeting the objective of human resource management in the organization managers should apply proven best practices in talent, performance, diversity, compensation and knowledge management to effectively attract, employ and develop enough qualified and motivated employees to perform agreed work, achieve desired performance and reach expected goals of the organization.

Keywords: human resources, human resource management; organizational performance; best practices; Czech Republic.

JEL Classification: O10; O15

Introduction

Human resource management is an integral part of organizational management. It refers to practices that enable any organization to attract, employ and develop enough qualified and motivated employees to achieve expected goals of the organization (Konušíková and Kucharčíková 2015). The basic human resource functions performed in every organization include employee selection, appraisal, compensation and development (Fombrun, Tichy and Devanna 1984). These functions are usually performed by managers, in some organizations, mostly in organizations with a greater number of people, normally with support of human resource professionals. Managers are responsible for managing other employees to successfully perform agreed work, achieve desired performance and reach expected goals of the organization. The successful fulfilment of this task differentiates successful and unsuccessful organizations.

The fundamental results of the ongoing worldwide research on the relationship between human resource management and organizational performance show that qualified and motivated employees represent a critical source of the organization (Grenčíková, Španková and Karbach 2015) and many researchers have demonstrated the positive impact of various practices in human resource management on employee and organizational performance (Guest 2011). It is obvious that employee performance determines organizational performance. So if managers apply appropriate practices in human resources management, they can positively influence organizational performance through influencing employee performance. It supports the assumption that the positive impact of human resource management on organizational performance is based on application of appropriate

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practices in human resource management that help to achieve expected organization's results through achieving desired employees' abilities, motivation and outputs.

As appropriate are referred various best practices in human resource management applied by the best organizations operating in similar conditions and pursuing similar goals that demonstrably improve organizational performance (Suttapong, Srimai and Pitchayadol 2014). The purpose of applying various best practices is to achieve continuous improvement of organizational performance by critical assumption of conceptual and system practices in management of the best organizations in specific sector or region. Their application should be a guarantee of optimally managed organization (Axson 2007). The tool of their application is benchmarking that represents systematic comparisons of organizational performance with the performance of the best organizations in specific sector or region. The purpose is to understand why comparable organizations are better, how the organizations have become the best and then take advantage of this knowledge to achieve continuous improvement of organizational performance in accordance with one's own conditions and requirements (De Castro and Frazzon 2017).

The application of best practices in human resource management is closely associated with the research on the relationship between human resource management and organizational performance, when the approach based on application of best practices in human resource management is considered to be one of the alternative approaches to research the link between human resource management and organizational performance (Delery and Doty 1996).

The approach based on application of best practices in human resource management assumes that there are universally applicable practices connected with employee selection, appraisal, compensation or development in human resource management, whose application has a positive effect on employee and organizational performance more or less regardless of conditions of their application. To this approach is the approach based on application of best fit in human resource management that assumes that no practices in human resource management can be applied universally, but always in accordance with conditions of their application (Harris, Brewster and Sparrow 2003). The explanation of the positive effect of human resource management on organizational performance and the validation of the assumption of the applicability of the approach based on best practices and/or best fit in human resource management are among the fundamental objectives of the ongoing worldwide research in the field of human resource management. Although the researchers often adopt a different conception of human resource management as well as a different conception of organizational performance, and therefore often reach different results about the essence of the positive effect of human resource management on organizational performance, they usually demonstrate the positive impact of various practices in human resource management on various indicators of organizational performance. It is obvious that employee performance determines organizational performance. But the question is what constitutes a positive effect of human resources management on organizational performance, in other words, what practices in human resource management, how and why managers have to apply to achieve expected organizational performance. Convincing answers to these questions are still missing (Armstrong 2006).

Similarly, there is still lacking a clear validation of the assumption of the applicability of the approach based on best practices and/or best fit in human resource management. However, the results of the research support the idea that assumptions of both approaches (best practices and best fit) are valid and are crucial in explaining the essence of the positive effect of human resource management on organizational performance (Nikandrou, Campos and Papalexandris 2006). In human resource management, there are universally applicable best practices whose application has a positive effect on organizational performance (motivating jobs, selective selection, performance management, performance-related pay, systematic training or creation of favourable working conditions), but their application requires best fit to all external and internal conditions of the organization that determine the positive effect of applied best practices in human resource management on achieved organizational performance.

1. Goal and Method

The goal of the paper is to summarize the theoretical basis of the best practice/best fit approach to human resource management and demonstrate what system of human resource management, how and why managers should apply to effectively attract, employ and develop enough qualified and motivated employees to perform agreed work, achieve desired performance and reach expected goals of the organization.

Achieving the goal of the paper is based on both the analysis of available scientific literature and academic journals focused on human resource management and the results of the authors' questionnaire survey carried out in order to verify in practice the theoretical basis of the importance of human resources and human resources

management in the organization, the relationship between human resource management and organizational performance and the application of best practices in human resource management.

The questionnaire included eleven multiple choice questions focused on:

- the value of employees;
- the conditions under which an employee can be considered as the most valuable source;
- the approach to human resources management;
- the conditions that affect human resource management;
- the role of line managers, HR professionals and outsourcing in human resource management;
- the impact of human resource management on organizational performance;
- the results achieved through human resource management;
- the existence of best practices in human resources management;
- the potential best practices in human resource management;
- the application of best practices in human resource management;
- the benchmarking in human resource management.

The questionnaire was distributed by e-mail to HR directors, HR managers and HR specialists of well-known and successful organizations in the Czech Republic. The relevant data were obtained from 100 organizations.

The organizations were characterized by size (14% small: less than 100 employees, 27% medium: 100-499 employees, 59% large: 500 and more employees) and branch of business (52% industry, 48% services).

The respondents were characterized by gender (43% male, 57% female), actual position (54% HR directors, 23% HR managers, 23% HR specialists), years of experience (5% less than 5 years, 16% 5–10 years, 20% 11–15 years, 19% 16–20 years, 40% more than 20 years), and education (6% secondary school graduates, 3% higher technical school graduates, 6% bachelor's degree graduates, 76% master's degree graduates, 9% Ph.D. degree graduates).

The data analysis was based on the calculation of relative frequencies (as a share from the total number of respondents) and the evaluation of the dependence of responses on the size of the organization (small, medium, large) and the branch of business of the organization (industry, services) using contingency tables and chi-square tests of independence. Chi-square tests of independence were applied to determine whether responses of respondents expressed in contingency tables were related to the size of the organization or the branch of business of the organization. The test procedure included the following steps:

- formulation of null (H_0) and alternative (H_A) hypothesis;
- selection of a level of significance α;
- calculation of the chi square statistic χ^2;
- calculation of the degrees of freedom f;
- selection of the critical chi-square value $\chi^2_\alpha(f)$;
- comparison of the chi square statistic χ^2 to the critical chi-square value χ^2_α (f) and acceptance or rejection of the null hypothesis.

2. Results and discussion

The results of the authors' survey are summarized in three parts, focusing on the importance of human resources, the link between human resource management and organizational performance, and the system of human resource management.

2.1. The importance of human resources

Human resources are usually valued as the most important source of any organization. Each organization also needs other resources, *i.e.* material, finance, or information, but qualified and motivated employees are indispensable to achieve expected organizational performance.

Organizational performance refers to an organization's results, including operating results (productivity, quality, efficiency, *etc.*), market results (sales, market share, customer satisfaction, *etc.*) or financial results (costs, revenues, profits, *etc.*). There is considerable evidence that achieving expected organizational performance is determined by achieving desired employee performance that refers to employees' working results and behaviour, determined by employees' abilities (knowledge and skills to perform agreed work) and motivation (willingness to perform agreed work), which enable an organization to achieve expected goals.

According to the authors' survey results, 96% of respondents agreed and 4% of respondents disagreed that employees are valued as the most important source in their organizations. According to the respondents, an

employee can be considered as the most valuable source if the employee has development potential or creates added value to the organization (Table 1). The data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.

Table 1. An employee as the most valuable source of the organization (authors)

Requirement	Frequency of responses (%)
The employee has development potential	76
The employee creates added value	76
The employee has the necessary qualifications	68
The employee achieves desired results	49
The employee represents a competitive advantage	38
The employee is a member of the team	33

In case of the role of managers in human resource management, all respondents agreed that in their organizations managers are responsible for human resource management, especially for performance management and performance review (Table 2). These activities help managers influence employees' abilities, motivation and outputs to perform agreed work, achieve desired performance and reach expected goals of the organization.

Table 2. The role of managers in human resource management (authors)

Activity	Frequency of responses (%)
Performance management	95
Performance review	90
Employee orientation	88
Employee compensation	63
Employee development	63
Employee planning	55
Employee selection	54

2.2. The link between human resource management and organizational performance

Human resource management has an impact on organizational performance through having an impact on employee performance. The essence of the positive impact of human resource management on organizational performance is an effective system of human resource management that enables an organization to attract, employ and develop enough qualified and motivated employees and achieve expected organizational performance by achieving desired employee performance.

According to the authors' survey results, 95% of respondents agreed and 5% of respondents disagreed that human resource management positively influence results of their organizations, including results related to both individual employees (expected satisfaction and motivation of employees, necessary number and structure of employees, required knowledge and skills of employees, desired results or behaviour of employees), as well as the entire organization (good employer's reputation, required labour productivity, desirable quality of products and services, expected business results or adequate customer satisfaction). The data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.

Table 3. Factors affecting human resource management in the organization (authors)

Factors	Frequency of responses (%)
External	
Economic	93
Legal	65
Demographic	60
Technological	41
Social	38
Political	22
Internal	
Strategy of the organization	73
Profitability of the organization	71
Culture of the organization	59
Branch of business of the organization	53
Size of the organization	52
Structure of the organization	46

The positive impact of human resource management on organizational performance is usually influenced by many external and internal factors. According to the respondents, essential external factors included difficult economic situation (loss of contracts), complicated legal environment (chaotic legislation) or unfavourable demographic trends (labour shortages), and essential internal factors include strategy, profitability, culture, branch of business, size (number of employees) or structure (Table 3). In this context, the majority of respondents confirmed that in their organizations, they regularly analyse the strengths, weaknesses, opportunities, and threats, as well as they regularly evaluate the level of human resources and human resource management, which is important for the successful implementation of human resource strategies and policies to meet the strategic objectives of the organization.

2.3. The system of human resource management

The objective of the system of human resource management in the organization is to attract, employ and develop enough qualified and motivated employees and through the effective use of their abilities, motivation and outputs to produce and distribute demanded products and services, gain and maintain regular and satisfied customers and achieve expected organizational performance and competitiveness. Any organization seeking to achieve excellent performance and sustained competitiveness must be a good employer to fulfil the potential of qualified and motivated employees, as well as a good trader to fulfil the potential of regular and satisfied customers. The connection of qualified and motivated employees and regular and satisfied customers through quality products and services leads to return on investment and satisfaction of important stakeholders, which is fundamental for achieving expected organizational performance and competitiveness.

The development of an effective system of human resource management in the organization should be based on a conceptual approach, including the regular analysis of the strengths, weaknesses, opportunities, and threats of the organization, as well as the regular evaluation of the quality of human resource management in the organization. According to the authors' research results, 93% of respondents agreed and 7% of respondents disagreed that they regularly analyse the strengths, weaknesses, opportunities, and threats of their organizations and 84% of respondents agreed and 16% of respondents disagreed that they regularly evaluate the quality of human resource management in their organizations.

Table 4. Contingency table. Question: "Do you regularly analyse the strengths, weaknesses, opportunities, and threats of your organization?" (authors)

	Industry	Services	$\sum$
Yes	51* (48.36)**	1 (3.64)	**52**
No	42 (44.64)	6 (3.36)	**48**
$\sum$	93	7	100
Note: *observed frequencies (O); ** expected frequencies (E)			
(1) H$_0$: There is no difference between organizations from industry and services regarding the regular analysis of the strengths, weaknesses, opportunities, and threats of the organization. H$_A$: There is a difference between organizations from industry and services regarding the regular analysis of the strengths, weaknesses, opportunities, and threats of the organization.			
(2) Level of significance α = 0.05			
(3) Chi square statistic χ^2 = $\sum \left[\dfrac{\left(P_{r,c} - E_{r,c}\right)^2}{E_{r,c}} \right]$ = 4.289 (4) Degrees of Freedom (f): $(r-1) \times (c-1)$ = 1 (5) Critical chi-square value χ$^2_{0.05}$(1) = 3.841 (6) The chi square statistic (χ^2) is greater than the critical chi-square value χ$^2_{0.05}$ (1). The null hypothesis is rejected in favour of the alternative hypothesis.			
r – the number of rows in the contingency table c – the number of columns in the contingency table			

In case of the regular analysis of the strengths, weaknesses, opportunities, and threats of the organization, the data analysis showed no significant difference among small, medium and large organizations, but it showed a significant difference between organizations from industry and services ($p < 0.05$). The authors tested the null hypothesis that there is no difference between organizations from industry and services regarding the regular analysis of the strengths, weaknesses, opportunities, and threats of the organization (Table 4). Since the chi square statistic χ^2 was greater than the critical chi-square value χ$^2_{0.05}$ (1) the null hypothesis was rejected in favour of the

alternative hypothesis. There was a significant difference between organizations from industry and services regarding the regular analysis of the strengths, weaknesses, opportunities, and threats of the organization.

In case of the regular analysis of the regular evaluation of the quality of human resource management in the organization, the data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.
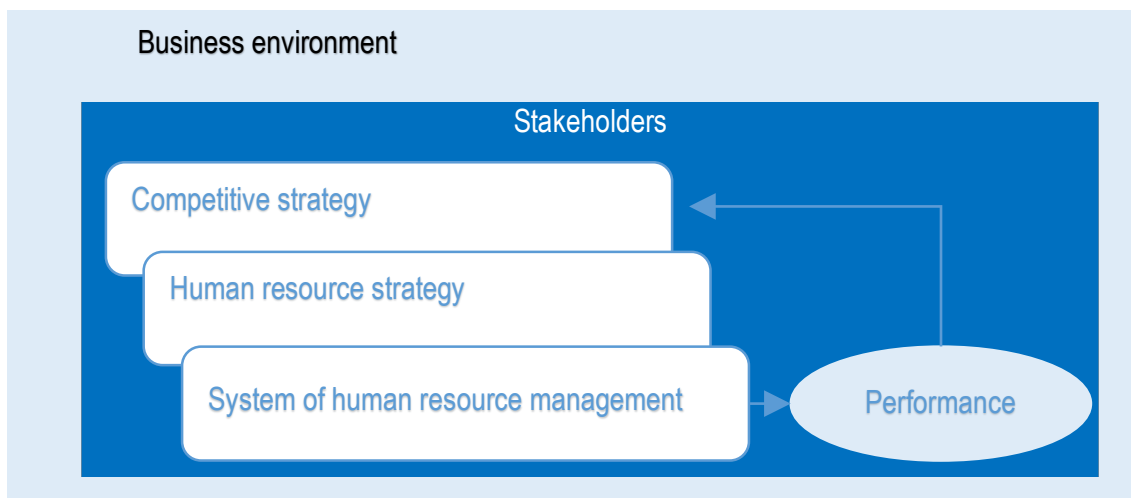
An effective system of human resource management in the organization could be developed on the basis of proven best practices in human resource management applied by the best organizations operating in similar conditions and pursuing similar goals that demonstrably improve organizational performance. According to the authors' survey results, 92% of respondents agreed and 8% of respondents disagreed that in human resource management, there are universally applicable best practices that positively influence organizational performance. The data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.

According to the respondents, potential best practices in human resource management include systematic training (forming employees' knowledge, skills and abilities to perform agreed work and achieve desired performance), performance-related pay (rewarding employees related to achieved results and behaviour), leadership (leading employees to perform agreed work and achieve desired performance achieve organizational objectives), regular performance review (evaluating employees' abilities, motivation and outputs to perform agreed work and achieve desired performance), talent management (planning, resourcing and developing people with high performance and development potential), motivating jobs (maintaining and increasing employees' satisfaction and motivation through designing complex, various, significant and autonomous jobs), positive selection (choosing employees applying specific criteria and methods related to individual abilities and motivation), work-life balance (creating working conditions for achieving a balance between employees' work and life) or performance management (managing and leading employees to perform agreed work and achieve desired performance).

In connection with the application of best practices in human resource management, 92% of respondents agreed and 8% of respondents disagreed that their organizations are managed in accordance with known best practices in human resource management, and 70% of respondents agreed and 30% of respondents disagreed that their organizations systematically compare achieved performance with the performance of the best organizations in the specific sector or region to apply appropriate best practices in human resource management. The data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.

It follows from the above, that in human resource management, there are useful best practices that positively influence organizational performance, but their application requires best fit to external and internal factors that determine the positive effect of applied best practices in human resource management on achieved organizational performance. This is the basis of the authors' model of human resource management in the organization, when the system of human resource management should be seen as a subsystem of organizational management (Figure 1) that is developed in accordance with the competitive strategy (cost, quality, innovation, *etc*.), with regard to the business environment (political, economic, social technological, legal, environmental, *etc*.) and in the interest of stakeholders (stockholders, managers, customers, employees, unions, state, public, *etc*.).

Figure 1. The system of human resource management as a subsystem of organizational management (authors)

Within the system of human resource management, to meet the objective of human resource management in the organization, managers should apply proven best practices in talent, performance, diversity, compensation and knowledge management (Figure 2) to effectively attract, employ and develop enough qualified and motivated employees to perform agreed work, achieve desired performance and reach expected goals of the organization.

In terms of talent management managers should be able to define how many and what sort of people are needed now and in the future and identify suitable people within and outside the organization to have a chance to meet, attract, and select talented people and potential employees. An attractive employee value proposition should include meaningful work, flexible hours, friendly relationships, personal development or career prospects. People with a talent that cannot be easily copied by competitors represent a competitive advantage of the organization (Rofaida 2016).

Figure 2. Fundamental components of the system of human resource management in the organization (authors)
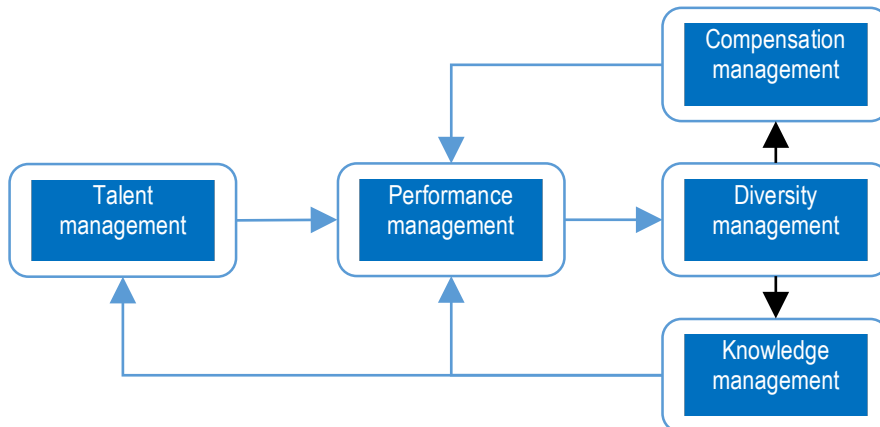
The talent management can help people with a high potential to align with goals of the organization and become aware of what attitudes and behaviour the organization requires and appreciates (Khoreva, Vaiman and Van Zalk 2017). Therefore, it is important for organizations to create motivating working conditions for people to encourage the application and development of their individual knowledge, skills and abilities (Ingram 2016).

In terms of performance management managers should ensure continuous improvement of employees' abilities, motivation and outputs. Through a written or verbal agreement between managers and employees about particular aspects of their performance managers should ensure that abilities, motivation and outputs of employees are consistent with expected goals of the organization. In view of effective management of employees' abilities, motivation and outputs it is important to ensure regular feedback from managers to employees through a regular performance review (Armstrong and Taylor 2014). The purpose is to assess and discus employees' abilities, motivation and outputs, find way to solve eventual problems or use potential opportunities and agree on necessary changes or performance requirements. The continuous improvement of employees' abilities, motivation and outputs can be ensuring through Plan-Do-Check-Act cycle, it means to plan what you expect to do, try to do it according to plan, compare the actual result the expected result and standardize what works (Rother 2010).

In terms of diversity management managers should create age diverse groups of people to mix the new ideas of young people with the life and work experience of other people in the organization. This approach should allow managers to understand the needs and perspectives of different groups of people to create appropriate and attractive employment opportunities for them. Diversity management means creating and maintaining employment opportunities and working conditions with regard to the natural diversity of people (Armstrong and Taylor 2014). In terms of the age of people, the aim of diversity management is to gain a competitive advantage by employing people of all ages. It requires changing some stereotypes associated with the employment of young and older people (Němec and Surynek 2015). Young people usually do not meet the employers' requirements for professional skills and experience, as well as social behaviour and professional motivation. Older people (aged 50 and over) are usually seen as loyal and hardworking, but inflexible, ineffective and unpromising. This leads to the fact that employers are not willing to invest in them. In addition, many young and older people believe that the age alone is a barrier for getting a job, but the fact is that age diverse groups of people have various knowledge, skills and abilities that add value to the workplace and play a key role in achieving success of the organization.

In terms of compensation management managers should be able to provide employees with fair and stimulating compensation for work done (Armstrong and Taylor 2014). A modern compensation systems include

both monetary compensations (wages and salaries) and non-monetary compensations (appreciation and benefits like cars, notebooks, mobile phones, flexible hours, home working, housing, insurance, sick leave, medical and dental care, vacation, holidays, leisure activities, training, *etc*.). In view of effective performance management in the organization, the applied compensation system should help managers stimulate employees to perform agreed work, achieve desired performance and reach expected goals of the organization. The monetary and non-monetary compensations should also stimulate employees to systematically develop their knowledge, skills and abilities to perform successfully in their jobs in the organization.

In terms of knowledge management managers should develop conditions for voluntary and mutual storing and sharing of knowledge in the organization. Knowledge management is concerned with managing available knowledge in the organization that may be divided into explicit and tacit knowledge (Armstrong and Taylor 2014). Explicit (expressible) knowledge is stored in databases of information systems. It is relatively easy shared and it can be managed through management of information systems and technologies. Tacit (hidden) knowledge is stored in memory of employees. It develops from interaction of explicit knowledge and other knowledge of employees. It is not easy shared and it can be managed only though management of employees. The purpose of knowledge management is to continually improve the storing and sharing of knowledge in the organization ad so continually improve performance of individual employees and the organization as a whole. Knowledge management support performance and talent management in the organization.

Conclusion

The authors' survey results support the suggestion that from the perspective of meeting the objective of human resource management in the organization managers should apply proven best practices in talent, performance, diversity, compensation and knowledge management to effectively attract, employ and develop enough qualified and motivated employees to perform agreed work, achieve desired performance and reach expected goals of the organization.

The authors' survey results include answers of 100 HR directors, HR managers and HR specialists of well-known and successful organizations in the Czech Republic. Although the current survey results do not allow authors to draw general conclusions, they confirm main findings of earlier research results cited in the paper and they show some interesting tendencies in the application of the best practice/best fit approach to human resource management that are worth attention from the point of view of managers and human resource professionals in various organizations and their current human resource management practice.

In the case of the importance of human resources, 96% of respondents agreed that employees are valued as the most important source in their organizations. According to the respondents, an employee can be considered as the most valuable source if the employee has development potential or creates added value to the organization. The data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.

In the case of the link between human resource management and organizational performance, 95% of respondents agreed that human resource management positively influence results of their organizations, including results related to both individual employees, as well as the entire organization. The data analysis showed no significant difference among small, medium and large organizations or between organizations from industry and services.

In the case of the system of human resource management in the organization, 92% of respondents agreed that their organizations are managed in accordance with known best practices in human resource management and 70% of respondents agreed that their organizations systematically compare achieved performance with the performance of the best organizations in the specific sector or region to apply appropriate best practices in human resource management. According to the respondents, potential best practices in human resource management include systematic training, performance-related pay, leadership, regular performance review, talent management, motivating jobs, positive selection, work-life balance or performance management.

In human resource management, there are useful best practices that positively influence organizational performance, but their application requires best fit to external and internal factors that determine the positive effect of applied best practices in human resource management on achieved organizational performance. This is the basis of the authors' model of human resource management in the organization, when the system of human resource management should be seen as a subsystem of organizational management that is developed in accordance with the competitive strategy, with regard to the business environment and in the interest of stakeholders. Within the system of human resource management, to meet the objective of human resource management in the organization, managers should apply proven best practices in talent, performance, diversity,

compensation and knowledge management to effectively attract, employ and develop enough qualified and motivated employees to perform agreed work, achieve desired performance and reach expected goals of the organization.

Any organization seeking to achieve excellent performance and sustained competitiveness must be a good employer to fulfil the potential of qualified and motivated employees, as well as a good trader to fulfil the potential of regular and satisfied customers. The connection of qualified and motivated employees and regular and satisfied customers through quality products and services leads to return on investment and satisfaction of important stakeholders, which is fundamental for achieving expected organizational performance and competitiveness. The effective system of human resource management in the organization based on proven best practices in talent, performance, diversity, compensation and knowledge management helps managers to attract, employ and develop enough qualified and motivated employees and through the effective use of their abilities, motivation and outputs to produce and distribute demanded products and services, gain and maintain regular and satisfied customers and achieve expected organizational performance and competitiveness.

References

[1] Armstrong, M. 2006. *A Handbook of Human Resource Management Practice*. 10th Edition London: Kogan Page, ISBN-10: 0749446315, 1008 pp.

[2] Armstrong, M., and Taylor, S. 2014. *Armstrong's Handbook of Human Resource Management Practice*. 13th ed. London: Kogan Page Limited. ISBN 978 0 7494 6964 1. Available at: https://otgo.tehran.ir/Portals/0/pdf/Armstrong's%20Handbook%20of%20Human%20Resource%20Management%20Practice_1.pdf

[3] Axson, D.A.J. 2007. *Best Practices in Planning and Performance Management: From Data to Decisions*. 2nd ed. Hoboken, New Jersey: Wiley, ISBN-10: 0470008571, 288 pp.

[4] De Castro, V.F. and Frazzon, E.M. 2017. Benchmarking of Best Practices: An Overview of the Academic Literature. *Benchmarking*, 24(3): 750-774.

[5] Delery, J.E. and Doty, D.H. 1996. Modes of Theorizing in Strategic Human Resource Management: Tests of Universalistic, Contingency, and Configurations Performance Predictions. *Academy of Management Journal*, 39(4): 802-835.

[6] Fombrun, Ch., Tichy, N.M. and Devanna, M.A. 1984. *Strategic Human Resource Management*. New York: John Wiley, ISBN: 0471810797, 9780471810797, 499 pp.

[7] Grenčíková, A., Španková J., and Karbach, R. 2015. Current Trends in Enterprise Employment Policies in Slovak Republic. *Actual Problems of Economics*, 170(8): 293-301.

[8] Guest, D.E. 2011. Human Resource Management and Performance: Still Searching for Some Answers. *Human Resource Management Journal*, 21(1): 3-13.

[9] Harris, H., Brewster, Ch., and Sparrow, P. 2003. *International Human Resource Management*. London: Chartered Institute of Personnel and Development, ISBN: 0852929838, 9780852929834, 218 pp.

[10] Ingram, T. 2016. *Relationships between Talent Management and Organizational Performance: The Role of Climate for Creativity.* In Wach, K., Zur, A. (Eds.). 8th International Scientific ENTRE Conference on Advancing Research in Entrepreneurship in the Global Context, 443-452 pp.

[11] Khoreva, V., Vaiman, V. and Van Zalk, M. 2017. Talent Management Practice Effectiveness: Investigating Employee Perspective. *Employee Relations*, 39(1): 19-32.

[12] Konušíková, L., and Kucharčíková, A. 2015. Approaches to Active Labour Market Policy in the Slovak Republic, Czech Republic and in Finland. *Communications – Scientific Letters of the University of Zilina*, 17(2): 73-79.

[13] Němec, O., and Surynek, A. 2015. *Age Management as a Part of Corporate Social Responsibility*. In Loster, T. and Pavelka, T. (Eds.). The 9th International Days of Statistics and Economics, 1180-1190 pp.

[14] Nikandrou, I., Campos e Cunha, R., and Papalexandris, N. 2006. *HRM and Organizational Performance: Universal and Contextual evidence.* In Larsen, H. H. and Mayrhofer, W. Managing Human Resources in Europe: A Thematic Approach (Global HRM). 1st Edition Taylor and Francis, ISBN: 9781134267156, 384 pp.

[15] Rofaida, R. 2016. *Competitive Advantage through Talent Management.* In Abdullah, A. G., Hurriyati, R., Nandiyanto, A. *et al.* (Eds.). 1st UPI Global Conference on Business, Management and Entreupreuneurship, 615-617 pp.

[16] Rother, M. 2009. *Toyota Kata: Managing People for Improvement, Adaptiveness and Superior Results*. New York: McGraw-Hill Education, ISBN-10: 0071635238, 306 pp.

[17] Suttapong, K., Srimai, S., and Pitchayadol, P. 2014. Best Practices for Building High Performance in Human Resource Management. *Global Business and Organizational Excellence*, 3(2): 39-50.

Do Universities Use Competitiveness Indicators in Their Development Programs? An Evidence from Russia

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Abstract:

Most higher education systems set objectives to improve competitive positions of the national universities as an instrument to increase country competitiveness. The goal of the paper is to analyze which indicators of competitiveness are used by the Russian universities in their development programs. Research undertaken included content analysis of the development programs and strategies of 81 Russian universities from all groups and categories, and further comparison of the results using 6 main indicators (education, employability, research, faculty, differentiation, strategic positioning) to see the gaps and make recommendations for the strategic planning. Research results show that universities in the top categories of Federal, National Research, and Core institutions, which need to meet specific government requirements in strategy and planning, have balanced development programs in all the competitiveness areas. Most other universities responsible for the mass of country's human capital education often neglect such areas as positioning, identification of the target audience and defining the strategic vision for the future. Common drawbacks in using the competitiveness indicators were identified, and recommendations about the structure and methods of development programs assessment were formulated to assist higher education institutions in analyzing past success and planning future efforts.

Keywords: higher education; strategic planning; development program; competitiveness indicators; university positioning

JEL Classification: I20; I23; M210

Introduction

Modern higher education systems all over the world are driven by similar factors, such as new jobs typology, middle-class role in the developing markets, geopolitical transformations, increased life expectancy, big data technologies and robotization (World Economic Forum 2016). The drivers being similar, organizational, economic and financial mechanisms are specific for each system and each country (McClure 2016, Kuzminov *et al.* 2013, OECD. Better Policies for Better Lives 2015). The higher education system needs flexibility to adapt to the changes as they happen and proactivity to foresee and prepare to the changing requirements and preferences of consumers and society (Bano and Taylor 2015, West 2012, Vinogradova 2015). Every country wants its higher education system to be competitive globally, and its universities to be able to serve the needs of national economic development and meet the international quality standards, attract international students and strengthen the country competitiveness (Sala-i-Martin 2010, Štimac and Šimić 2012, Degtyareva *et al.* 2013). These goals and objectives are set in various government documents, leaders' appeals and government programs (Law on Education of the Russian Federation 2017-2016, Russian Education)

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In Russia there are currently several priority programs in the sphere of higher education: "Universities as innovation centers" focuses on achieving by 2025 the global competitiveness of the leading Russian universities and their presence in the top 100 of the universities rankings (Russian Information Bureau 2016). "Modern digital education environment" (Passport of the Priority Project "Modern Digital Educational Environment in the Russian Federation" 2016) is supposed to provide conditions for education quality increase and lifelong education opportunities using digital technologies and e-learning platforms[27]. To improve the attractiveness of Russian higher education among foreign students a new project was introduced in 2017 - "Developing export potential of the Russian education system" involving thirty-nine Russian universities and aiming at three times increase of the number of international students by 2025 (Russia's Government 2017).

Such interest in the competitiveness of the Russian higher education is a reflection of economy globalization, as it is now possible to compare the performance of different systems internationally, including education. The modern concept of "lifelong learning" makes the demand for educational services of a specific educational organization serve as the criteria of quality and transforms the education system into a valuable resource for the further development of the country (Sokolov 2013, Štimac and Šimić 2012).

The notion of competitiveness as an economic category is used today to describe all types and fields of activities (Moore 1993, Balkyte and Tvaronaviciene 2010, Bhawsar and Chattopadhyay 2015). The competitiveness of higher education as a system and of its institutions is a common objective of many countries and regions, but the very concept of university competitiveness and its indicators are often misunderstood or presented in a general way. The goal of this paper is to analyze which indicators are used in the university development programs of different groups of Russian universities assuming that the goals and specific, detailed objectives will facilitate the achievement of an improved competitive position of the university. Using the literature review of the publications on university competitiveness, the analysis of the international rankings, accreditation systems and the indicators used by the Russian Ministry of Education and Science (MES), competitiveness indicators were selected from those present in all the four inspected fields. The resulting 6 sets of indicators were used to analyze the current development programs of 81 Russian universities representing all university types in the country. Documents for the analysis were the development programs or strategies of the universities published in their official web-sites or selected by the Internet key-words search. The paper includes the results of literature review, description of the research methods and process, presentation and discussion of research results and recommendations to improve strategic planning in the Russian universities.

1. Literature Review

1.1. Defining the competitiveness of a university

Competitiveness is a set of properties, characteristics of some entity of the same nature that determine their ability (willingness) to best satisfy a particular need of the individual, groups of individuals and society as a whole (Aitbayeva *et al.* 2016). According to Porter (1998), the main factors of the formation of competitive advantages are resources factors (human resources, material and financial resources, infrastructure, and intangible capital) and demand factors (its structure, size, and degree of internationalization; the characteristics and preferences of the target audience). Research literature analysis identified several approaches to the definition of competitiveness of higher education organizations. Some authors as: Korchagova (2007), Bauk and Jusufranic (2014), understand competitiveness as a set of organization's capabilities existing now or possible to develop in the future based on the organization resources (Analytical Center for the Government of the Russian Federation 2017). A variation of this approach is viewing competitiveness as a set of education product/service characteristics (Aitbayeva *et al.* 2016). Another approach defines graduates as education organization products and assesses their abilities to compete in the labor market as university competitiveness (Konoplyanskij 2016, Malin 2007).

Realizing the importance of indicators of competitiveness, educational organizations strive to create and develop these special features, guaranteeing a steady demand for their products among the target consumers (Rusinko 2010). The formation of competitive advantages should be reflected in policies and development programs of the universities, defining the main directions of their strategies (Abankina *et al.* 2013, Korchagova 2007, Huisman and Mampaey 2016). Effective goal-setting involves not only a clear and specific direction of development but also measurable achievements, the relevance of the objectives, their feasibility during a specified period.

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[27] In 2015 8 leading Russian universities initiated a project to create a national platform for open education.

Often competitiveness of universities in a country or region is viewed as a factor leading to the country competitiveness because higher education is an important element of the Global competitiveness index (Salmi and Froumin 2013). Many countries see the increase in higher education system competitiveness as a way to improve the competitive position of the country. By increasing the competitiveness of their higher education system and individual universities, countries may want to attract international students and reduce the brain drain, develop top quality human capital, activate the development of science and innovations.

1.2. Competitiveness indicators

Basing on the concept of competitiveness, research literature analysis identified the following components of competitiveness of higher education institutions (Korchagova 2007, Sokolov 2013, 2017, Aitbayeva *et al.* 2016, Hazelkorn 2015):

- the quality of resources of educational organizations, including staff qualifications, quality of applicants and their level of training, quality of infrastructure and material resources of the University, quality of the management systems, availability and level of intangible resources (including the brand power and image of the University);
- the quality of educational, scientific and information products of the University, such as advanced technology and training methods, modern educational programs; the level of scientific research and products, quality of graduates and their professional success, achievements of the teaching staff of the University;
- meeting the needs and expectations of the target audience through precise positioning of the organization and its products, knowledge of the needs of the target segments and monitoring of their changes, differentiating characteristics that are relevant to the target audience and society;
- strategic directions of development, understanding by the organization of its purpose and direction of development (mission and vision).

Educational organizations traditionally divide their activities into educational (education and teaching) and research (research, development, innovation). It is in these areas that the quality of work of the organization and its effectiveness are usually assessed and controlled by government bodies and international organizations (Hazelkorn 2015, Eggins 2014, Sokolov 2013). To improve their positions in the market educational organizations, use their competitive strategies, *i.e.*, specific patterns of behavior in the field of development, production, the supply of their educational products and services (Burgel 2007, West 2012). Educational organizations periodically revise their competitive policies and strategies, taking into account changes in the market situation, government and accreditation bodies' requirements, target audiences' preferences and needs, ensuring the sustainability of their competitive advantages (Abankina *et al.* 2013, Golik 2007). The tool used could be the development of strategies and road maps, participation in performance monitoring and assessment exercises, international and local rankings (Lachmann 2010, OECD. Better Policies for Better Lives 2015, Hazelkorn 2015) *i.e.,* events that make the organizations analyze the situation in the market, study the positions of their main competitors, clarify the requirements and expectations of their target audiences and decide how and through what characteristics the educational organization would be able to retain, develop or change their competitive position (Bauk and Jusufranic 2014, Bačík *et al.* 2015).

The problem of increasing the competitiveness of the education system in Russia stem from the strategic priorities of the country since the reforms of the 1990s and the need for integration of Russia into European and world educational space, transforming Russia into an industrialized country with well-functioning democratic institutions and a market economy (Kuzminov *et al.* 2013, Salmi and Froumin 2013, Sala-i-Martin 2010). The Concept of modernization of Russian education for the period 2002-2010 formulated priorities of educational policy: access to education, improving its quality and improving the economic regulation of education (The Ministry of Education of the Russian Federation 2002). The competitiveness of higher education was interpreted in this period as compliance with the requirements and norms of democratic institutions and market economy. Relationships within the educational system included the competition of educational institutions for the attention and recognition of the stakeholders (Fatkhutdinov 2006, Sokolov 2013).

The main directions of the state policy in the field of higher education in the mid-2000s is recorded in the document "The Conception of the Federal Target Program of Education Development for 2016 - 2020" (2014). These areas included: the development of a modern system of continuous professional education, improving the quality of education, an increase of investment attractiveness of education. The government has identified the key priority of the development of higher education as strengthening the influence of Russia on the world events,

ensuring proper entry into the postindustrial, information society and knowledge economy. In the context of Russia's participation in the Bologna process and WTO membership, the question of the competitiveness of Russian universities, their competitive advantages and success in the international market was of national importance.

In the program of long-term socio-economic development of the Russian Federation for the period until 2020 (About the Federal Target Program of Education Development for 2016-2020), the growing role of human capital is one of the main factors of economic development. The program identified the need for a flexible and diversified system of higher education to meet the requirements of the labor market and the innovation economy.

1.3. Indicators in the universities' strategies

The requirements of the government policy were translated by the MES into a number of organizational initiatives forming 3 groups of the leading higher educational institutions in the country: Federal universities are the result of the unification of several regional institutions within the same federal district. The main objective of these 10 universities is to contribute to the formation and development of competitive human capital in Federal regions. 29 National Research universities were selected by competition among more than 130 applicants who had to prove they can ensure the high level of research combined with education. The most recent group created were Core universities organized in the Russian regions with the main goal to provide high-quality human capital for the regional development programs (33 have been set and there are plans to increase their number up to 80). The universities in these groups were selected through competitive contests, institutions mergers and had to develop their strategies and roadmaps meeting the requirements set by ministry guidelines and instructions. Many of them set objectives to enter the international rankings and steadily improve their positions, so they use the indicators of the rankings in their strategic development programs. Russian universities which are not included into the leading universities category generally focus on the set of performance indicators used my MES to assess the universities' effectiveness. Some of them are doing this without proper analysis of their priority for the specific subject area or industry, the university positioning or status, so it is believed that a university formal status (belonging to a specific group or type of the educational institutions) has more influence on the university "organizational career" than its specific strategy (Sokolov 2017).

From the perspective of strategic development of educational institutions, indicators of competitiveness need to reflect the competitive advantages that a university has, or to the formation of which the strategy is directed. Competitive advantage must be sustainable, *i.e.* must provide a long-term benefit from the implementation of the selected strategy to create customer value that cannot be easily copied by the competitors (Rusinko 2010). For an educational organization, a competitive advantage can be based on the unique resources, focus on the identified needs of the target audience or through the provision of novel educational, scientific or information products of the organization (McClure 2016). The strategy includes two components: the development, *i.e.*, creation of competitive advantage, and the target activity, *i.e.*, the use of competitive advantages. Thus, the competitiveness indicators should include not only indicators of organization performance or effectiveness, but also indicators of the organization positioning to create competitive advantages (Eggins 2014). From literature analysis the research hypothesis was formulated: the university development programs or strategies should include both performance indicators and strategic positioning characteristics to lead the institution to improved competitiveness results.

2. Materials and Methods

To identify the indicators of competitiveness used by the educational organizations a research was carried out, comprising the following steps:
- the selection of the indicators used by the Russian MES monitoring the effectiveness of universities in the development programs of specific categories of institutions (Federal, National research, Core and others);
- the selection of indicators of competitiveness used in international rankings and accreditation systems;
- a comparison of the resulting list with the requirements of competitiveness, obtained from the analysis of scientific literature to identify aspects of competitiveness, which should be taken into account on top of the performance indicators;
- the use of the amended list of indicators for the analysis of the development programs of the Russian universities.

For analysis of the presence of competitiveness indicators in the development programs of Russian universities, content analysis was carried out. Out of the three approaches (Krippendorf 1980, Babbie 1992) to content analysis (conventional, directed, or summative) the directed approach was used: analysis started with the

literature survey as guidance for initial codes, which were then used by experts qualified in analyzing the information presented for international rankings and strategic development programs.

Experts analyzed the development programs of 81 universities, including representatives of the main groups of educational institutions within the Russian higher education system – 8 Federal universities (80%), 19 national research universities (74%), 18 core universities (65%) and 36 "other" universities (4%)[28].

All programs were taken from open sources. Since the development program is a mandatory requirement for the Federal and National research universities and universities included in the Core category, these programs were taken from the websites of the respective institutions. Other universities do not always have development programs or strategies on their websites. To collect these documents an Internet search was conducted using the keywords. We collected 42 documents, out of which 36 were suitable for the analysis. Incomplete documents or those without specific and measurable indicators were not included in the analysis.

The main goal of the experts was to register the presence or absence of the competitiveness indicators in the universities' programs. The analysis was conducted in two stages. In the first phase, experts studied the development programs and registered the presence of the selected indicators of competitiveness using the three-point coding system, where 1 - was absence of the indicator, 3 - presence of the indicator in the program, and 2 - partial presence of the indicator. The code "2" was given when, for example, the metric was not used, but the program contained not just keywords, but specific measures related to the absent indicator. The lack of specific, measurable outcomes in the program was seen as the absence of the indicator. During programs analysis, the expert at the first stage included comments on the codes assigned in a separate column of the analysis sheet. In the second stage, another expert checked the codes and if necessary adjusted them based on the re-examination of the relevant sections of the development plan and the comments made by the first expert. Directed content analysis with experts' participation helped to interpret the meaning of the text data from development programs.

After the analysis of the development programs, all results were entered into the database forming the basis for further generalization and comparison of the obtained results. In the next section the results of the analysis by groups of universities will be explained. In the category of Federal and National research universities an additional criterion was introduced to identify the participants of the program "5-100"[29]. In the category of "other" educational institutions, an additional criterion was introduced to identify institutions that receive additional funding from the specific industry ministries or agencies.

3. Results

The resulting list of indicators used for the analysis included six areas: four of which were performance indicators and two reflected universities strategic positioning and creating competitive advantages (Table 1). Performance indicators included those parameters which were used both in MES effectiveness indicators set, and in the international rankings and accreditation systems. Strategic positioning indicators were selected from the research literature studied and then shortlisted against indicators of the international rankings. Researchers did not create any additional indicators and did not include those which could not be specifically identified.

Table 1. Competitiveness Indicators

Area	Indicator
Faculty quality	Share of faculty with a scientific degree; Share of international faculty.
Research & development	R&D earnings share; Publications per faculty; Citations per faculty.
Education and student body	Average USE[30] score; Share of subject contests winners in the intake; Share of international students; Share of graduate students; Share of Ph.D. students;

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[28] Through this number accounts only for 4% of the total number of higher education institutions as of 2016, the sample included 8 well-known universities, 28 government owned institutions and 8 private schools of different specializations and locations.

[29] 21 Russian Universities are winners of the contest for government support to maximize the competitive position of these leading Russian universities in the global research and education market (The Ministry of Education and Science of the Russian Federation).

[30] Unified State Examination - an exam all secondary school leavers take.

Area	Indicator
	Teacher/student ratio.
Graduates employability	Share of graduates employed in a given time period
Differentiating features	Additional services for students Additional study opportunities; Unique study programs; Unique location, facilities or other material assets; Strong brand or other intangible assets.
Strategic vision	Specified strategic positioning; Specific strategic objectives related to the identified target audience; Competitive advantages to be developed.

Comparison of the results of the expert analysis allowed to notice some trends and patterns of educational institutions behavior in the use of competitiveness indicators (Figure 1). The scores represent the averages for the analyzed groups of universities. Of course, individual results will vary within each group. However, the average scores for the group allow to compare outcomes in different groups and see the effect of the requirements that are applied to the universities by the MES.

Figure 1. Results of the expert analysis by university group
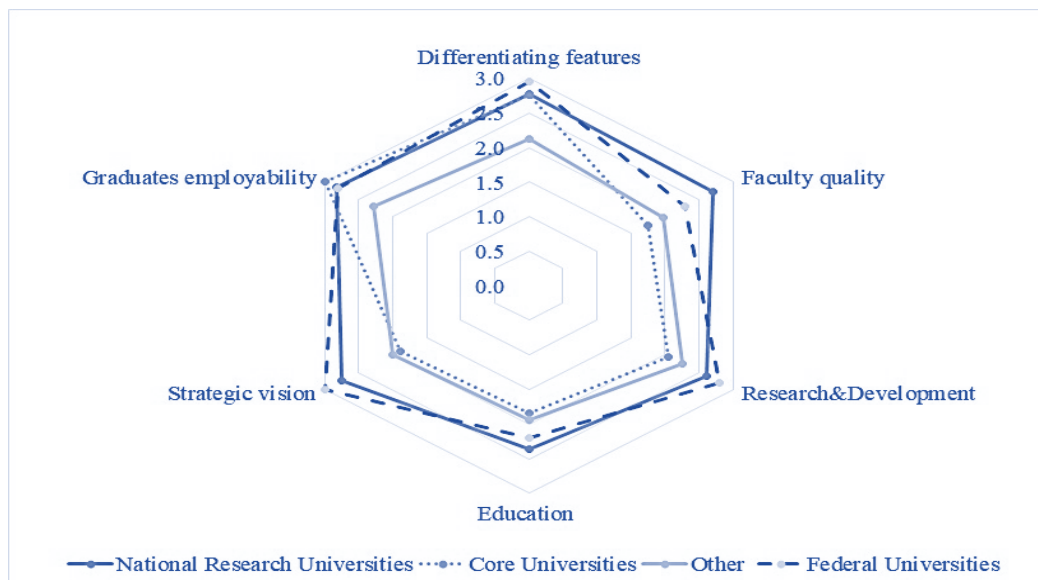
3.1. National Research Universities

The figure shows that most balanced results were demonstrated by the National research universities. This is not surprising, of course, as this category is supposed to include organizations most advanced in research and development according to the international standards. However, one can see that they do not demonstrate maximum scores in education, which means that their strategic objectives did not always include such indicators as the average Secondary education exam score[31] or share of special subject contests winners among students enrolled in the 1st year. It may be due to the stable high competition to these universities and already high levels in these areas, so these are not included in the development programs. But absence for some schools of such indicators as the share of post-graduate and master students in the total number of students, or the percentage of international students in the student body, leading to the average value of 2.36 for this group, seems strange. After all, National research universities, by definition, should be focused primarily on the training of specialists with the highest skill levels, *i.e.,* master and Ph.D. students.

Similar questions were raised by the score in the faculty quality indicator, which although showed the average of 2.71 (the highest figure for all groups of universities), but actually means that not all educational

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[31] Unified state exam is a set of examinations taken by the secondary schools graduates at the end of their studies, the results of these exams are accepted to enter the higher educational institutions which may require certain scores in order to be admitted. The average score of all accepted to the first year can serve as a sign of the quality of the student body of the institution.

organizations of this group in their development programs used such indicators as the share of faculty with scientific degrees or the share of international faculty.

Experts noted high scores of the indicators "differentiating features" and "strategic vision", which means the universities clearly define their competitive positioning and advantages in their strategies. A possible stimulus for this may be the requirements of the Ministry to focus the development programs to specific areas of research so that all activities of the University were linked to these areas.

3.2. Federal Universities

Federal universities show almost the same level of performance as the National research universities in such areas as research and development, strategic vision and differentiating characteristics. We can again refer this to the requirements of the Ministry to the universities of this group, according to which their plans and development programs should be aimed at ensuring the socio-economic development of their federal regions, therefore, regional strategies and features determine the directions of Federal universities development.

In this group of educational institutions, we also see an insufficient attention to the indicators of the faculty and students' quality. This does not mean that these issues are not given proper attention, but the stakeholders cannot learn about their importance or priority for universities from their development programs. The average scores for the group of Federal universities are 2.3 for faculty quality indicator, and 2.2 for education indicator. This may again be due to the high and stable competition to enter these universities.

3.3. Core Universities

Core universities are the group that has been formed recently to include educational institutions which serve as the core in their regions and are supposed to provide methodological and professional support for other institutions in Russia with the same specialization. In our analysis core institutions demonstrated lower scores in faculty quality indicators (1,75), education (1,84) and strategic vision (1,89) in their development programs. The average lower than 2.0 means that several institutions of this group did not include this indicator into their programs. The score for graduates' employability indicator in the programs of Core institutions (3.0) is higher than of Federal (2.8) or National research (2.83), which means that this indicator is present in all strategies of the Core institutions.

In general, four out of six indicators of competitiveness have lower average scores for Core institutions (faculty quality, research and development, education and strategic vision). Bearing in mind that to enter this group educational organizations had to meet certain requirements set by the Ministry, we can conclude that these indicators either were not clearly identified by the Ministry or were neglected by the institutions as not representing the top priority for them.

3.4. Other Universities

The group of "other" institutions included organizations which were not part of any formal group or category. This group included both well-known top universities from Moscow and St. Petersburg, and smaller regional institutions of different origins and forms. Some of them (like Moscow University of Foreign Affairs, Financial University or Plekhanov Russian University of Economics) demonstrated high scores in all indicators, meaning that all competitiveness factors were present in their strategies. However, the average scores of institutions in this group showed some clear patterns which cannot be recognized as leading to increasing competitiveness. Most of these institutions scored low in differentiating features (2.3) and strategic vision (2.1) indicators.

The comments given by the experts show that not only these indicators were not present in many of the strategies, but explanations in these sections of the programs were vague and general, not showing that institutions understood who their target consumers were and what differentiating points they had or were aiming to develop. Discussion of the research results will identify common patterns and draw conclusions.

4. Discussion

Research of the Russian universities' development programs proved the conclusions of research literature survey that most international rankings, accreditation systems and other international and national competitive comparisons use similar indicators. However, the Russian universities effectiveness indicators used by MES do not include the differentiation features and strategic positioning indicators which are important to build and enhance competitive advantages relevant for the target consumers and stakeholders. The research revealed that balanced strategies using proper competitiveness indicators which are specific, detailed and measurable, including not only effectiveness metrics which are used by the Ministry of education to assess the school current effectiveness, but also the points of difference and strategic vision of the future development areas, were developed by top groups of

Russian higher education institutions - Federal, National research and Core universities. All these were supposed to meet specific requirements when they applied for their status, so they paid particular attention to the sections required by the MES, responsible for assigning these statuses.

Analysis of the results showed that universities from the Federal group focus on the development objectives of their federal regions, clearly identifying those through the directions and specific indicators in their strategies and annual development programs. Universities from the National Research category which are supposed to focus on specific research subject areas also clearly demonstrate this focus, using relevant competitiveness indicators. All university programs studied for these two groups show that the organizations define their strategic objectives and policies as leading to efficient serving their target segments.

The group of Core institutions which was the recent classification category in Russian higher education system, also shows focus on some relevant areas (differentiating features and graduates' employability indicators), but their understanding of the strategic development is not clear for all institutions of the group (average score of 1.88 in strategic vision indicator). The fact that institutions in this group did not all include such indicators as faculty quality and education into the development programs looks strange as their status of the core institution in their area does need faculty and education processes support. However, this issue needs further research to understand the possible reasons.

The other institutions being free to use the indicators of their choice can be divided into three groups by their approach. Some top institutions in their subject areas, which were not included in any of the three categories, followed their priorities and demonstrated a balanced approach in using competitiveness indicators in the strategies and development programs. The majority of the "others" either stuck to the Ministry effectiveness indicators (those used to assess the current position of the institution during the compulsory annual assessment exercise) or tried to copy the strategies and programs of some top universities (Federal or National research) with some reduction coefficient. Both of these approaches do not seem productive, as they do not allow the university to develop their competitive advantages. If the institution restricts its development horizon by only meeting the effectiveness indicators (often with threshold scores), it does not even guarantee the survival in a medium-term perspective, as the requirements are increased annually, and focusing on the present year figures does not provide any stimulus for further development. Copying indicators of the top group universities is also not productive as these may differ from the position of the institution and may not be relevant for their target consumers either in the education or labor market.

Not trying to formalize an already highly regulated Russian education market we still think that some recommendations concerning the structure of the development programs and indicators to be used are necessary for these "other" institutions. Development programs should contain at least 2 sections: one dealing with achieving the performance indicators, and the second devoted to identification and development of competitive advantages. Consultations or assistance through some regional methodological and planning centers could be the instrument to improve the situation. Most Russian universities are not required to provide free access to their development programs and strategies and often do not publish them on their websites. This is bad for the stakeholders and consumers, who cannot use this information for their decision-making, companies do not see the potential for partnerships, local governments do not know the contribution of the institution to the regional development.

Conclusion

Though many authors writing on modern higher education issues agree to use competitiveness as a notion describing modern education market, there is no uniform definition of competitiveness for universities. Using research literature analysis, a set of current effectiveness indicators of the Russian Ministry of Education and Science, requirements used in international university rankings and most well-known accreditation systems, a set of six competitiveness indicators was selected: faculty quality, education, graduate employability, research and development, strategic vision and differentiating features. Combining performance indicators with differentiation characteristics and strategic vision indicators provides a framework for further discussion, as well as a framework for action, focusing on the competitive advantages the institution can build or enhance using the existing resources, development opportunities and relating its strengths to the target audience needs. Our research identified a gap between competitiveness indicators description in the scientific literature and indicators used by the Russian universities and governing bodies in practice. Focus on performance indicators in the Russian MES university effectiveness exercise resulted in omission of strategic positioning and differentiation indicators in most of Russian university development programs.

The analysis of the competitiveness indicators used by the Russian universities in their strategies and development programs showed that universities in the top categories of Federal, National Research, and Core

institutions, which need to meet the government requirements in strategy and planning, generally have well-balanced development programs including all competitiveness areas identified.

The content analysis of universities' programs provided data for further comparison of higher education institutions. Comparison revealed that universities which are not part of the top groups (marked as "other" in the research) score lower on some indicators (especially strategic vision and differentiating features). This can be partially explained by the absence of formal requirements to the content and structure of universities' strategies and development programs resulting in these schools either restricting their competitiveness indicators to the effectiveness criteria used in the annual effectiveness exercise of the Ministry of education and science, or some of the schools copying the indicators used by the top universities.

This situation does not provide stakeholders of the Russian higher education organizations with relevant information about their current positioning and future areas of development, which can negatively influence the decision-making process and the competitiveness of the higher education institutions. The research draws from and extends previous conceptual research on higher education competitiveness in the literature surveyed by providing evidence on the usage of competitiveness indicators by the Russian universities. Research addresses the need to specify strategic objectives of a university and include indicators which can lead the institution to developing competitive advantages and strengthening the positioning relevant for the target consumers and university stakeholders.

Though the research was limited to only registering of the presence or absence of the competitiveness indicators in the universities programs, the inclusion of all types of Russian institutions of higher education provided good evidence of the present situation and influence of the MES guidelines and rankings on selecting a balanced set of the strategic development indicators. The development programs assessment using the competitiveness indicators set can be useful for universities outside the leading group, and can help those who are analyzing past successes and failures, as well as those planning future efforts.

Further measures to improve the situation can include the provision of support and consultations for universities to use relevant competitiveness indicators in their strategic planning. Possible areas of further research may include the in-depth analysis of the differentiation and strategic positioning of the Russian universities to identify the metrics which can be used for improving the competitiveness of the educational organizations.

References

[1] Abankina, I.V., Aleskerov, F.T., Belousova, V.Ju., Gohberg, L.M., Zin'kovskij, K.V., Kisel'gof, S.G., Shvydun, S.V. 2013. Typology and analysis of the scientific and educational performance of Russian universities. *Foresight,* 7(3): 48–63.

[2] Aitbayeva, G.D., Zhubanova, M.K., Kulgildinova, T.A., Tusupbekova, G.M., Uaisova, G.I. 2016. Formation of education clusters as a way to improve education. *International Journal of Environmental and Science Education*, 11(9): 3053–3064.

[3] Babbie, E. 1992. *The Practice of Social Research*. Wadsworth Pub. Co, ISBN: 0534155766, 9780534155766, 493 pp.

[4] Bačík, R., Fedorko, R., Štefko, R. 2015. The analysis of significant common attributes of websites in the context of the most prestigious world universities. *Journal of Applied Economic Sciences*, Volume X, Fall, 6(36): 848-854.

[5] Balkyte, A, Tvaronaviciene, M. 2010. Perception of Competitiveness in the Context of Sustainable Development: Facets of Sustainable Competitiveness. *Journal of Business Economics and Management,* 11(2): 341-365.

[6] Bano, S., Taylor, J. 2015. Universities and the knowledge-based economy: perceptions from a developing country. *Higher Education Research and Development,* 34(2): 242-255.

[7] Bauk, S., Jusufranic, J. 2014. Competitiveness in Higher Education in Terms of the Level of Students' Satisfaction with E-Learning in Blended Environment. *Montenegrin Journal of Economics*, 10(1): 25-42.

[8] Bhawsar, P, Chattopadhyay, U. 2015. Competitiveness: Review, Reflections and Directions. *Global Business Review,* 16(4): 665-679.

[9] Burgel, G. 2007. Autonomie: Compétitivité sauvage ou élitisme républicain? *Esprit,* 12: 136-145.

[10] Degtyareva, I.V., Marjina, A.V., Shalina, O.I. 2013. The influence of state on the innovative processes. *Contemporary Economic Issues*, 1, Available at: http://economic-journal.net/index.php/CEI/article/view/27/15. DOI: 10.24194/11313.

[11] Eggins, H. 2014. *Drivers and Barriers to Achieving Quality in Higher Education*. Rotterdam: Sense Publishers. ISBN: 978-94-6209-494-9, 182 pp., Available at: https://www.sensepublishers.com/media/1806-drivers-and-barriers-to-achieving-quality-in-higher-education.pdf

[12] Fatkhutdinov, R. 2006. Managing the university competitiveness. *Higher Education in Russia,* 9: 37–38.

[13] Golik, A. 2007. The system of external factors of university competitiveness. *Higher Education in Russia*, 7: 131–135.

[14] Hazelkorn, E. 2015. *Rankings and the Reshaping of Higher Education: The Battle for World-Class Excellence*. Second Edition. London: Palgrave Macmillan, ISBN: 978-1-137-44667-1, 304 pp.

[15] Huisman, J., Mampaey, J. 2016. The style it takes: how do UK universities communicate their identity through welcome addresses? *Higher Education Research and Development*, 35(3): 502-515.

[16] Konoplyanskij, D.A. 2016. Specific features of the roadmap method in the formation of the graduate's competitiveness. *Vestnik of the Voronezh State University,* 1: 55-59.

[17] Korchagova, L.A. 2007. Assessment of the university competitiveness. *Marketing in Russia and Abroad*, 5: 48–54.

[18] Krippendorf, K. 1980. *Content Analysis: An Introduction to its Methodology*. Beverly Hills: Sage, ISBN: 0803914970, 9780803914971, 191 pp.

[19] Kuzminov, Y., Semyonov, D., Froumin, I. 2013. University Network Structure: From the Soviet to the Russian "Master Plan." *Educational Studies*, 4: 8-69.

[20] Lachmann, J. 2010. Le développement des pôles de compétitivité: Quelle implication des universités? *Innovations,* 3: 105-135.

[21] Malin, A.S. 2007. Inter-university and internal university competition of the educational programs of higher education. *Modern competition,* 6: 49-55.

[22] McClure, K.R. 2016. Building the innovative and entrepreneurial university: An institutional case study of administrative academic capitalism. *Journal of Higher Education*, 87(4): 516-543.

[23] Moore, J.F. 1993. Predators and Prey: A New Ecology of Competition. *Harvard Business Review,* 71(3): 75-83.

[24] Porter, M.E. 1998. *Clusters and Competition. New Agendas for Companies, Governments and Institutions*. Boston: Harvard Business School Press. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.199.4104&rep=rep1&type=pdf

[25] Rusinko, C.A. 2010. Integrating Sustainability in Management and Business Education: A Matrix Approach. *Academy of Management Learning & Education*, 9(3): 507-519.

[26] Sala-i-Martin, X. 2010. *The Economics behind the World Economic Forum's Global Competitiveness Index.* In: GRAUWE, P. (Ed.). Dimensions of Competitiveness. Cambridge: MIT Press, 1-18 pp.

[27] Salmi, J., Froumin, I. 2013. Excellence Initiatives to Establish World-Class Universities: Evaluation of Recent Experiences*. Educational Studies*, 1: 25-68.

[28] Sokolov, M.M. 2013. *What did the Ministry of education and science ranking measure?* Statistical analysis. Available at: http://polit.ru/article/2013/05/24/rossiyskie_reitingy/

[29] Sokolov, M.M. 2017. The Myth of University Strategy. Market Niches and Organizational Careers of Russian Universities. *Educational Studies,* 2: 36-73.

[30] Štimac, H., Šimić, M.L. 2012. Competitiveness in Higher Education: A Need for Marketing Orientation and Service Quality. *Economics & Sociology*, 5(2): 23-34.

[31] Vinogradova, N.A. 2015. Methods of evaluation of social development. *Contemporary Economic Issues*, 1: Available at: http://economic-journal.net/index.php/CEI/article/view/123/106. DOI: 10.24194/11506

[32] West, M.R. 2012. *Education and Global Competitiveness: Lessons for the United States from International Evidence.* In: HASSETT, K. (Ed.). Rethinking Competitiveness. Washington: American Enterprise Institute Press, 68-94 pp.

*** About the Federal Target Program of Education Development for 2016-2020 (with changes for September 9, 2017). Available at: http://docs.cntd.ru/document/420276588

*** Analytical Center for the Government of the Russian Federation. 2017. Reform of Higher Education: Domestic and Foreign Experience. *Education Bulletins,* 12. Available at: http://ac.gov.ru/files/publication/a/14650.pdf

*** Law on Education of the Russian Federation. General statements of the Federal Law on Education 2017-2016. Federal Law "On Education in the Russian Federation" N 273-FZ of December 29, 2012 with the changes of 2017-2016. Available at: http://zakon-ob-obrazovanii.ru/

*** OECD. Better Policies for Better Lives. PISA 2015 Results. Available at: www.oecd.org/pisa

*** Passport of the Priority Project "Modern Digital Educational Environment in the Russian Federation". 2016. Available at: http://static.government.ru/media/files/8SiLmMBgjAN89vZbUUtmuF5lZYfTvOAG.pdf

*** Russian Education. Federal website. Available at: http://www.edu.ru/documents/

*** Russian Information Bureau. 2016. Innovations. 100 University Centers for Regions Development. Available at: http://www.rosinform.ru/society/306583-innovatsii-100-universitetskikh-tsentrov-dlya-razvitiya-regionov/

*** Russia's Government. 2017. Passport of the Priority Project "Development of Export Potential of Russian Education System" Approved. Available at: http://government.ru/news/28013/

*** The Conception of the Federal Target Program of Education Development for 2016–2020. 2014. Available at: http://static.government.ru/media/files/mlorxfXbbCk.pdf

*** The Ministry of Education and Science of the Russian Federation. World-Class Russian Education! Available at: http://5top100.com/

*** The Ministry of Education of the Russian Federation. 2002. About the Conception of Modernization of the Russian Education for the Period till 2010. Available at: http://docs.cntd.ru/document/901816019

*** World Economic Forum. 2016. The Future of Jobs. Available at: http://reports.weforum.org/future-of-jobs-2016/

Appendix 1. 100 Best Russian Universities

2017 position	2016 position	University name	Ranking potential	Rank for quality education	Rank for graduates' employability	Rank for R&D quality
1	1	Lomonosov Moscow State University	4.729	1	2	1
2	2	Moscow Institute of Physics and Technology (MIPT /Moscow Phystech)	4.603	3	5	3
3	3	National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)	4.424	7	4	2
4	5	Saint-Petersburg State University	4.244	4	12	5
5	7	Moscow State Institute of International Relations (MGIMO University)	4.223	2	7	34
6	6	National Research University Higher School of Economics (HSE, Moscow)	4.216	5	6	15
7	4	Bauman Moscow State Technical University	4.136	10	1	11
8	8	National Research Tomsk Polytechnic	4.100	6	15	7
9	9	Novosibirsk State University	3.957	8	16	6
10	11	Peter the Great Saint-Petersburg Polytechnic University	3.890	12	13	8

Source: https://raexpert.ru/rankings/vuz/vuz_2017/#2

Appendix 2. Russian Universities in the QS Rankings 2016-2017 and 2015-2015

	University	2016 - 2017	2015 - 2016
1.	Lomonosov Moscow State University	108	108
2.	Saint-Petersburg State University	258	256
3.	Novosibirsk State University	291	317
4.	Bauman Moscow State Technical University	306	338
5.	Moscow Institute of Physics and Technology (MIPT /Moscow Phystech)	350	431-440
6.	Moscow State Institute of International Relations (MGIMO University)	350	397
7.	Tomsk State University	377	481-490
8.	National Research Tomsk Polytechnic	400	
9.	National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)	401-410	501-550
10.	National Research University Higher School of Economics (HSE, Moscow)	411-420	501-550
11.	Peter the Great Saint-Petersburg Polytechnic University	411-420	471-480
12.	Kazan (Volga region) Federal University	501-550	5510600
13.	Far Eastern Federal University	551-600	651-700
14.	National Research Saratov State University	551-600	601-650
15.	Southern Federal University	551-600	601-650
16.	National University of Science and Technology MISIS	601-650	701+
17.	RUDN University	601-650	601-650
18.	Ural Federal University	601-650	601-650
19.	Lobachevsky University	701+	701+
20.	Plekhanov Russian University of Economics	701+	701+
21.	Voronezh State University	701+	701+
22.	Novosibirsk State Technical University	701+	

Source: QS Quacquarelli Symonds, https://www.topuniversities.com/university-rankings/world-university-rankings/2016

Current Questions of Managerial Function – Decision - Making in View of the Global Economic Crisis in the Conditions of the Slovak Republic

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Abstract:

The content of managerial functions is constantly evolving and responding to changing environmental conditions. These include the economic crisis, which is a certain milestone, a sudden disruption of how the businesses used to operate until then. Global economic crisis is one of the most significant environmental changes influencing all managerial functions – including decision-making. The crisis has removed the prejudice that only higher-level management managers make decisions in the companies. A corporate-wide approach is being preferred in decision-making, involving managers on different management levels and with different expertise. In this paper we examine the changes in given function due to the economic crisis and we test the hypothesis whether the currently increased participation of employees on decision-making processes is conditioned by the crisis. The statistical hypothesis is tested on the significance level of 0.05 with 115 foreign and domestic companies participating in the research and running their business in the Slovak Republic.

Keywords: economics crisis; collaborative decision-making; trends; Slovak Republic

JEL Classification: D70; M16

Introduction

After the fading crisis and revival of the labor market, several managers approached the need to assess the crisis and post-crisis period in order to learn from the situation and prepare for further unforeseen events. Theorists and practitioners agree that decision-making became much more demanding than during the times of prosperity and greater security in the markets. In the current business environment marked by the economic crisis, globalization, the development of information and communication technologies, *etc.* there is a need of prompt and accurate decision-making. In the pre-crisis period, managers have done a number of fast decisions on a daily basis, some of which were described by the critics as risky and led to the economic crisis. (Sahlman 2010) (Stiglitz 2014) Currently they are not inclined to this "trend" and they consider more the accuracy and reliability of the results of the decision-making process.

The goal of the submitted article is to examine the impact of the economic crisis on managerial decision-making function. We are focused on three different areas – usage of sophisticated decision-making methods, involvement of lower managerial levels in decision-making process and information sufficiency for decision-making process. Our research contains the comparison of present and crisis period for all these three areas.

1. Literature Review

In an effort to stand uncertain and unfavorable times and to move forward again, managers use more sophisticated management methods. According to Janouch (2012) a consultant in decision-making, marketing, and information systems, a very rapid expansions of tools based on the game theory is expected, as well as others sophisticated mathematical methods that ensure quality decision-making in a complex and uncertain business environment. Other trends in management methods and tools can include big data analytics, business intelligence, simply rules

strategy, cloud-based solutions, and predictive analytics. Currently there is massive dispute about the rational and psychological direction in decision-making. Using the Gut and Gigabytes, PwC Global Data and Analytics Survey 2014, the PwC consulting company came to the conclusion that data analysis improves managerial decision-making based solely on experience and intuition. 58% of executives rely heavily on own experience, intuition, and co-worker experience. (PwC 2014). For comparison, a survey of the Harvard Business Review found that for 49% of executives, decision-making based on intuition and experience loses its importance due to the availability of data sets and analyses. Authors Davenport – Harris – Morison (2013) describe in the Analytics at Work article how the manager can implement data analysis into day-to-day company operations and how analytical tools can improve managerial decision-making. In the current business environment oversaturated with information technologies and accessibility of data sets, decision-making cannot be done without the involvement/engagement of the human factor. (Kuncel – Ones – Klieger 2014) Based on Bednár's research (2013) decision-making has the main goal - to maximize benefits. Thus the most rational choice is the one with the highest subjectively expected added value.

In current literature, the continuous managerial function is much associated with human resources especially in the area of motivation (Pohanková 2010) and decision-making tools of artificial intelligence, namely fuzzy logic, (Karatop, Kubat and Uygun 2015) find their application in assessing employee performance (talents).

An essential part of decision-making is definitely relevant information. In the pre-crisis period in the defined function there was a problem with uneven distribution of information, which was reflected in poor results of decision-making. According to the Harvard Business Review Analytics Services research, as many as 42% of managers stated that they are not sure of some of their decisions due to insufficient information or lack of access to it, and only 13% of managers stand by their decision. (Deighton 2014) Current scientific resources appeal to the need to have sufficient quality information necessary to make good decisions (Chatti *et al.* 2010, Mariadoss *et al.* 2014, Xiao *et al* 2015, García-Peñalvo – Conde 2014).

In theoretical bases we are increasingly encountering the term Collaborative decision-making (Evers *et al.* 2016) determining the effect of economic crisis on decision-making. (Zarate 2013) The economic crisis removed all bias that only managers in higher management levels make the decisions in enterprises. Decision-making should be based on a company-wide approach, involving managers on different management levels and with different professional skills. (Spetzler – Neal 2015) Theoreticians recommend allowing employees to make own decisions. The idea is to create easier access and open spaces for the people to communicate and feel involved in the happening. (Valackiene 2010) This relates to the Cross-functional team function. It is a group of people with different professional skills that is created for the purpose of achieving a common goal. The function became part of modern management that will ensure the existence of enterprises and better customer communication. Experts have different opinions on this function. One group maintains that effective decisions should be done without consulting other functional departments; others are convinced that correct decisions should be the result of cooperation between different functions. (Rogers, Blenko 2006).

According to Mankins and Steele (2006), the trends in corporate decision-making are as follows: eliminate smaller decisions because they are becoming a certain routine, not pay excessive attention to planning, but make quick decisions and automatic decision-making processes. Today, enterprises abstain from cost and risk decisions and rather lean on the possibilities of experiments and testing.

Decision making process in terms of Slovak market was described in research of Remeňová and Procházková (2014). They proved that the applying of rational thinking in decision-making of managers is clearly dominating. It is three times more often used than intuitive decision-making. The research results confirmed that up to 68% of managers use rational-analytic style of decision-making. The second most common style used by Slovak managers is intuitive-analytic style. Zagoršek and Slávik (2017) showed that there are limited degrees of freedom in decision making when building a business model because different strategic approaches are suitable to different outcomes. Based on Ljudvigová's research (2014) in today's rapidly changing business environment, leaders are deciding in conditions of uncertainty. In turbulent environments, the decision based on 80 percent of information supplemented by pervasive intuition is often better than waiting for a 100 percent of information. Tarišková (2013) described the usage of balanced scorecards in human resource management and their influence on decision making process.

2. Methodology

To obtain the desired results we have used the empirical method of observation using a questionnaire survey. The questionnaire was distributed by electronic communication at the beginning of October 2016, whereby data collection was completed in February 2017. 117 questionnaires have been included in the research sample, of which 2 did not meet the relevant completeness, due to which they were not included in the survey.

Targeted segment of our research was randomly chosen Slovak and foreign enterprises running their business in Slovak republic whereby respondents were members of higher management. The total number of distributed questionnaires was 370 and the return rate was 31%. Inductively-deductive methods, descriptive methods, one-dimensional, and two-dimensional descriptive statistics were used to analyze collected data. Statistical apparatus methods were used to test statistical hypotheses. Hypotheses were tested at the significance level of α = 0.05. We have used following coefficients to verify the hypotheses: Pearson's correlation coefficient, Čupr's contingency coefficient, and Cramer's coefficient.

3. Research results

In the result section, we present the results of our research logically grouped into areas. Using descriptive methods, we describe and summarize our research sample by field of operation, size of enterprises, the age of companies and their economic development.

3.1. Field of operation

The analyzed companies were divided into three groups according to the field, in which they are conducting their business activity. In our research sample, the biggest share consisted of production companies (41.70%, 48 subjects), commercial (38.30%, 44 subjects), and finally, 1/5 of companies were service companies (20%, 23 subjects). Our results are shown in Table 1.

Table 1. Field of operation

Evaluating criteria (field of operation)	Number of subjects	Percentage share
Production	48	41.70
Services	23	20.00
Commerce	44	38.30
Total	115	100.00

Source: own processing

3.2. Size of enterprises

For the purpose of closer examination of our research sample, it is necessary to characterize companies according to the number of employees, as shown in Table 2. The most dominant group of companies based on the size criterion is large companies (33.90%, 39 subjects). Meanwhile, microcompanies accounted for the smallest portion (16.50%, 19 subjects). The summary of enterprises sorted by size is included in Table 2.

Table 2. Size of enterprises

Type of enterprise	Evaluation criteria (no of employees)	Number of subjects	Percentage share
Microcompanies	up to 10	19	16.50
Small companies	10 - 49	26	22.60
Middle companies	50 - 249	31	27.00
Large companies	over 250	39	33.90
Total		115	100.00

Source: own processing

3.3. The age of companies

The third evaluation criterion was the age of companies. Most companies in our sample were established companies with 15 and more years of operating on the market. We identified 67 such companies, which is more than half of all of them (58.30%). Our results are shown in Table 3.

Table 3. Duration of operation

Age of companies	Number of subjects	Percentage share
15 and more years	67	58.30
10 – 14	27	23.50
7 – 9	13	11.30
3 – 6	4	3.50
Less than 2 years	4	3.50
Total	115	100.00

Source: own processing

3.4. Economic development

More than a half of analyzed companies (55.70%, 64 subjects) assessed their economic development as mainly growing in the period before the crisis (until 2007). Almost 2/5 of companies stated that in the defined period, they recorded permanent growth (34.70%, 40 subjects), eight subjects were stagnating, and only three subjects stated that their economic development was mainly declining. We can notice that during the economic crisis period (2008-2010) the companies' development slowed down and either started to show signs of stagnation (39.1%, 45 subjects), or continued to show a growing trend (36.5%, 42 subjects), the situation of 18 subjects weakened to main loss, and one respondent showed a permanent loss during the crisis period. In the period after the crisis (from 2011), we can see the companies growing again, but compared to the period before the crisis, there was not a full recovery.

Affected companies are recovering from unfavorable situation only slowly, which can be seen in just a small share of companies with permanent, sustainable growth. Compared to the period before the crisis, the decrease of permanently growing companies is about half. Our results are shown in Table 4.

Table 4. Economic development of companies

Economic development	Before crisis period		Crisis		After crisis period	
	No. of subjects	Share (%)	No. of subjects	Share (%)	No. of subjects	Share (%)
Permanent growth	40	34.70	9	7.80	20	17.50
Mainly growth	64	55.70	42	36.50	61	53.00
Stagnation	8	7.00	45	39.10	25	21.70
Mainly loss	3	2.60	18	15.70	9	7.80
Permanent loss	0	0.00	1	0.90	0	0.00
Total	115	100.00	115	100.00	115	100.00

Source: own processing

We use statistical analysis to interpret the data we obtained in our survey and to present the story of companies that overcame the economic crisis, how they did it, and what they learned.

Table 5. Area of decision-making during the crisis and in the present

Statements	Assessment level				Total
	1	2	3	4	
	Number of companies				
During the EC we have used sophisticated decision-making methods	54	35	19	7	115
Currently we are using sophisticated decision-making methods	Yes		No		
	44		71		115
During the EC we lacked information necessary for decision-making processes	25	36	42	12	115
Currently we have sufficient information necessary for decision-making processes	Yes		No		
	81		34		115
During the EC lower levels of management were involved in decision-making	20	42	40	13	115
Currently lower levels of management are involved in decision-making	Yes		No		
	75		40		115

Note: 1 – completely disagree, 2 – partially disagree, 3 – partially agree, 4 – completely agree, EC – economic crisis.
Source: own processing

From Table 5 we found the following:

▪ Experts in given field report that the post-crisis period is linked to a rapid onset of sophisticated decision-making methods. Companies operating in Slovakia strongly disagreed with this statement. Up to 77% of the respondents during the crisis did not use advanced methods in decision-making processes and only 23% of companies have confirmed that during the time of greatest uncertainty on the market they were used state of the art decision-making methods. These were mainly large companies, operating in the market for a long time and stagnating during the critical years (2008-2011).

▪ Theoretical sources inform that in the pre-crisis period, in the decision-making function, there was a problem with uneven distribution of information, which was reflected in poor results of decision-making. Through our research we found out that Slovak managers actually complained about lack of information, which led to poor quality decisions. Currently, there are 50% more businesses that are sufficiently informed to make quality decision-making processes.

- About 54% of our respondents did not engage employees from lower levels of management in the decision-making process during the crisis period. Currently we see that managers are inclined to the collaborative decision-making trend. Currently, more than 65% of managers allow participation of lower organizational units in decision-making. We were wondering if the impact of the economic crisis truly conditioned the increased possibility of participation of lower organizational units in decision-making, or not. We have verified this claim statistically. Our approach was as follows:

1. Postulating the zero hypothesis (H_0)
- zero hypothesis: H_0: *There is no contingency between the crisis and the post-crisis period in the intensity of employee participation in decision-making;*
2. Postulating the alternative hypothesis (H_1)
- alternative hypothesis: H_1: *There is contingency between the crisis and the post-crisis period in the intensity of employee participation in decision-making;*
3. Setting the significance level
- we have set the significance level at 5% (0.05).
4. Calculating the test statistics and P – value.
   A) Test at significance level 0.05 whether there is dependence between time periods and level of participation in decision-making. Calculation of the test statistics was preceded by the compilation of a cross-table (Table 6), which divides the counts of two variables at the same time.
- line variables (a_1, a_2) are monitored periods, in our case the crisis period and present (r = 2),
- column variables (b_1, b_2, b_3 a b_4) are assessment levels, *where* 1 – completely disagree, 2 – partially disagree, 3 – partially agree, 4 – completely agree (s = 4).

The creation of Table 6 was preceded by calculating the actual counts (O_{ij}) and theoretical counts (E_{ij}).

Table 6. Testing the dependencies between the period and the level of participation in decision-making

	b_1	b_2	b_3	b_4	$\sum$	Critical value	
a_1	2.80	1.65	2.70	0.75	7.91		
a_2	5.25	3.10	5.07	1.41	14.82		
$\sum$	8.05	4.75	7.78	2.16	22.73	>	7.815

Source: own processing

We compared the calculated test characteristic with 95th percentile χ^2 of the division with (r - 1).(s - 1) = (2 – 1).(4 – 1) = 3 degrees of freedom, $\chi^2_{0.95}$ (3) = 7.815. Since the square contingency (22.73) exceeds the critical value, we can state that there is significant dependence between the crisis and the post-crisis period and the degree of participation in decision-making. The intensity of engaging employees from lower levels of management in the decision-making processes in companies is truly affected by the effects of the economic crisis.
At the significance level 0.05 there is statistically significant dependence between periods and degree of employee participation. The H_0 hypothesis is rejected.
   B) Assess the degree of intensity of the examined dependence using suitable measures.
   To assess the degree of contingency intensity we have used Pearson's correlation coefficient, Čupr contingency coefficient and Cramer's coefficient, so-called Cramer's V. Pearson's correlation coefficient:

$$C = \sqrt{\frac{\chi^2}{n+\chi^2}} \tag{1}$$

Čupr contingency coefficient:

$$\tau^2 = \frac{\phi^2}{\sqrt{(r-1).(s-1)}} \tag{2}$$

Cramer's coefficient, so-called Cramer's V:

$$V = \sqrt{\frac{\chi^2}{n.h}} \tag{3}$$

Pearson's correlation coefficient, Čupr contingency coefficient and Cramer's coefficient point to moderate dependency between the analyzed periods (crisis and post-crisis) and degree of engagement of lower units in decision-making. Our results are shown in Table 7.

Table 7. The degree of dependence on individual coefficients

Used coefficients	Values
C	0.4062
τ^2	0.3378
V	0.4446

Source: own processing

For the purpose of making the best decisions, companies have a relatively large number of methods at their disposal; from simple ones to the most complicated ones. In the next analysis we have focused on determining which decision-making methods and to what extent were used by our respondents during the monitored periods. To determine the required outputs, the respondents had 100% at their disposal for each monitored period, which they should divide among the decision-making methods. In Table 8, there are results of this analysis; the values are presented in percentages.

Table 8. Using the decision-making options during the monitored periods

	Pre-crisis period (until 2007)				Crisis period (2008-2011)				Post-crisis period (since. 2012)			
	Intuition, experience	Data analysis	Intuitive decision-making	Group decision-making	Intuition, experience	Data analysis	Intuitive decision-making	Group decision-making	Intuition, experience	Data analysis	Intuitive decision-making	Group decision-making
Ø	32.09	25.78	19.26	22.87	32.22	28.39	16.39	23.00	33.09	24.13	18.74	24.04
MODE	30.00	0.00	25.00	10.00	30.00	30.00	0.00	25.00	10.00	0.00	20.00	10.00
MAX	100.00	70.00	50.00	80.00	100.00	80.00	50.00	80.00	100.00	75.00	50.00	80.00
MIN	10.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00

Source: own processing

In choosing the decision-making method, the respondents chose empirically based methods, so they were relying on practical experience, knowledge, and intuition. The results of the questionnaires show that interest in these methods continues to grow despite the fact that surveys in the subject matter point to a decline in the importance of decision-making based on intuition and experience. The interest in quantitative methods (methods based on data analysis) was mainly during the crisis. Currently, we are monitoring a 4% drop of quantitative methods over the previous period.

In the processed results we can also notice that managers preferred group to individual decision-making during all monitored periods. Especially during the crisis period, managers found themselves in situations, when they needed to confront their opinions with the opinions of their co-workers. They were solving specific, unstructured, complex situations that required expertise from different disciplines. During the crisis, managers assigned 23% importance to group decision-making out of 100% and its importance continues to grow among managers.

Conclusion

In our paper we have presented research results on the impact of the economic crisis on managerial decision-making. We state that the crisis had a significant impact on decision-making and decision-making methods used by companies.

The results of our research are interesting and practical. We have discovered that during the crisis period managers were deciding in a group, encouraged fellowship in decision-making, and relied more on their intuition and experience rather than complicated decision-making methods.

Lack of relevant information was the main shortcoming during the crisis, which in the critics' opinion led to several risky decisions that led to the start of the economic crisis. Our respondents confirmed this statement also. The lack of information was felt especially during the crisis period. Currently, there are 50% more companies that are sufficiently informed to conduct quality decision-making processes.

Our research opens questions about deeper causations of our results that should be explained with further research.

Acknowledgement

References

[1] Bednár, R., Slávik, Š., Ljudvigová, I. 2013. *Popdpora startupov a ich inovačný potenciál*. In "Stratégie a podnikateľské modely v postindustriálnej ére podnikania". Vydavateľstvo EKONÓM, Bratislava, ISBN: 8022537594, 9788022537599, 198 pp.

[2] Chatti, M.A., Agustiawan, M.R., Jarke, M., and Specht, M., 2010. Toward a personal learning environment framework. *International Journal of Virtual and Personal Learning Environments*, 1(4): 66-85.

[3] Davenport, T., Harris, J., and Morison, J. 2010. *Analytics at Work: Smarter Decisions, Better Results*, Harvard Business Press, ISBN: 1422177696, 9781422177693, 214 pp., Available at: https://www.hbr.org/product/analytics-at-work-smarter-decisions-better-results/an/12167-KBK-ENG (accesed 08-06-2017)

[4] Deighton, A. 2014. *Data and Organizational Issues Reduce Confidence*. A Report by Harvard Business Review Analytic Services, Harvard Business Review. Available at: http://go.qlik.com/rs/qliktech/images/HBR_Report_Data_Confidence.PDF?sourceID1=mkto-2014-H1 (accesed 09-06-2017)

[5] Evers, M., Jonoski, A., Almoradie, A., and Lange, L. 2016. Collaborative decision making in sustainable flood risk management: A social-technical approach and tools for participatory governance. *Environmental Science & Policy,* 55(2): 335-344.

[6] Garcia Penalvo, F.J., and Conde, M.Á. 2014. Using informal learning for business decision making and knowledge management. *Journal of Business Research*, 67(5): 686-691.

[7] Janouch, V. 2012. *Managerial decision-making with the support of game theory*. IT Systems 3/2012, Business Intelligence, Available at: http://www.systemonline.cz/business-intelligence/manazerske-rozhodovani-s-podporou-teorie-her.htm (accesed 08-06-2017)

[8] Karatop, B., Kubat, C., and Uygun, O. 2015. Talent management in manufacturing system fuzzy logic approach. *Computers & Industrial Engineering,* 86(10): 127-136.

[9] Ljudvigová, I. 2017 Vertikálne a tímové vodcovstvo v startupoch Vertical and team leadership in startups. In "Ekonomika a Manažment: Vedecký časopis Fakulty podnikového manažmentu", Ekonomickej univerzity v Bratislave, Bratislava, Fakulta podnikového manažmentu Ekonomickej univerzity v Bratislave, *Economics and Management Scientific Journal of the Faculty of Business Management, University of Economics in Bratislava,* Volume XIV, (1): 52-63.

[10] Mankins, M.C., and Steele, R. 2006. Stop Making Plans, Start Making Decisions. *Harvard Business Review,* 84(1): 76-84

[11] Mariadoss, B.J., Johnson, J.Z. and Martin, K.D. 2014. Strategic intent and performance: The role of resource allocation decisions. *Journal of Business Research*, 67(11): 2393-2402.

[12] Pohanková, A. 2010. Motivation and decision-making process in managing chance within the organization. *Human Resources Management & Ergonomics*, 4(2): 1-9.

[13] Procházková, K., and Remeňová, K. 2014. *Rozhodovanie manažérov a ich vodcovský potenciál,* Bratislava: Vydavateľstvo EKONÓM, ISBN: 978-80-225-3968-5, 137 pp.

[14] Rogers, P., and Blenko, M.W. 2006. Who Has the D? How Clear Decision Roles Enhance Organizational Performance. *Harvard Business Review*, 83(1): 52-61.

[15] Sahlman, W.A. 2010. *Management and the financial crisis*, Harvard Bussines School, Working Paper 10-033. Available at: http://www.hbs.edu/faculty/Publication%20Files/10-033.pdf (accesed 08-06-2017)

[16] Spetzler, C., and Neal, L. 2015. *An Organization-Wide Approach to Good Decision-Making*, Harvard Business Review. Available at: https://hbr.org/2015/05/an-organization-wide-approach-to-good-decision-making

[17] Stiglitz, J., Akerlof G., Blanchard O., Romer, D. 2014. *What Have We Learned? Macroeconomic Policy after the Crisis*. London, The MIT Press, ISBN-10: 0262027348, 368 pp.

[18] Tarišková, N. 2013. *Balanced scorecard v riadení ľudských zdrojov: Praktikum*. Bratislava: Vydavateľstvo EKONÓM, ISBN: 978-80-225-3689-9, 195 pp.

[19] Valackiene, A. 2010. Efficient Corporate Communication: Decisions in Crisis Management. *Inzinerine Ekonomika-Engineering Economics*, 21(1): 52-61.

[20] Xiao, Y., Zhang, H., and Basandur, T.M. 2015. Does information sharing always improve team decision making? *Journal of Business Research*, 68(6): 1-9.

[21] Zagoršek, B., and Slávik, Š. 2017. How can strategy influence the internal nature of business model? *Journal of Applied Economic Sciences*, Volume, XII, Summer, 4(50): 1080-1090.

[22] Zarate, P. 2013. *Tools for Collaborative Decision-Making*, New York, Wiley, ISBN: 9781848215160, 128 pp.

*** PwC. 2014. Gut & gigabytes, PwC Global Data and Analytics Survey, Available at: http://www.pwccn.com/webmedia/doc/635489055506685975_big_data_report.pdf (accesed 08-06-2017)

Management of Intangible Assets' Potential at Oil Companies: Market Positioning, Place and Role of Business Reputation – Goodwill of Companies

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Abstract:

The article substantiates the necessity to revise basic trends in the intangible assets' potential management market of oil companies and their competitive positioning. In recent years, due to market competition for buyers, especially buyers of products of famous brands, and for innovative technologies, world companies invest a lot in creation and improvement of intangible assets. This implies the percentage growth of brand value in the total value of companies due to products and technologies upgrade. Note that in 2015 the world market, among the expected oil company market trends, showed a sharply rising interest in information and communication technologies. Nowadays, the growth of intangible assets' value of oil companies due to investments in the patent and license market, improvement of business reputation and reinforcement of brands is worthy of special attention. The case studies of Rosneft and TNK-BP formed the basis of this research.

Keywords: intangible assets; oil company intangible assets' marketing; brand; goodwill; licenses and other intangible assets.

Jel Classification: G12; M31; O13

Introduction

The intangible assets' market, on the one hand, is clear and almost defined, but its marketing processes require closer discussions and analysis. For example, production outsourcing gives opportunities for deeper management of the brand and other marketing functions. Within the market pressure period, it helps to reinforce the brand, if available, or to build the brand in the shortest possible time. The understanding of the importance of the intellectual capital potential management resulted in a special type of marketing – company intangible assets' marketing.

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The intangible assets' market means a complex of economic relations, where technologies, patents, know-how, licenses, brands, that is, company intangible assets, belong to purchase and sale objects. In this market, the sellers are companies having new technologies, famous trademarks, know-how, patents, *etc*., and the buyers are companies that desire to get certain intangible assets, which are sold in this market at a definite price.

1. Methods

In case of investments in intangible assets, the latter can create added value. Companies with a substantial share of intangible assets use up-to-date and expensive equipment, skilled labor; their goods are highly competitive and profiTab; these companies' profit is higher than industry average. All these facts positively result in a company's added value. Intangible assets are divided into separable from the company, that is, assets that can be sold separately (trade name, patents, licenses, etc.) and non-separable, which include goodwill. Intangible assets are an effective way for risk reduction and competitive growth. They are non-monetary assets, have no physical form and are included into capital assets (Panova and Danko 2017).

Examples of intangible assets are as follows: owners' trademark rights, that is, legal rights of manufacturers to produce the goods (Danko and Golubev 2013), business reputation of the organization, intellectual property, a patent owner's exclusive rights to inventions, industrial samples; exclusive copyright rights to computer programs, databases; property rights of authors or other rightholders to integrated circuit layout (Danko 2016). Intangible assets are often called the intellectual capital presenting the result of former investments, but at the same time future-oriented (Pankrukhin 2005).

With the Internet development, it is possible to win consumers by virtual methods. As a result, the brand is not only a product that a person sees and imagines, but at the same time it is a set of opinions suggested online.

We consider the management of intangible assets' potential as a set of recognizable intangible assets of a company, its brands, trademark attributes, including a name, a symbol, a sign, as well as feedback proved by emotional perception of the brand from standard communication methods and social networks and other Internet sources, which give an additional user value to the goods and (or) the company in the market. Being a constituent part of intangible assets in the company's balance sheet, goodwill is examined by the employer through the employees' vision of the company and its reputation, and at the same time through the goodwill parameter making the major part of the market value of the company. While studying the market of intangible assets, based on the fact that they are the source of added value consisting of product value and customer appeal of a product, it stands to mention their importance in the reinforcement of product value as a guarantee for the company's reputation and goodwill. The opportunity to form the loyalty of customers to this parameter of business reputation changes the competitiveness and the investment attractiveness of the company.

Intangible assets as intellectual property take part in creation of added value. Companies with a substantial intangible assets' share use up-to-date and expensive equipment, skilled labor; their goods are highly competitive and profiTab., the company's profit is higher than industry average. All these facts positively result in the company's added value (Ekimov, Bolvachev, Doknoyan, Danko and Zarova 2016). The object of financial management of intellectual property of the company is financial flows, connected with creation and commercialization of objects of exclusive rights, copyrighted or patented (Panova 2015). We think that the intangible assets' potential management is aimed at increasing the company's market value due to commercialization of objects of exclusive rights.

Based on the aim, we determine the tasks of the intangible assets' potential management:
- to choose the most efficient innovative project of the company (or the developer);
- to optimize financial sources to develop, legally protect (if objects of exclusive rights are created at the company) and to commercialize objects of exclusive rights;
- to analyze financial and marketing risks arising due to implementation of the chosen innovative project;
- to determine the synergetic effect from commercialization of intellectual property (Ivolgina 2015).

Goodwill defines the quality of intangible assets' potential management of the company.

Goodwill is an indicator of business reputation, competitiveness and investment attractiveness of a company. Goodwill can be positive and negative. Positive goodwill shows the net profit growth through the use of the company's intangible assets. Negative goodwill means that intangible assets are impaired at even greater rate as compared to the growth behavior of net profit made by intangible assets. International Financial Reporting Standard (IFRS) 38 rightfully requires intangible assets to be identified enabling to distinguish them from goodwill. IFRS 38 requirements provide for two main distinctions between intangible assets and goodwill: separation of intangible assets from the organization, for example, sales; besides, an intangible asset is to result from the contractual or any other legal rights. Assets that do not comply with these requirements can be referred to goodwill. Thus, IFRS 38 considers that it is impossible to identify goodwill individually, as well as to separate it from business.

More than 83 countries reporting according to IFRS show goodwill as per IFRS 3 "Business Combinations" that has replaced (International Accounting Standard) IAS 22 "Accounting for Business Combinations" since March 31, 2004. The title of IFRS 3 shows that goodwill is considered with regard to business combinations. IFRS 3 has a broader sense as it considers goodwill in the context of business sales or purchase return. Goodwill indicating the return to intangible assets plays an important role in forming the synergetic effect from transactions in the merger and acquisition market. It is known that the synergetic effect can result from the income growth, cost reduction, implementation of new technologies and financial savings at raising external capital (Ivolgina 2015).

In the Russian Federation goodwill is calculated as an intangible asset according to (Russian Accounting Standard) RAS 14/2007. In RAS 14, one of the paragraphs on recognizing an object as an intangible asset stipulates for its possible identification. The difference between IFRS 38 and RAS 14 is that in RAS 14 object identification is qualified as "possible". In IFRS, an object is to be necessarily identified; otherwise, it will not be qualified as "an intangible asset". Goodwill amortization is another important issue. For a long period, most countries have amortized goodwill. But the definition of the amortization period is a complex and subjective process drawing criticism. In such countries as Spain, Italy, and the Netherlands, the amortization period averaged 5-10 years. In Sweden it could be up to 40 years. There is a modern method of goodwill accounting, where goodwill is not amortized, but tested for impairment according to IAS 36 "Impairment of Assets" yearly or more often. Yearly testing is obligatory irrespective of available impairment indicators. According to IAS 36, cash-generating unit (CGU) testing of goodwill is determined as a difference between replacement cost of the acquired goodwill and its balance value. The replacement cost of the acquired goodwill equals to an asset fair value minus selling expenses and its usage value. A fair asset value is a net current value, and a goodwill usage value is a capitalized value of current net profit or future profit value.

It is challenging to define the replacement cost of the purchased goodwill. It is impossible to determine goodwill replacement cost as goodwill is non-separable from the organization and is connected with other assets. Thus, IAS 36 introduced such notion as CGU. This notion includes appropriation of intangible assets that are able to generate a cash flow irrespective of other assets. Generating unit can be a part of business or the whole business. Goodwill is tested based on appropriated units. Testing has not changed its basis and is performed in compliance with the above-mentioned material. The changes have only affected goodwill replacement cost that is calculated based on the group of appropriated assets included in CGU. If goodwill testing shows that the unit replacement cost is higher than the balance value, goodwill impairment will not be recognized. If the unit balance value is higher than the replacement cost, the company recognizes losses that are allocated pro rata to balance value of all assets, included into the CGU group. In the Russian Federation, according to RAS 14/2007, the business reputation is amortized within twenty years. Amortization charges on positive business reputation are calculated by the straight-line method, because it is rather difficult to apply other methods. Negative business reputation refers to financial results of the company as other income and expense.

There are quite a lot of goodwill evaluation methods. But experience has proven that the surplus profit method is used to evaluate goodwill in majority cases. Foreign literature contains another title for the surplus profit method – the "treasury" method. For the first time this method was used in the Memorandum of the US Department of the Treasury to calculate the goodwill as a difference in the cost that was found by the alcohol producer during the National Prohibition Act in 1920. In this case, goodwill is calculated as the net profit from intangible assets use capitalized by the evaluation date. Income and profit indicators of the company (assets, capital) make the basis for calculations as compared to industry average (Danko, Panova, Kazaryan, Kazaryan, and Sekerin 2017).

Intangible assets are divided into separable from the company, that is, assets that can be sold separately (trade name, patents, licenses, *etc.*), and non-separable, which include goodwill. Intangible assets are an effective way for risk reduction and competitive growth. They are non-monetary assets, have no physical form and are included into capital assets (Varlamov, Kostin, Mamedov, Omarov, Belyaev, Danko, and Sekerin 2016).

2. Results

The authors studied the intangible assets' share in the company balance sheet according to consolidated financial statements (Tsenina, Danko, Ekimova, Sekerin, and Gorohova 2016). Evidences from the oil merger and acquisition market were taken for the study, namely, the difference between Rosneft and British Petroleum transactions, 2016 vs. 2012.

In 2012-2013, the major transaction of the Russian company was the acquisition of TNK-BP by Rosneft. On March 22, 2013, the Directorate-General for Competition approved the merger of Rosneft and TNK-BP by purchasing 50% shares in ARR at USD 27.73 bln. and 50% shares in BP at USD 16.65 bln., paid in cash and 12.84% of Rosneft shares.

You may find bellow the bond structure resulting from the transaction. USD 14.2 bln. was obtained as credit facilities from the group of international banks to finance purchasing of ARR share, and USD 16.8 bln. was British Petroleum share. The following transactions were also made: pre-export financing for USD 10 bln. and bond distribution for USD 3 bln. (Figure 1).

Figure 1. Sources of financing TNK-BP acquisition (OAO Rosneft 2012)
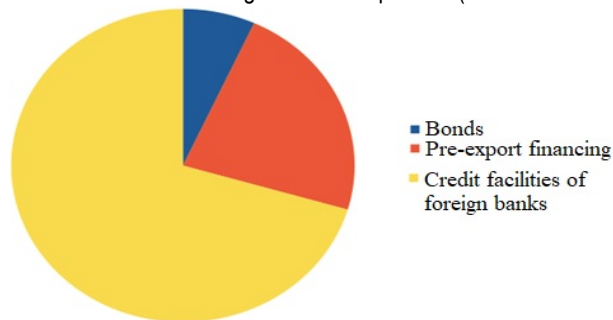
TNK-BP quarterly performance is shown in Table 1.

Table 1. Distribution of TNK-BP aggregate value, 2013, USD mln.

Indicator	2013
Goodwill	
Intangible assets	733.3
Acquisition cost	44,000.0

In July 2013, Rosneft closed the transaction on purchasing the retained 49% of Itera shares. The transaction amounted to USD 2.9 bln (Table 2).

Table 2. Distribution of Itera aggregate value, USD mln.

Indicator, USD mln.	2013
Goodwill	244.4
Intangible assets	
Acquisition cost	2,900.0

In mid-2014, it was reported on the transaction on purchasing controlling shares in eight companies of Weatherford International Plc., involved in well drilling and servicing both in Russia and Venezuela. Such acquisition amounted to RUB 18 bln. or app. USD 400 mln. (Table 3)

Table 3. Distribution of Weatherford aggregate value, 2014, USD mln.

Indicator, USD mln.	2014
Goodwill	
Intangible assets	
Acquisition cost	500.00

On October 10, 2016, the Government signed a Decree, according to which 50.075% of state-owned stake of Bashneft was sold to Rosneft at RUB 329.7 bln., that is, app. USD 5.3 bln (Table 4).

Table 4. Distribution of Bashneft aggregate value, 2015, USD mln.

Indicator, USD mln.	2015
Goodwill	
Intangible assets	51.8
Acquisition cost	5,300.0

Here are the British Petroleum major transactions (2012-2016). In mid-2012, BP announced its intentions to sell the TNK-BP share. British Petroleum got the 18.5% share package of Rosneft and app. USD 12.5 bln (Table 5).

Table 5. Rosneft performance, 2012-2013, USD mln.

Indicator, USD mln.	2013
Goodwill	6,416
Intangible assets	1,069

A contract for sale of 20% shares in Taas-Yuryakh Neftegazdobycha by the Russian British Petroleum was signed in June 2015 (Table 6).

Table 6. Performance of Taas-Yuryakh Neftegazdobycha, Russian British Petroleum, 2014-2015, USD mln.

Indicator, USD mln.	2013
Goodwill	531.25
Intangible assets	
Acquisition cost	3,139.00

3. Discussion

The factor analysis showed a trend of the major dependency of return *on* equity (ROE) on return *on* revenue (ROR) for the Russian company and financial leverage for the British analogue. But nowadays business reputation and intangible assets become more and more popular, the synergetic effect from mergers and acquisitions inclusive. Business reputation and intangible assets behavior are presented in the Table 7, 8 and 9 and the Figure 2 and 3.

Table 7. Business reputation behavior, USD mln.

	2013	2014	2015	2016
Rosneft	6,416.3	3,821.65	3,155.75	3,791.82
BP	12,181.0	11,868.00	11,627.00	11,194.00

Table 8. Intangible assets' behavior, USD mln.

	2013	2014	2015	2016
Rosneft	1,069.4	871	658.6	972.7
BP	22,039.0	20,384	18,836.6	18,183.0

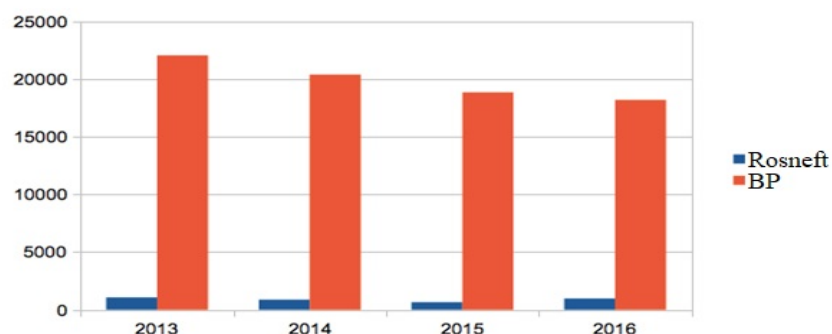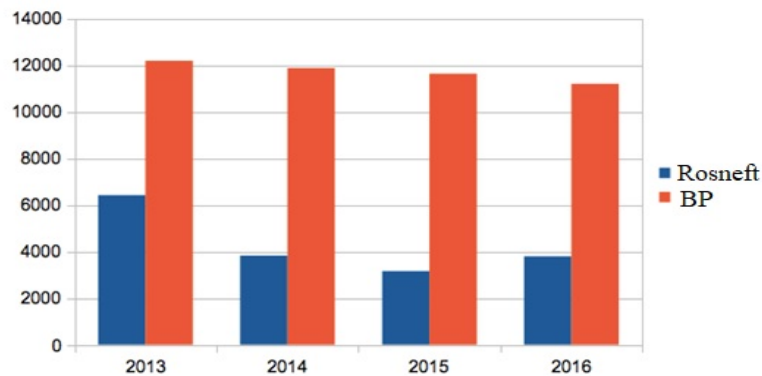Figure 2. Intangible assets' behavior in 2013-2016, Rosneft and British Petroleum, USD mln.

Table 9. Business reputation and intangible assets' behavior, Rosneft, RUB bln.

	2013	2014	2015	2016
Business reputation	210	215	230	230
Intangible assets	35	49	48	59

Figure 3. Business reputation behavior in 2013-2016, Rosneft and British Petroleum, USD mln.

The intangible assets' structure has a well-marked difference. Two oil and gas companies have conceptually different policy in terms of intangible assets.

As for the business reputation, although the goodwill indicator of the British company is two times more than the local one, it stands to mention differently directed trend. Thus, for the last 4 years the goodwill indicator of BP has been decreasing, and that of Rosneft has been growing in ruble equivalent. The decline in the diagram can be explained by the raise in USD.

Conclusion

Thus, we have made the competitive evaluation and performed the marketing-financial monitoring of value positioning of oil companies in terms of intangible assets (Kitova, Kolmakov, Dyakonova, Grishina, Danko, and Sekerin 2016). Rosneft's share of intangible assets is not large. Please note that the crisis of 2014-2015 affected the consumers' demand, the companies under research inclusive: consumers began to analyze their costs and to choose companies with good performance and accepTab. prices. So, the quality of services becomes a topical issue. The reinforcement and growth of intangible assets enabled these companies to raise the profit, to strengthen the leading positions (Panova 2014), sustainability, shares inclusive, and to increase the brand value in global ratings. Tangible products are transferred into the intangible aspect. In the era of globalization, the increasing urgency of political, economic and ecological situation, the consumers' choice is increasingly determined by the brand, which is an intangible asset of the company (Danko, Ekimova, Bolvachev, Zarova, Shemetkova, Solovyova, and Sekerin 2016).

The role of rating agency evaluation grows; the brands struggle. And thus, business attitude changes from "produce and sell" towards "feel and react". Company's value increasingly depends on intangible assets, among which the reputation holds a prominent place influencing company's market stability. It should be noted that intangible assets (the business reputation in value terms is shown through intangible assets or separately as goodwill) of all leading companies have a substantial ratio in company's balance sheet (Varlamov, Kostin, Mamedov, Omarov, Belyaev, Danko, and Sekerin 2016). So, if company aims at being among the best world companies, it should pay attention to both product manufacturing and creation of intangible assets, which will make an essential part of company's value in the world market in future.

At the moment, the existing reporting does not show the depth of the intangible assets' market, while we have found out that the main part of intangible assets belongs to the reputation, trademark exclusive rights, licenses and patent holder's rights to invention.

The awareness of intangible assets' value and their competent utilization can strengthen company's market positioning and protect it during crisis to some extent, because intangible assets do not burn within a crisis period. Besides, innovations, a large number of patents, licenses, that is, intangible assets, mean that production is highly technological, and, thus, the quality of products and labor efficiency are high.

References

[1] Danko, T.P. 2015. *Upravlenie marketingom: Uchebnik i praktikum dlya bakalavriata i magistratury* [Marketing Management: Textbook and Manual for Bachelor's and Master's Programs] (4th Edition, revised and enlarged). Moscow: Urait, ISBN-10: 5991678510

[2] Danko, T.P., and Golubev, M.P. 2013. *Menedzhment i marketing, orientirovannyi na stoimost: uchebnik* [Management and Marketing, Focused on Cost: Textbook]. Moscow: INFRA-M, 416 pp.

[3] Danko, T.P., Ekimova, K.V., Bolvachev, A.I., Zarova, E.V., Shemetkova, O.L., Solovyova, M.G., and Sekerin, V.D. 2016. Assessment of the Competitive Potential of the Region through an Integrated System of Rating Positioning. *Global Journal of Pure and Applied Mathematics, 6*: 2361-2367.

[4] Danko, T.P., Panova, E.A., Kazaryan, M.A., Kazaryan, A.A., and Sekerin, V.D. 2017. Competitive Estimating of Value Positioning of the Intangible Assets Market. *International Journal of Applied Business and Economic Research,* 15(8): 141-151

[5] Ekimova, K.V., Bolvachev, A.I., Doknoyan, Z.M., Danko, T.P., and Zarova, E.V. 2016. Improvement of the Methods for Assessing the Value of Diversified Companies in View of Modification of the Herfindahl-Hirschman Model. *Journal of Internet Banking and Commerce,* 21(S4): 14

[6] Ivolgina, N.V. 2015. Finansovye aspekty upravleniya intellektualnoi sobstvennostyu [Financial Aspects of Intellectual Property Management]. *Pravo intellektualnoi sobstvennosti,* 5: 33-37.

[7] Ivolgina, N.V. 2015. Protsess sliyaniya i pogloshcheniya kompanii kak instrument povysheniya ikh rynochnoi stoimosti [The Process of Mergers and Acquisitions of Companies as a Tool to Enhance Their Market Value]. *Problemy ekonomiki i yuridicheskoi praktiki,* 2: 216-218.

[8] Kitova, O.V., Kolmakov, I.B., Dyakonova, L.P., Grishina, O.A., Danko, T.P, and Sekerin, V.D. 2016. Hybrid Intelligent System of Forecasting of the Socio-Economic Development of the Country]. *International Journal of Applied Business AND Economic Research,* 14(9): 5755-5766.

[9] Pankrukhin, A.P. 2005. *Marketing* [Marketing] (3rd Ed.). Moscow: Omega-L, 656 pp.

[10] Panova, E.A. 2014. Comparative Analysis of the World's Leading Brands of Companies. *Journal of Audit and Financial Analysis,* 5: 242-251

[11] Panova, E.A. 2015. Teoretiko-metodologicheskoe obosnovanie formirovaniya rynka nematerialnykh aktivov [Theoretical and Methodological Basis of Intangible Assets' Market Formation]. *Marketing v Rossii i za rubezhom,* 5: 3-11

[12] Panova, E.A., and Danko, T.P. 2017. *Marketingovyi podkhod k otsenke vliyaniya nematerialnykh aktivov na stoimost kompanii* [Marketing Approach to Evaluation of Intangible Assets' Effect on Company Value]. Moscow: Dashkov & Co., 215 pp.

[13] Tsenina, E.V, Danko, T.P., Ekimova, K.V., Sekerin, V.D., and Gorohova, A.E. 2016. Indication of Competitiveness of the Potential of the Region through Hurwitz and Wald Criteria. *Global Journal of Pure and Applied Mathematics,* 12(1): 325-335.

[14] Varlamov, V., Kostin, A.V., Mamedov, R.A., Omarov, R.B., Belyaev, D.P., Danko, T.P., and Sekerin, V.D. 2016. Modeling a New Approach to the Management of the Effective Economic System Development in the Transition to the Sixth Technological Order. *International Journal of Economic Research,* 13(8): 3583-3591.

*** OAO Rosneft. 2012. *Godovoi otchet* [Annual Report]. Moscow, 17 pp.

Indication of the Influence of Motivational Significance of Values Underlying Young Consumers' Preferences for Basic Consumer Products

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Abstract:

Young people are an important part of the modern consumer market and make up just under a quarter of the world's population. In marketing, there continues a search for tools aimed at using "higher-level values" as motivational factors. In this study, the authors focused on the possibility of indicating the motivational significance of young consumers' value orientations.

The purpose of the study was to develop a methodology for calculating the indicator of value trends for the youth student audience. The conducted research should be referred to search-based marketing research. The sample accepted for processing was made up of 233 questionnaires. The sample was formed with the use of the "snowball" method from undergraduate students of the first year of studies. The research was carried out with the use of the on-line survey method on the basis of a structured questionnaire.

The following categories were used as marker products: "Mobile phone or smartphone", "Tablet / laptop", "Everyday clothes", "Footwear for everyday wear", "Cool drinks and juices", "Snacks and chocolate bars", "Mobile services and the Internet in the home region". The study was carried out with the use of frequency analysis, ρ-Spearman's rank correlation indices (ρ), as well as Gatev's methods of analyzing structural shifts. The volume and structure of the sample correspond to the search-based character of marketing research, which characterizes a small sample size. There was no stratification or quota allocation. Gender and social representativeness were not supposed to be covered in the study. The results of the search-based study make it possible to conduct further research with a statistically significant result on the basis of the approved methodology. The study confirmed the absence in the studied audience of significant gender differences in the influence of higher-level values. The obtained results confirm that there are significant differences between the influence of "higher-level values", as guiding life principles and their impact, as a motivational factor in the choice of marker products.

The results obtained in the study made it possible to propose a methodology for indicating the motivational significance of young consumers' value orientations. Analyzing the dynamics of the motivational influence of "higher-level values" will allow companies to use it as a basis for positioning goods and services, and developing marketing communications targeted at the youth audience.

Keywords: young consumers; consumer values; gender differences; activity reference point; Schwartz's human values; Plekhanov's indicator

JEL Classification: M30; M31; D11; D12

Introduction

This study explores the presence of gender differences that affect the value orientations of young consumers belonging to the student audience and the correspondence of these values to their "consumer values (preferences)". The use of the system of human values system according to Schwartz (1994b) and the concept of

value in marketing (Kotler *et al.* 2010) are the basic premises of the study. The research methodology allows the authors not to analyze the whole "system of values" and "sub-values", as activity reference points and is aimed at studying the relationship between the higher-level values (HLV) and consumer behavior in the choice of certain marker products.

The obtained results made it possible to identify the absence of significant gender differences in the influence of higher-level values on the motivation of young consumers. This allows the use of communication marketing tools based on HLV, without gender division of the student audience. At the same time, significant structural differences were revealed between the influence of higher-level values, as the guiding life principles of the student audience, and their impact as a motivational factor in analyzing their preferences for marker products. Analysis of the results shows the need to take into account the differences between values declared by the student audience and their consumer preferences in order to manage communications based on HLV.

Based on the obtained results, the authors proposed Plekhanov's indicator, built on the results of wave research, which is supposed to show the dynamics of the motivational significance of HLV in choosing the selected marker products.

Structurally, this work consists of several sections. The section following the introduction shows the place of this research among the works studying and describing the influence of values on consumer preferences. This is followed by a description of the data and the methods used in the study. After that, the results of the analysis are presented, as part of the discussion in the context of previous studies. The final part contains conclusions and proposals.

1. Background of the Research

Young people are an important part of the modern consumer market and make up just under a quarter of the world's population. Considering the global structure of the youth segment, it should be noted that, according to the United Nations Population Fund (UNFPA), almost nine out of ten young people in the world live in less developed countries (Narodonaselenie mira 2015). The largest number of young people live in India, China and Indonesia. As for the developed countries of the European Union (EU) and the United States, the share of young consumers is also significant. The proportion of youth aged 15-29 is 18% of the male population of the EU, and 17% of the female population. (Molodezh SNG, demograficheskij portret 2017). According to the United Nations Population Fund (UNFPA), a quarter of the population of the United States of America (USA) is also made up of young people (Narodonaselenie mira 2015).

In Russia, the age group from 15 to 29 is referred to as the youth by Federal State Statistics Service. The share of this age group in 2015 was 19.7% of the total population of Russia.

In their work, the authors are guided by the provisions, existing in the studies, which consist in viewing the student youth as the most active youth group influencing the consumer behavior of the entire youth audience (Sergeev 2010).

The abovementioned allowed the authors to propose the possibility of using the results of studying the relationship between the changes in the student audience's value orientations and consumer preferences as indicators of the motivational influence of HLV.

In the study carried out by Skorobogatykh (Skorobogatykh *et al.* 2016), a conceptual marketing model linking value orientations (as an activity reference point) and consumer preferences was proposed. Analyzing the results of this study, the authors consider it necessary to separate the concepts of value preferences and consumer choice. The consumer choice is greatly influenced by situational factors, including marketing decisions of companies. In turn, value preferences are of a deeper motivational nature.

When studying the issue of the student audience's values and consumer preferences, the authors rely on analysis of the studies reflecting a marketing approach to consumer behavior (Kotler *et al.* 2010, Sidorchuk 2015). In this context, consumption is characterized by profound changes in the ratio between the rational and the irrational in consumer behavior, when there occurs a certain substitution of the material content of goods and services for their symbolic values that are created by the consumer's cultural context and form the cultural space around them (Bourdieu 1987). In turn, the irrational behavior requires the application of specific marketing tools, for example, those aimed at the use of deeper consumer motivation.

The authors associate this deep motivation with the category of "value", which is understood as "Human Values" (Schwartz 1994b) in this study based on the concepts of the marketing theory formulated by Kotler *et al.* (2010). The structure of higher-level values and "sub-values" (values of a lower level than higher-level values) was viewed as a complex hierarchical model of "Human Values", based on the existing approaches to the theory of values (Rokeach 1973, Schwartz 1992, 1994a, 1994b, 2005, 2012, 2014). The proposed research methodology

presupposes studying the motivational influence of Schwartz's higher-level values (2005) on consumer preferences, considering the whole hierarchy of "subvalues" and the links between "Human Values" as a "black box" area of consumer values. The obtained results made it possible to determine the order of value reference points that are important for young consumers based on ranking the significance of the higher-level value influence on consumer preferences for the products-markers. The marker products used by the authors were initially specified in the study carried out by Skorobogatykh *et al.* with reference to the student youth audience (2016): "Mobile phone or smartphone", "Tablet/laptop", "Everyday clothes", "Footwear for everyday wear", "Cool drinks and juices", "Snacks and chocolate bars", "Mobile services and the Internet in the home region".

The empirical part of the study was built on the basis of methodologies accepted in marketing (Malhotra and Birks 2007): a survey, a comparative analysis of data, *etc*. The respondents were chosen on the basis of the "snowball" method, with the restrictions of age and year of studies (only first year students studying for the bachelor's degree). The indicated restrictions are related to the need for unambiguous interpretation by the respondents of the semantic constructions describing the higher-level values. As survey tools, Schwartz's (Schwartz 2005) questionnaires were used and the analysis of values was carried out according to marker products. The study was conducted on the basis of an online survey. The obtained results were processed with the help of IBM SPSS 20 software using frequency analysis, ρ-Spearman's rank-correlation indices, as well as the method of analyzing Gatev's structural shifts. The conducted research had multiple objectives, and one of its aspects is presented in this article. As a result of the study, a methodology was proposed for calculating "Plekhanov's index of value motivation" as an indicator of the HLV influence on the youth student audience's consumer behavior.

The novelty of the study is predetermined by obtaining the data on the absence of significant gender differences in the influence of HLV and the existence of significant differences between the influence of HLV as the student audience's guiding life principles, and their impact as a motivational factor (HLVm) in their preferences for marker products.

The aim of the study is to develop a methodology for calculating the indicator of value trends for the youth student audience. Objectives of the study:

- to determine the degree (level) to which the student youth audience's higher-level values are expressed as their guiding life principles;
- to assess the degree of interrelation between the basic values (the level of collinearity) and the possibility of using them as a "coordinate system" for measuring the youth audience's consumer preferences;
- to assess the level of influence exerted by higher-level values, as the youth audience's motivational preferences for the studied marker products;
- to build an indicator of consumer preferences based on the chosen marker products.

In the process of achieving the set objectives, the authors considered the possibility of confirming or refuting the following hypotheses:

(H1) There are no significant gender differences in the influence of higher-level values possessed by the studied youth audience.

(H2) There are significant structural differences between the influence of the higher-level values as the guiding life principles, and their influence as a motivational factor in the choice of marker products.

2. Literature Review

2.1. Values and Consumer Preferences

The influence of values on consumer choice is widely described in the literature. In particular, in the study done by Parsons (1951b), based on the results of studying the mechanism of young audience's value orientation in society, the author concludes that: "the combination of motivational processes in question must be conceived as a set of processes of action in roles which, on the basis of known facts about motivational process, analytical and empirical, tend to bring about a certain result, in the present case the internalization of certain patterns of value- orientation. This result is conceived to be the outcome of certain processes of interaction in roles" and "In Values, Motives and Systems of Action five cathectic-evaluative mechanisms of learning were distinguished and systemically related to one another". This, on the one hand, emphasizes the special role of a person's individual system of values in the field of motivating their actions, and, on the other hand, allows one to consider value as an independent mechanism of the decision-making system. Rohan (2000) also stresses that "Used as a verb, value refers to the process of ascertaining the merit of an entity with reference to an abstract value system structure. Used as a noun, value refers to the result of this process. These value judgments may be formed or amended when people encounter

new entities or existing judgments are challenged". Thus, he reveals the possibility of treating value representations as a complex structure, which is subject to study and analysis.

Schwartz (2005, 35) points out that "The values theory provides a framework for relating the system of ten values to behavior that enriches analysis, prediction, and explanation of value-behavior relations", which allows marketers to adapt and make decisions that are appropriate for the target audience.

Babin, B. and Babin, L. (2001), emphasize that "increased intentions are associated with hedonic value through an increased desire for stay and continue gratification", thereby explaining the relationship between intention and a concrete value (sensual pleasure). Similar conclusions are used in marketing for understanding and anticipating motivational attitudes.

It should be noted that the cultural aspect has a direct impact on the formation and hierarchy of a person's values. In particular, Schwartz (2014) points out the influence of institutional and other external factors on the formation of individual values: "The institutional policies and practices that the underlying societal culture promotes, inhibits, or justifies also influence the opportunities available to enact various behaviors and the payoffs for enacting them. The culture affects opportunities to express dissent, to cooperate with strangers, to innovate, and to amass wealth, for example".

In turn, in marketing it is important to evaluate the influence of values in order to understand and anticipate motivational attitudes of consumer preferences. Thus, the study of the influence of attributes, as utilitarian aspects of consumer decision-making, based on the example of the municipal transport system (Sidorchuk, Efimova, Lopatinskaya and Kaderova 2015), leads the authors to the need to search for deeper motivational reasons that determine consumer behavior.

Following the study of how cultural values influence tobacco consumption in 25 countries, Hassan and Shiu, the authors of another study (2015), conclude that there is a relationship between values and the consumption of a product: "findings highlight that cultural value dimensions play an important role in strengthening or dampening individual drivers of quit intentions" (Hassanand Shiu 2015, 7). However, this study is of a general nature, in view of the lack of research into the consumer supply of cigarettes and the conclusions that "However, policy makers and legislators need to understand the role of the cultural context in facilitating or inhibiting smoking cessation" (Hassan and Shiu 2015, 7).

Kansra (2014) gives the following description of the connection between values and attributes of a product: "When consumers form an attitude toward the product they make evaluative associations between the product and its attributes. Some of those attributes may be utilitarian such as durability or comfort, or hedonic such as color, fashion ability or styling". Here the author emphasizes the connection between the value of hedonism with the attributes of the product. The value of hedonism is most often in the center of researchers' attention. For example, in the study done by Noh, Runyan and Mosier (2014), based on an online survey, the connection between innovative thinking and the young audience's value of hedonism was established, as well as the connection between the choice of fashionable clothes and the influence of income level on this choice. But the authors did not study how much other values affect consumer preferences.

A number of studies are devoted to the research into specific consumer behavior of young consumers. In the study done by Sharma, Sivakumaran and Marshall (2014), the authors give the results of studying the influence of impulsiveness and young consumers' "ability to stay in control of their emotions" on the purchase of various products (travel, food, entertainment, *etc.*) In their article, Benbassat and Shulman (2016) study parents' influence on the consumer opinion of "young adults aged 18 - 22". Various specific features of the acquisition of goods and services have also been studied in a number of works (Wang and Chui 2016, Aschemann-Witzel and Niebuhr 2014, Sogari *et al.* 2015). At the same time, in the studies mentioned above, the motivational significance of values and its influence were not considered or studied.

There are works devoted to the study of the connection between values and consumer preferences. The study done by Pimenta and Piato (2016), gives the results of a qualitative analysis aiming "to highlight the perceptions that characterize the behavior of new-car consumers, while identifying cognitive relationships between vehicle attributes and personal values". Researchers conducted 60 in-depth interviews and identified 36 "sub-values", separately comparing them with the utilitarian characteristics of sports cars and conventional cars. It should be emphasized that researchers use the concept of saturation "The saturation was reached about the 50-th interview. After it, ten additional interviews were conducted in order to reinforce an adequate level of saturation" (Pimenta and Piato 2016), rather than a sample, thereby emphasizing that the study is of a qualitative character. It should be noted that the methodology of qualitative research excludes the detection of statistically significant dependencies and correlations, and does not allow extrapolating the results to the entire population.

Quantitative studies of the youth audience, based on Schwartz' value theory, are carried out in the category of healthy beverages and are presented by Lee *et al.* (2014). Researchers adapt the formulations of semantic constructions that describe values, based on the cultural characteristics of China's population. They use the terminology of a specific product "The values were interpreted and defined with respect to this study. This value interpretation is proposed to explain the concepts of value that are relevant to Chinese consumers in terms of food consumption decisions" (Lee *et al.* 2014). An analysis of this work shows that it does not have a complex character either in establishing the connection between the hierarchy of values and consumer choice.

2.2. Value Indicators of Consumer Preferences

In addition to investigating the relationship between values and consumer preferences, an important task of this study should be the opportunity to develop an indicator that makes it possible to identify structural changes in the value system.

For the purposes of marketing, various indicators have been developed, but the indices that take into account consumer behavior patterns are closest to the aim of this study. *For example*, TGI - Target group index (Kantar media 2016), reflects the consumption of the main product groups and the psychographic profile of consumers. Special software, which is attached to the report, makes it possible to calculate the index for different age groups, including the youth audience (Cairns 2007).

Another TNS Worldpanel index is based on panel studies in 60 countries of the world. It studies the behavior of consumers at markets of everyday goods, impulse goods, fashion and children's goods (Sharp 2007).

Nielsen conducts research in 106 countries around the world into actual sales of everyday products and complements it with information from household research panels. On this basis, the index of preference for brands of certain goods is formed (Lichtman-Sadot 2016, Vickner 2016). The considered indices describe the product and brand preferences of consumers and allow monitoring the dynamics of their changes. They reflect the utilitarian and marketing factors of influence, but do not give an answer to the question of the motivational influence of consumers' value hierarchy on their choice.

The World Values Survey (WVSA 2017) should be emphasized; it is a system for indexing the values of residents of different countries. Despite the fact that this index is closest to the aims of this study, the authors argue that it reflects the declarative character of the respondents' values. The research methodology does not provide for linking the identified values to specific consumer preferences, which, as the authors consider, can only be done in relation to specific marker products, as suggested by Skorobogatykh *et al.* (2016).

Summarizing the review of the literature, it should be noted that the studies discussed above do not form an integrated approach to studying the influence of value hierarchy on consumer preferences.

3. Data and Method

The research methodology is based on the provisions of the classical approach to marketing research described in the literature (Malhotra and Birks 2007). The study included the solution of several research problems, one of which is described in this article. The study was conducted in Moscow between June and October 2016.

For this study, the selection unit was the first-year students of all faculties of the Russian University of Economics. The total aggregate of the study of 2797 first-year students is considered by the authors to be a "small aggregate". During the processing, the authors took into account the confidence interval for the sample of 5.4% and the confidence probability of 90%, which corresponds to the approaches accepted in the practice of marketing research in case of search-based studies. The descriptive nature of the study is related to the stated goal of the work, *i.e.* developing a methodology for calculating the indicator of the youth student audience's value trends.

The plan for the empirical part of the study consists of several stages:
▪ the definition of information research indicators on the basis of the hypotheses put forward;
▪ the development of a measurement methodology, the selection of scales and the development of a survey questionnaire;
▪ the development of selection criteria for respondents and the sample size;
▪ the choice of methods for conducting a survey, a survey of respondents and subsequent processing of the results.

A conceptual model for estimating the connection between value orientations and consumer preferences, as well as the product categories that the authors considered to be markers, have been described previously (Sidorchuk 2015, Skorobogatykh *et al.* 2016). The main information indicators of the study are the demographic and social characteristics of the respondents. The questionnaire consisted of 4 sections. The second and third sections of the questionnaire were built on the basis of Schwartz's value survey (SVS) and Portrait values

questionnaire (PVQ) (Schwartz 2005). The questionnaire also contained a qualification section describing respondents and a block containing a table with 10 rows across (Schwartz's top-level values) and 7 rows down (categories of marker products), in which respondents were asked to mark the values that were of the greatest importance in yes/no format for each product category.

The method of selecting respondents was "a snowball" method. The selection took place through the communication channels of the university student associations (personal emails) and the groups of first-year students of Plekhanov Russian University of Economics (all faculties and branches in Russia) in the social network Vkontakte, which is the largest social network in Russia and CIS countries. Using social media in marketing is described by Kick (2015). This approach acted simultaneously as a tool for assessing external validity, *i.e.* compliance with the sample of the "generation" aged 17-22. The unity of understanding the semantic constructions, according to the authors, is achieved by limiting the sample to the first year students, which makes it possible to refer them to one "generation". The survey was voluntary and unpaid. Data on the survey participants' personification were not collected during the survey. To describe the respondents, the following types of data were collected: age, region of residence before entering the university, financial situation, hobby, format of residence (in a hostel, with parents or independently), financial dependence on parents, presence of a job, marital status (married) and hobby. Data on pair correlation of the sample characteristics are given in the Appendix (Table A).

In order to test the questionnaire, a preliminary survey of 25 respondents was conducted. Based on the results of the testing, an on-line survey was chosen to simplify the work with the questionnaire and increase the respondents' motivation. The questionnaire was posted on a special Google Forms service. The use of the service is described in the literature (Chen *et al.* 2017). As a result of the survey, 240 questionnaires were received, of which 233 were accepted for further processing on the basis of the eligibility criteria, i.e. in which the respondents were first year students.

The limitations of the study are caused by a number of factors. Firstly, the students of Plekhanov Russian University of Economics, who are enrolled in the first year of the bachelor's degree, were assumed as the general population of the studied audience. Secondly, there was no provision for gender or social representation in the study. Thirdly, no quotas were introduced for the place of study (Moscow or branches in other cities) or the faculties for the students of the Russian University of Economics.

4. Results

The analytical basis for the results of the study was represented by average sample figures characterizing the degree to which the higher-level values (HVL) are expressed as guiding life principles and as motivational factors in the choice of marker products.

Determining the degree to which the student youth audience's higher-level values (HVL) are expressed as guiding life principles. The basis of the sample at this stage was represented by the results of the respondents' answers to the second and third sections of the questionnaire. First, the indicators showing the expression of the higher-level values were determined as the average figures indicating the respondents' assessment of the level of using each HLV as the guiding life principle. The average values were calculated as the sum of the respondents' scores (points) for this value divided by the sample size. The results are shown in Figure 1. The standard error of the mean does not exceed 0.2.

As can be seen from Figure 1, such values as collectivism, autonomy and hedonism have the highest degree of expression among the youth student audience. Assessing the degree of connection between the basic values (the level of collinearity) and the possibility of using them as a "system of coordinates" for measuring consumer preferences of the student youth audience

When processing the survey data, the independence of HLV was checked. For this purpose, a nonparametric correlation analysis of the HVL components was carried out. As a result, a matrix, 10X10 by size, of ρ-Spearman's pair correlation indices was obtained, between components of HLV (Appendix, Table B). Analysis of the matrix showed that the values of the correlation coefficients do not exceed 0.5, which indicates the absence of a significant connection between the analyzed higher-level values. Consequently, the components of Schwartz's HLV can be regarded as independent and used in marketing research of the student audience in order to identify its value orientations and determine the influence of these values on consumer behavior.

Figure 1. The diagram showing the expression of the youth audience's higher-level values (HVL) as guiding life principles
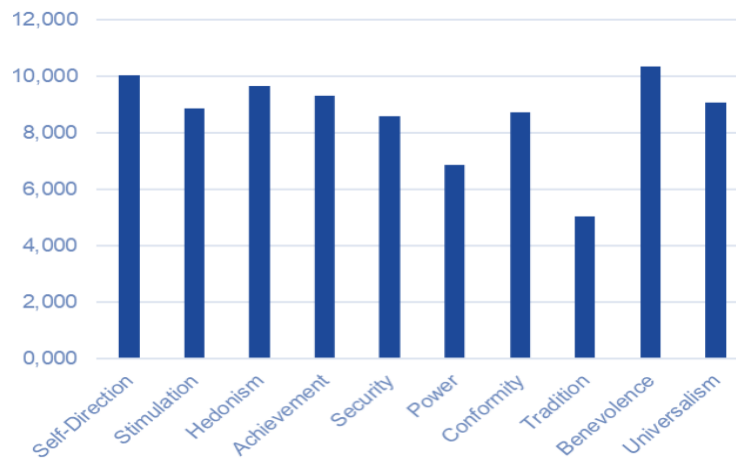
Evaluating the degree to which the student youth audience's higher-level values influence their choice of marker products, as motivational factors.

One of the important tasks of the research was to study the influence of HVL on the consumer behavior of the student youth audience. The analysis was carried out by statistical processing of the section of the questionnaires with direct questions about the impact of the values included in the HLV on the respondents' preferences while choosing products identified as markers in the previous study (Sidorchuk *et al.* 2016).

The evaluation was carried out in two stages. At the first stage, the share of participation of individual higher-level values was determined in the process of choosing the marker products, at the same time taking into account the influence of the gender factor in assessing the correctness of H1 hypothesis about the absence of significant gender differences in the degree to which the higher-level values influence consumer choice.

To solve this problem, the total votes of the respondents were determined, both in general and with a division into male and female audiences in terms of their preference for specific values in the choice of marker products (for each marker product, the respondent indicated preferences on the dichotomous scale). In this case, the following assumption was used: the more votes are given for a particular value in the choice of a marker product, the greater the degree of influence that this value has as a factor of motivational influence on the choice of the analyzed marker product (and vice versa). The indicator of the degree of influence that the values have regarding marker products was defined as a selective average of preferences given to a specific value.

Figure 2 shows the distribution of relative shares of influence that HLV have on the student youth audience's consumer preferences when choosing marker products.

Figure 2. Relative shares of influence that HLV have on consumer preferences of student youth audience (the sum of shares equals 1.0)
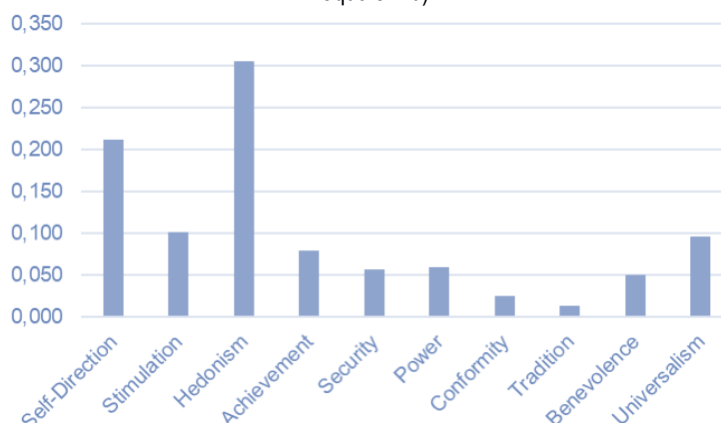
As follows from Figure 2, the influence of the values of *independence and hedonism* is most clearly manifested. The total level of influence of these two values often exceeds the influence of other values. The choice of marker products is least influenced by such values as *power, security, conformism and tradition*.

The impact of gender differences on the level of exposure to HVL as motivating factors of consumer preferences is presented in Table 1.

Table 1. Relative share of HLV influence on consumer preferences for marker products taking into account the gender factor.

HLV	MPhone		Tablet		Clothes		Footwear		Soft drinks		Snacks		Mobil	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female
Self-Direction	0.203	0.173	0.230	0.261	0.253	0.243	0.247	0.254	0.122	0.093	0.104	0.098	0.287	0.268
Stimulation	0.073	0.100	0.115	0.105	0.072	0.109	0.064	0.098	0.102	0.114	0.081	0.084	0.099	0.121
Hedonism	0.271	0.241	0.230	0.200	0.249	0.245	0.269	0.286	0.469	0.536	0.548	0.609	0.282	0.230
Achievement	0.063	0.104	0.083	0.122	0.086	0.111	0.050	0.070	0.027	0.021	0.030	0.019	0.050	0.092
Security	0.115	0.090	0.078	0.077	0.090	0.063	0.073	0.058	0.027	0.019	0.030	0.024	0.017	0.037
Power	0.073	0.065	0.069	0.058	0.050	0.041	0.068	0.052	0.075	0.042	0.044	0.026	0.077	0.092
Conformity	0.021	0.041	0.023	0.030	0.036	0.028	0.023	0.013	0.027	0.025	0.015	0.017	0.028	0.019
Tradition	0.005	0.004	0.023	0.008	0.005	0.020	0.023	0.012	0.014	0.023	0.037	0.019	0.022	0.002
Benevolence	0.057	0.086	0.046	0.060	0.045	0.031	0.046	0.022	0.014	0.028	0.030	0.022	0.061	0.101
Universalism	0.120	0.097	0.101	0.079	0.113	0.108	0.137	0.136	0.122	0.097	0.081	0.082	0.077	0.039
Sum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Notes: MPhone - Mobile phone or smartphone; Tablet - Tablet (laptop); Clothes   Everyday clothes; Footwear - Footwear for everyday wear; Soft drinks - Soft drinks and juices; Snacks - Snacks and chocolate bars; Mobil - Mobile communication and Internet services in the home region

The data in Table 1, as well as in Figure 2, demonstrate that the influence of the same values (*independence and hedonism*) is most strongly manifested in both male and female audiences. And the total level of influence of these two values is almost equal to the total share of influence of other higher-level values. Such values as *power, security, conformism, and tradition* exert the least influence on the choice of marker products, regardless of the gender factor. It can also be easily seen that the strength of HLV influence on the choice of snacks (snacks and chocolate bars) and drinks (soft drinks and juices) is noticeably lower than in case of other marker products (Figure 3). The differences are more than 1.5 times.

Figure 3. Distribution of the combined effect of HLV on the preferences for marker products
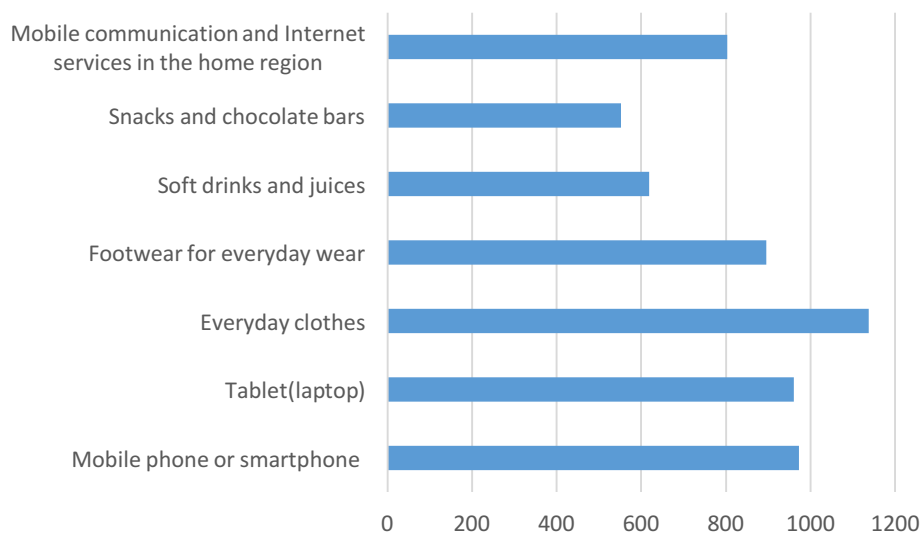
Despite the limited number of marker products selected for research, such differences can hardly be explained by accidental reasons.

For the analysis of gender differences, the indicators of HLV impact on the choice of marker products when making purchasing decisions were calculated separately for male and female audiences. As a result, the total HLV indicators were obtained for the preference of a particular product. Then the shares of each value in the total amount were determined. The results of the distribution of the HLV effect on the preference of a specific marker product are shown in Figure 4.

Figure 4. Effect of HLV on the preference of marker products based on gender distribution
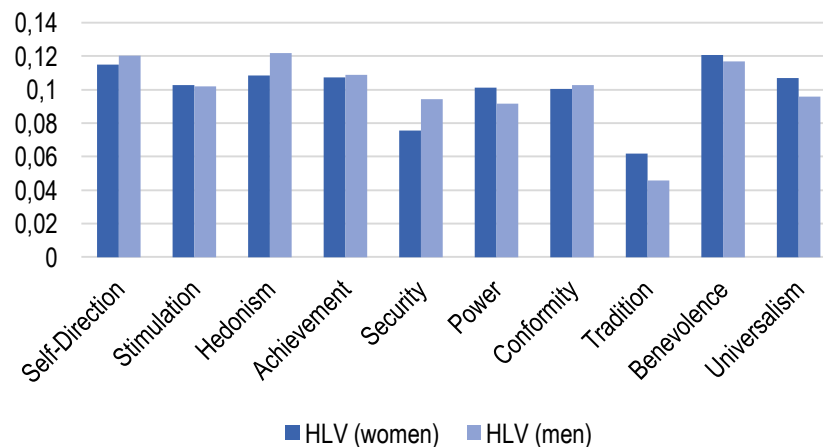
As can be seen from the visual analysis of the diagram in Figure 4, there are no significant differences in the impact of individual values depending on gender. In order to assess the differences in the influence of values, Gatev's integral index of structural differences was calculated. Gatev's index (Karpov 2008) can take values from 0 (full coincidence of compared structures) to 1 (absolutely different structures). In this case, this index is equal to 0.071, *i.e.* gender structural differences account for 7%. Hence the conclusion about the practical absence of structural differences in the influence of HLV in terms of gender. The results of analyzing gender differences in the influence of HLV on the choice of marker products also support hypothesis (H1).

For a detailed assessment of the accuracy as for the absence of gender differences in the influence of higher-level values on the choice of specific marker products, a nonparametric correlation analysis of HVL preferences was carried out for the male and female audiences during the choice of marker products (Appendix, Table C). The matrix of p-Spearman's pair indices for the same marker products is presented in Table 2.

Table 2. Matrix of pair indices of correlation

	MPhone_f	Tablet_f	Clothes_f	Fotwear_f	Drinks_f	Snacks_f	Mobil_f
MPhone_m	**.796****	.784**	.827**	.912**	.904**	.599	.639*
Tablet_m		**.945****	.957**	.982**	.873**	.675*	.791**
Clothes_m			**.891****	.927**	.788**	.457	.634*
Footwear_m				**.900****	.889**	.569	.618
Drinks_m					**.881****	.805**	.641*
Snacks_m						**.826****	.587
Mobil_m							**.850****

**. Correlation is significant at the level of 0.01 (2-tailed). *. Correlation is significant at the level of 0.05 (2-tailed).

Notes: MPhone - Mobile phone or smartphone; Tablet - Tablet (laptop); Clothes   Everyday clothes; Footwear - Footwear for everyday wear; Soft drinks - Soft drinks and juices; Snacks - Snacks and chocolate bars; Mobil - Mobile communication and Internet services in the home region; m and f - denote male and female, respectively

Analysis of the matrix shows that the values of the correlation indices that characterize the similarity of the influence of values on the same marker products in male and female audiences are at the level of 0.8 (in bold type), which, if the level of significance is sufficient, indicates the similar character of the impact of values as motivational factors of consumer choice in male and female student youth audiences.

Comparative analysis of differences in the influence of HLV as vital life principles and as motivational factors in consumer preferences

In order to carry out a comparative assessment of the significance of the HLV influence as the guiding life principles and their impact as a motivational factor in the consumer choice of marker products, it was necessary to obtain comparable estimates of the expression of HLV in these two areas (Figure 5).

Figure 5. Shares of the impact of HLV as life principles and motives for choosing marker products
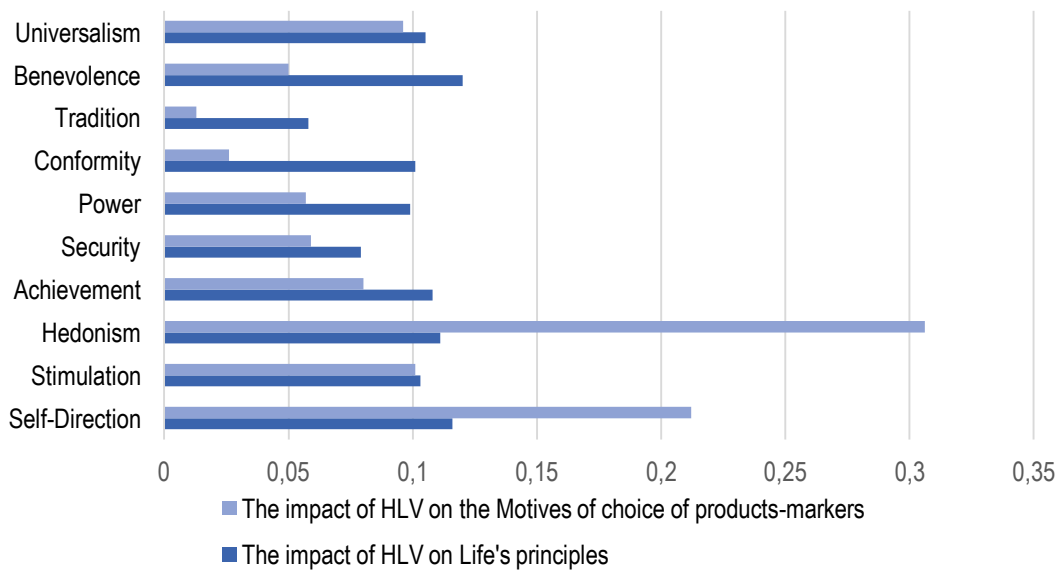
The shares of individual HLVs in the total assessment of their influence as life principles and as a motivational factor in the behavior of the student youth audience can serve as such assessment.

As Figure 5 shows, the difference in the strength of HLV's influence is very noticeable, especially for such values as *independence, hedonism, conformism, and traditionalism.* In order to assess the degree of similarity (or difference) in the influence of HLV using the data presented in Figure 3, Gatev's integral index of structural differences was calculated, which turned out to be 0.475 or 47.5%. This value of the index indicates that there are significant differences in the youth student audience between the importance of HLV as guiding life principles and the importance of HLV as the motives for choosing goods.

5. Discussion

Summing up the conducted research it should be noted that the hypotheses put forward by the authors were confirmed. Based on the theoretical basis of Schwartz' studies (1992, 1994a, 1994b, 2005, 2012, 2014), the authors assessed the degree of collinearity among HLV and confirmed the possibility of using them for measuring motivation in consumer preferences of a young audience. The obtained results made it possible to approach confirming hypothesis (H1) - about the absence of significant gender differences in the influence of higher-level values. The conducted gender ranking analysis of HLV based on Spearman's rank correlation index (p) allowed the authors to consider the structure of HLV ranks to be strongly correlated with each other for female and male audiences. The results are complementary to previous studies (Sharma *et al*. 2014, Benbassat and Shulman 2016, Wang and Chui 2016 and others) regarding the possibility of not focusing on gender differences in the use of HLV for communicative interactions with the student audience as consumers of goods and services.

This conclusion is valid both in relation to the impact of HLV as vital life principles, and in terms of their impact on consumer behavior. The analysis of the structural differences in the share of values in motivating the preferences for marker products based on Gatev's integral index of structural differences showed a gender difference level of 7%, which demonstrates the insignificance of these structural differences in the influence of HLV. As we have shown above, this kind of research has not been carried out before.

To solve the task of developing the indicator of consumer preferences, an assessment was made of the level of influence of higher-level values as motivational preferences of the youth audience for the marker products. The obtained results allowed the authors to confirm H2 hypothesis about significant differences between the influence of HLV, as the guiding life principles and their impact, as a motivational factor, on the choice of marker products. To confirm the hypothesis, the authors calculated Gatev's integral index of structural differences, which equals 47.5%. A high value shows significant structural differences. It should be noted that on the one hand, in contrast to the Schwartz' values described above, and on the other hand, the studies of young consumers conducted by Kansra (2014), Noh, Runyan, Mosier (2014), Sharma, Sivakumaran and Marshall (2014), Hassan and Shiu (2015) and others, the authors succeeded in identifying the differences between value orientations as guiding life principles and their motivating influence. This makes it possible to supplement Schwartz's research with

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a significant fact for marketing that the higher-level values declared by young consumers are not always significant in determining consumer preferences.

Based on the data obtained, according to the authors, it is possible to construct an integral indicator of the influence of HLV on product preferences. According to the authors, for this purpose a special indicator reflecting the influence of HLV on the choice of marker products could be the most suitable.

The main idea embedded in its design is to link the influence of HLV as the guiding life attitudes with the motivational impact of HLV in the choice of goods. The processing of the results of the study made it possible to reveal the influence of HLV as life principles, and to obtain average (for the sample) indicators for each HLV. Similar indicators were obtained for assessing the effect of HLV on the preferences for marker products. The construction of Plekhanov's indicator of value motivation (PIVM) is presented in Figure 6.

As a quantitative measure of the influence of HLV on these two directions, the authors proposed to use the scalar product of two vectors: the vector of the average values of the HLV influence force as life principles and the vector of the average HLV values of consumer preferences for marker products.

The scalar product is expressed by a number equal to the sum of the pair products of the vector elements. The received value can be considered to be a measure characterizing the general influence of HLV on the students' choice of goods (selected for research). The result of calculating the PIVM indicator for 2016 is 9.294.

Figure 6. Plekhanov's indicator of value motivation (PIVM)
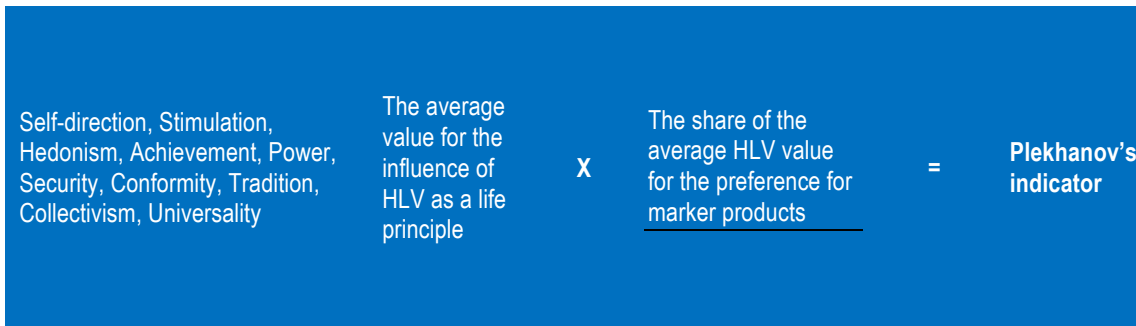
The obtained indicator is proposed to be calculated on the basis of annual wave market research, which will provide a dynamic set of indicators. A positive increase in the indicator means an increase in the influence of HLV on purchasing behavior, and a negative growth means a decrease in their influence.

For such a dynamic series, one can calculate chain and base indices. It is important to note that the proposed algorithm for calculating PIVM makes it possible to analyze the factors that determined the change. They can occur either due to a change in the strength of HLV's influence as a life principle, or due to structural shifts. As shown above, the index of World Values Survey (WVS) is closest to the proposed indicator. Therefore, for comparison, Figure 7 shows the results of the ranking of values in Russia (based on the study of WVS) and based on the research conducted by the authors. Values with the lowest rank are of great value.

Figure 7. Comparison of value ranks received from WVS in Russia and from the results of the study
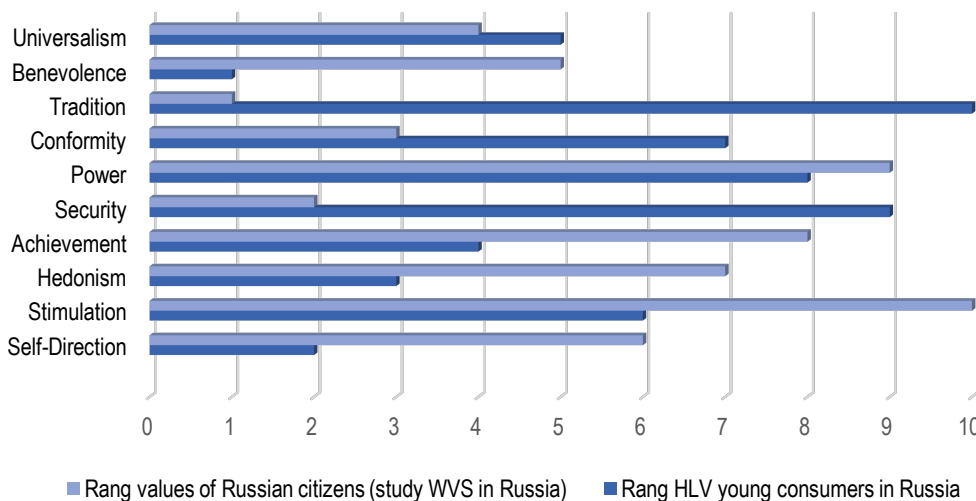
The diagram in Figure 7 shows that only 2 values have close ranks ("Universalism" and "Power", there is a one rank difference). The WVS study in Russia gives priority to such values as "Tradition", "Security" and "Compliance". And in this study, young consumers prefer such values as "Goodwill", "Independence" and "Hedonism". Such differences can be related to the semantic constructions and the methodology of selecting respondents. This brings the authors to the need to indicate the limitations of this research.

The main factor limiting the results of this study is the choice of first-year undergraduate students studying at Plekhanov Russian University of Economics as the general population. There was no stratification or quota allocation. Gender and social representativeness was not supposed to be covered in the study.

Apart from this, an important methodological issue in research of this type is determining the quantity of goods and services to be analyzed. Given the natural limitations of questionnaires, it is impossible to conduct research into a large number of products. It is believed that their number cannot be more than 10. In this regard, it is viable to conduct research into aggregated units, *i.e.* types of goods or ranges of products. Taking into account the results of previous studies, another possibility is to group the products with close structural indicators of the HLV influence to aggregates. So, according to the results of the study, it is possible to combine clothes and shoes into one position.

Conclusion

In view of the above, it is difficult to draw conclusions as to how universal the obtained results are in describing the influence of HLV on consumer behavior. At the same time, the authors consider that the methodology itself is universal and can be used in other studies on the influence of HLV, regardless of the country of study and the chosen population.

In the authors' opinion, the results of the study are useful for solving a number of strategic marketing tasks for companies operating in the youth market of goods and services:
- the values of the higher-level can be more widely used as the basis for positioning goods and services aimed at the youth audience;
- results of research into the influence of values on the choice of products can be used in the development of new products, design and packaging;
- creative solutions for marketing communications with consumers should take into account the priorities of value orientations for groups of products. First of all, this refers to the choice of the content of advertising for products intended for the youth (student) audience.

Further development of this direction presupposes:
- improving the research methodology by expanding the geography and the profile of the audience as well as the categories of goods and services;
- carrying out wave studies among cohort audiences in order to reveal the dynamics of value preferences of youth student audiences. This will allow a comparative analysis of consumer behavior under the influence of HLV for different generations.

Acknowledgements

References

[1] Aschemann-Witzel, J., Niebuhr Aagaard, E.M. 2014. Elaborating on the attitude - behaviour gap regarding organic products. Young Danish consumers and in-store food choice, *International Journal of Consumer Studies,* 38(5): 550-558. DOI: 10.1111/ijcs.12115

[2] Babin, B., and Babin, L. 2001. Seeking something different? A model of schema typicality, consumer affect, purchase intentions and perceived shopping value, *Journal of Business Research*, 54(2): 89-96. DOI: 10.1016/S0148-2963(99)00095-8

[3] Benbassat, N., Shulman, S. 2016. The Significance of Parental Reflective Function in the Adjustment of Young Adults, *Journal of Child and Family Studies*, 25(9): 2843-2852. DOI: 10.1007/s10826-016-0450-5

[4] Bourdieu, P. 1987. *Distinction: A Social Critique of the Judgment of Taste*. Harvard University Press. ISBN 9780674212770, 640 pp. Available at: https://monoskop.org/images/e/e0/Pierre_Bourdieu_Distinction_A_Social_Critique_of_the_Judgement_of_Taste_1984.pdf

[5] Cairns, W. 2007. Booster-seats, pies and twenty-first century childhood, *Young Consumers*, 8(3): 172-176.

[6] Chen, L., Lu, M., and Tu, Y. 2017. After Auction's Complete: What Will Buyers Do Next? - A Case Study of Feedback Rating at eBay, *International Journal of E-Business Research (IJEBR)* 13 (3): 17, accessed (October 02, 2017). DOI:10.4018/IJEBR.2017070101

[7] Hassan, L.M., and Shiu, E. 2015. The moderating role of national cultural values in smoking cessation, *Journal of Business Research*, 68(10): 2173-2180. DOI: http://dx.doi.org/10.1016/j.jbusres.2015.03.017

[8] Karpov A. 2008. Measurement of disproportionality in proportional representation Systems, *Mathematical and Computer Modelling*, 48(9–10): 1421-1438. DOI: 10.1016/j.mcm.2008.05.027

[9] Pooja, Kansra. 2014. Determinants of the Buying Behavior of Young Consumers of Branded Clothes: An Empirical Analysis. *Journal of Brand Management*, XI (3): 57-70.

[10] Kotler, P., Kartajaya, H., Setiawan, I. 2010. *Marketing 3.0: From products to customers to the human spirit.* John Wiley and Sons, Inc., Hoboken, New Jersey, USA. ISBN: 9780470598825, 208 pp.

[11] Lee, P., Lusk, K., Mirosa, M. and Oey, I. 2014. The role of personal values in Chinese consumers' food consumption decisions. A case study of healthy drinks. *Appetite,* 73: 95–104, DOI:10.1016/j.appet.2013.11.001

[12] Lichtman-Sadot, S. 2016. Does banning carbonated beverages in schools' decrease student consumption? *Journal of Public Economics*, 140: 30-50. DOI: 10.1016/j.jpubeco.2016.05.004

[13] Malhotra, N.K., and Birks, D.F. 2007. *Marketing Research: An Applied Orientation*. Pearson Education. NY, USA. ISBN: 0132279460, 9780132279468, 878 pp.

[14] Noh, M., Runyan, R., Mosier, J. 2014. Young consumers' innovativeness and hedonic/utilitarian cool attitudes. *International Journal of Retail and Distribution Management,* 42(4): 267-280. DOI:10.1108/IJRDM-07-2012-0065

[15] Parsons, T., Shils, E. 1951 *Toward a General Theory of Action,* Cambridge, Mass., Harvard University Press, ISBN 9780674863507, 506 pp.

[16] Pimenta, M.L., Piato, É.L. 2016. Cognitive relationships between automobile attributes and personal values", *Asia Pacific Journal of Marketing and Logistics*, 28(5): 841-861. DOI: 10.1108/APJML-09-2015-0147

[17] Rokeach, M. 1973. *The nature of human values,* New York: Free Press, ISBN-10: 0029267501, 438 pp.

[18] Rohan, M.J. 2000. A rose by any name? The values construct, *Personality and Social Psychology Review*, 4(3): 255-277.

[19] Schwartz, S.H. 1992. Universals in the content and structure of values: Theory and empirical tests in 20 countries, In M. Zanna (Ed.), *Advances in Experimental Social Psychology*, 25: 1-65, New York: Academic Press. DOI: http://dx.doi.org/10.1016/S0065-2601(08)60281-6

[20] Schwartz, S.H. 1994a. *Beyond Individualism/Collectivism: New Cultural Dimensions of Values*. Sage Publications, Inc., 85-119 pp.

[21] Schwartz, S.H. 1994b. Are there universal aspects in the structure and contents of human values? *Journal of Social Issues*, 50: 19–46.

[22] Schwartz, S.H. 2005. *Robustness and fruitfulness of a theory of universals in individual human values* In A. Tamayo and J. B. Porto (Eds.), Valores e trabalho [Values and work]. Brasilia: Editora Universidade de Brasilia, 56–95 pp.

[23] Schwartz, S.H. 2012. An Overview of the Schwartz Theory of Basic Values, *Online Readings in Psychology and Culture*, 2(1). DOI: http://dx.doi.org/10.9707/2307-0919.1116

[24] Schwartz, S.H. 2014. Rethinking the concept and measurement of societal culture in light of empirical findings, *Journal of Cross-Cultural Psychology*, 45(1): 5-13.

[25] Sergeev, R.V. 2010. Youth and students as social groups and an object of the sociological analysis. *Vestnik adygejskogo gosudarstvennogo universiteta: regionovedenie: Filosofija, Istorija, Sociologija, Jurisprudencija, Politologija, Kul''turologija*, *serija* 1: 127-133

[26] Sharma, P., Sivakumaran, B., Marshall, R. 2014. Looking beyond impulse buying: A cross-cultural and multi-domain investigation of consumer impulsiveness, *European Journal of Marketing,* 48(5-6): 1159-1179. DOI: 10.1108/EJM-08-2011-0440

[27] Sharp, B. 2007. Loyalty limits for repertoire markets, *Journal of Empirical Generalizations in Marketing Science*, 11: 1-9. DOI: 2-s2.0-38149084052

[28] Sidorchuk, R. 2015. The Concept of "Value" in the Theory of Marketing. *Asian Social Science,* 11(9): 320-325. DOI:10.5539/ass.v11n9p320.

[29] Skorobogatykh, I., Sidorchuk, R., Efimova, D., Meshkov, A., Danchenok, L. 2016. Conceptual aspects of studying value reference points and consumer preferences of young consumers, *J A B E R*, 14(10): 7337-7356

[30] Sogari, G., Corbo, C., Macconi, M., Menozzi, D., Mora, C. 2015. Consumer attitude towards sustainable-labelled wine: an exploratory approach. *International Journal of Wine Business Research*, 27(4): 312-328, DOI: 10.1108/IJWBR-12-2014-0053

[31] Vickner, S.S. 2016. Seafood Safety and Marketing: The Case of the Deepwater Horizon Tragedy. *American Journal of Agricultural Economics*, 98(2): 643-647. DOI: 10.1093/ajae/aav099

[32] Wang, Y., and Chui, E. 2016. An exploratory path model of social work students' satisfaction with field education experience in China. *Social Work Research*, 40(3): 135-145, DOI: 10.1093/swr/svw010

*** WVSA. 2017. World Values Survey. Available at: http://www.worldvaluessurvey.org/wvs.jsp (date of access 20.05.2017)

*** Kantar media: TGI Survey Data: http://www.kantarmedia.com/global/our-solutions/ consumer-and-audience-targeting/tgi-survey-data

*** Molodezh' SNG, Demographic portrait. Available at: http://www.demoscope.ru/weekly/2017 /0711/barom01.php

*** Narodonaselenie mira. Available at: http://www.unfpa.org/sites/default/files/pub-pdf/RU-SWOP14-Report%20Rev-Web-update%2024%20Nov.pdf

Innovations and New Product Development: Evidence from Enterprises Active in Slovak Republic

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Abstract:

The study investigates innovations and a new product development process in Slovak Republic. The findings extend and update existing innovations knowledge at a firm level. Relationships between the researched parameters were identified based on the market data given by enterprises. There is a need to increase awareness of innovations superiority as a way of development, to stimulate innovations more actively, including additional incentives from the government, to update sets of using methods *etc*. Positive relationships were confirmed between innovativeness of launching products and acceptance of projects' risks, number of developing products and number of successfully launched products, experience of enterprises and share of successfully launched products, product innovativeness and period of its development. Relationships between product innovativeness and the size of enterprise were not proved.

Keywords: innovations; new product development; enterprises; Slovak Republic.

JEL Classification: O3

Introduction

Innovations and a new product development (NPD) process are the key direction, which can support economy actors' sustainable growth for the long term (Drucker 1985), (OECD 2007). Enterprises are not able to avoid the impact of the constant environmental changes, such as increased competition, widespread and rapid diffusion of knowledge, as well as the rapid growth of expenditures in research and development, the reduction of products and technologies' life cycles. A commercialization process is of high interest. Despite the critical importance of innovation, there is still a very low percentage of new products successful launches. Many researchers (Stevens and Burley 1997), (Cooper 2000), research agencies and enterprises claim it. According to research company Nielsen, no more than 10% of all launched products stay in the market and less than 0.5% shows breakthrough results (Nielsen 2016). The post-socialist Central and Eastern European countries have lower share of Research and Development expenditures and number of patents (OECD 2017). In particular, the present approach to innovations doesn't support constant remarkable growth of the innovation performance in Slovak Republic. The country belongs to moderate innovators group with stable scores during the last several years. It ranked on the 22th place among 28 European Union countries (European Commission 2016). This study analyses and evaluates the innovation process with a focus on NPD activities conducted by enterprises in Slovak Republic.

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1. Literature Review

Over the past decades, many authors discovered different aspects of innovations – concepts, types, models, value chains, effectiveness and efficiency, a new product development with theoretical and empirical approaches on different levels. In terms of citations, the highest impact was done by an open innovation paradigm proposed by Henri Chesbrough (Chesbrough 2003) as the opposite to close innovations. Innovation models discovered by Von Hippel (Hippel 1988) – end-user generated innovations; the stage-gate model (Cooper 2008); the chain-interactive model (Caraça 2007); the triple helix innovation model (university – industry – government) (Etzkowitz and Leydesdorff 1995); the quadruple helix innovation model (added civil society) (Yawson 2009), (Arnkil *et al.* 2010), (Carayannis *et al.* 2012); classifications of innovation models (Marinova and Phillimore 2003) *etc*. Types of innovations were examined by multiple authors (Clayton 2003), (Barbero 2014) *etc*. Institutional context researched by other authors (Colwell and Narayanan 2010), (Boso *et al.* 2013), (Wu 2013), (Ma *et al.* 2014). Measuring and communicating the value of innovation activities and investments are discovered by Rochina-Barrachina *et al.* (2010), Eisend *et al.* (2016) *etc*. Consumer participation and co-creation in NPD had a great response in peer academic journals – *e.g.* Fang discovered effects of a customer participation on innovativeness and the market launch speed (Fang 2008), co-creation in NPD (Hoyer *et al*. 2010), the returns of customer participation on NPD performance (Chang and Taylor 2016), multinational companies' specifics (Griffith and Lee 2016). Separate parts of NPD from fuzzy front end to a launch of new products to the market were the key topic for Schatzel and Calantone (2006), Kuester *et al.* (2012), Wei *et al.* (2016). Laursen and Salter (2006), Huston and Sakkab (2006), Wan and Quan (2014), Oh *et al.* (2015) discovered an industry and a firm experience. Nevertheless, there are much less empirical studies of innovations and NPD at a firm level for specific smaller European countries.

At the same time, innovation activities and its stimulation in enterprises, as one of the most important agents in macro system, is an essential path of countries development. Success in the domestic market requires that firms develop new goods and services that respond to local context of market characteristics, customers' and firms' needs. Knošková and Kollár (2011) discovered the success factors of innovation activities in firms, which are active in Slovak Republic; Makó *et al.* (2013) – organizational innovations in service firms of Slovak Republic and Hungaria, Kubičková *et al.* (2016)– relationships between innovations and productivity in the services in the Slovak economy.

2. Methodology

The purpose of the study was to improve the efficiency of a new product development process and propose ways to increase number of successfully launched products to the market in Slovak Republic. As an innovative product we supposed a good or a service that is new or significantly improved (Oslo Manual 2005). The research was performed through an internet survey in two languages. The data of this study were collected using web-based questionnaires. On-line questionnaire was divided into three parts. The first part contained general questions about innovation activities taking part in an enterprise, the second one – questions about an innovation process and the third one – questions about an enterprise itself. In total, it contained sixteen open and closed questions. However, even the closed questions were complex and flexible in structure, and always contained an open alternative. The method of selection of sample is random sampling of enterprises operating in Slovak Republic. The participants of our research were general managers, marketing directors, heads of research and development departments, new business directors and other managers who involved in the field were our target audience.

Throughout the first quarter of 2017 year, two thousand emails with invitations were sent. As respondents in business-oriented surveys were more sensitive, we decided to contact them only once without additional reminders. It help to avoid pushing respondents which could affect the given answer in different ways. Each person´s decision to participate in the research was entirely voluntary, and based on sufficient information and adequate understanding of both the proposed research and the implications of participation in it. They were also offered the choice of whether to receive a summary report of the findings at the conclusion of.

As a result of questionnaire distribution, 85 respondents had completed and submitted their responses. In addition, several respondents have sent answers that they do not apply innovations at their enterprises. The average response rate reached 4.4%. Three responses were determined as invalid because answers did not match all questions correctly. Due to anonymous character of the survey, we were not able to contact the respondents to make more accuracy to the given answers and did not include them into analysis. In total, 82 responses were proceeded for the further analysis. The collected data refers to a wide range of economy activities of enterprises in the business sector – manufacturing, trade, transportation and storage, information and communication, financial activities, construction *etc*. In terms of a company size there were 80% of small enterprises with the number of

employs up to 49 persons, 14% of medium enterprises with the number of employs from 50 to 249 and 6% of large enterprises with the number of employs over 250 persons. Based on the collected data we analysed and evaluated the innovation process with a focus on NPD activities conducted by enterprises in Slovak Republic, reviewed challenges, proposed recommendations. Statistical methods are used in the data analysis. The subject of the research was an innovation activity in enterprises operating in Slovak Republic including an innovation process, methods, measured indexes, a product innovativeness, attempting external resources, duration of NPD etc. Investigated period is limited by the last decade with a focus on 2014 – 2016 years.

We begin with the country facts that provide general understanding and insights. In terms of innovation activity, Slovak Republic performs significantly below the average European Union level. Over the analysed period it keeps position of moderate innovator in the last third of the European Union innovative countries list with minor changes (European Commission 2016).

According to Statistical Office of the Slovak Republic (2017) the share of enterprises with innovation activity in industry and selected services was 31.8% in 2014 (Table 1). Quite a limited number of enterprises in Slovak Republic has innovation activity. Moreover, their share in total number of enterprises has a negative trend. This fact influenced the response rate level and the number of completed questionnaire forms in the research.

Table 1. Dynamics of some innovation indicators in Slovak Republic.

Indicator	2008	2010	2012	2014
Share of enterprises with innovation activity*	36.1	35.6	34.0	31.8
Total number of patents**	313	372	368	454
Share of innovation expenditure (in total turnover, %)*	1.2	1.2	1.8	1.3

Note: *data from the Slovak Statistics (2017); ** the World Intellectual Property Organization (2017)
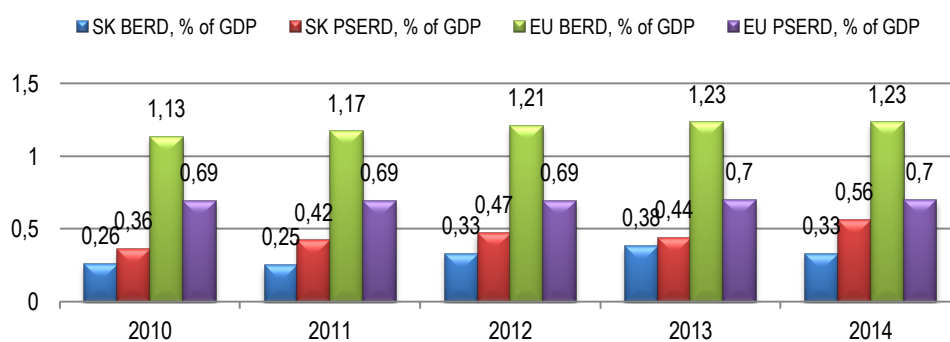*Source:* own processing

One of the most important results of innovation activity is number of patents. It has a positive trend but the indicator values are relatively low in Slovak Republic compared to the others. For example, its neighbors on the country's borders – the Czech Republic, Hungary, Austria and Poland have more than several times higher figures compared to Slovak Republic. Moreover, European Innovation Scoreboard 2016 states a very strong decline in License and patent revenues from abroad (-25%) and Non-Research & Development (Non-R&D) innovation expenditures (-9%).

Among the reasons of the moderate innovation results in Slovak Republic we can identify low expenditures to innovation activities. At the same time, all leading innovators have high expenditures on R&D which are above average. In Slovak Republic, the share of innovation expenditures in total turnover keeps on 1.2-1.3% level except the uplift in 2012 (Table 1). In comparison with the average European Union level, the share of R&D in GDP is more than two times lower (Figure 1). Despite some growth during 2010-2014 it is increased at the expense of public sector growth mostly. Meanwhile dominant share of R&D in the European Union belongs to the business sector as the most significant in comparison with the public sector

A positive trend takes place in human resources and labour productivity. The unemployment rate is still high at 9.7% in 2016, but it has declined significantly over the past three years. The labour productivity growth constantly exceeds the average European Union level (OECD 2017). In terms of labour productivity, Slovak Republic performs better than the most Central and Eastern European countries and becomes more and more close to the average European Union level (Figure 2).

Figure 1. Dynamics of Business enterprise expenditure on R&D (BERD) and Public sector expenditure on R&D (PSERD) as % of GDP indicators in Slovak Republic and the European Union

Source: own processing, data from the OECD (2017)

Figure 2. Labour productivity, GDP per hour worked, constant USD PPPs to average EU level in some EU countries 2016
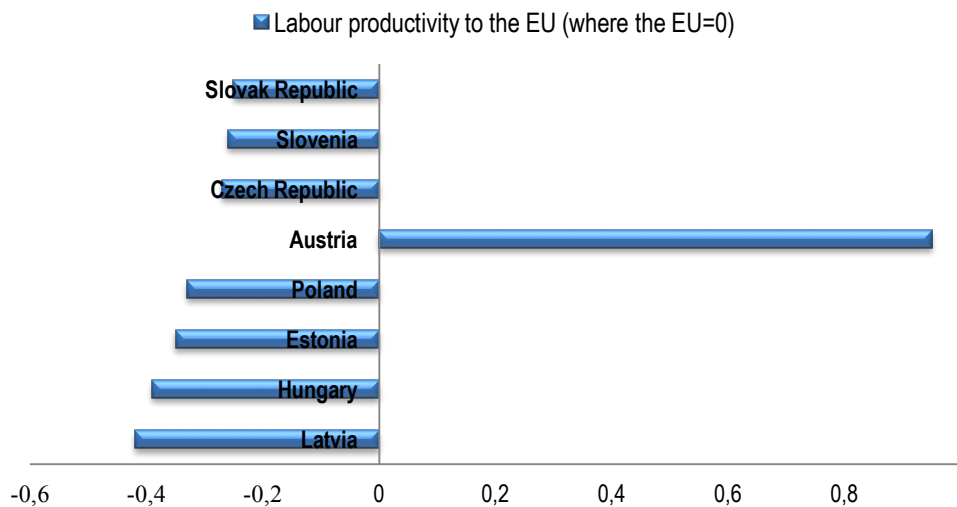
Source: own processing, computed indexes are based on data from the OECD (2017).

The other issue of innovation performance is its irregularity across the territory of the country. Eastern and Central regions are underdeveloped compared to Bratislava region and the Western part which enjoy confidence of foreign direct investments with the leading part of automotive industry. Importantly, there is a progress of attracting start-ups in the recent years. In terms of total number of the fastest-growing private European companies, Bratislava comes just behind Stockholm, Sweden and London (Inc. 5000 2017).

The data obtained from enterprises operating in Slovak Republic show that they are mainly focused on their own resources and prefer a close innovation model. It is also in line with the previous research – Makó *et al.* (2013) where outsourcing received the lowest scores among drivers of changes in firms. 57% of surveyed enterprises attracted external partners to the process of developing new products, but at the last stage – launch to the market basically. Each enterprise that attracts external resources has on average four external partners. The closed nature of innovations in companies restrains the innovative development of the country. There is a need to increase diversity in internal and external knowledge sources. Meanwhile optimal balance between internal R&D expenditures and the diversity of R&D collaborations has to be found. Gkypali *et al.* (2017) argue that diversity in external collaborations has a negative impact on internal innovation efforts.

We computed paired data correlations for better understanding of liner relationships between discovered indicators and hypothesis testing. The correlations are calculated using the formula of Pearson's correlation coefficient:

$$r(x, y) = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2 \sum_{i=1}^{n}(Y_i - \bar{Y})^2}} \qquad (1)$$

Then we have checked its significance at p=0.01 and p=0.05 probability levels using comparison of the calculated Fisher coefficient and its critical value. Fisher coefficient can be calculated based on the following formula:

$$F = \frac{\dfrac{r^2}{m}}{(1 - r^2)/(n - m - 1)}. \qquad (2)$$

where: n – number of observations (82 in our case); m=1 in pared correlation.

The results are summarized in the correlations matrix (Table 2). All correlations whose absolute values are greater than .21 (.28) are significant at p<.05 (p<.01) level. The determined correlations are an effect size between indicators and, so we can verbally describe the strength of it. Below we test our research hypotheses and describe other results based on the correlations matrix.

Table 2. Correlations matrix between indicators.

Indicator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. High innovative (vs. low) products	1																
2. Many (vs. lack of) external partners	.36	1															
3. Special vs managing director responsibility	.17	.11	1														
4. High (vs. low) risk projects	.52	.07	.36	1													
5. High (vs. low) number of successfully launched products	-.09	.05	-.05	.11	1												
6. High (vs. low) number of developing products	-.09	.05	.02	.12	.66	1											
7. High (vs. low) share of successfully launched products	-.03	.11	.07	-.08	.15	.09	1										
8. Long (vs. short) period of development	.55	.38	.13	.23	-.05	-.06	-.09	1									
9. Reducing (vs full) time development	.27	.08	.35	.22	.14	.16	.09	.19	1								
10. Technological (vs other) factor	.39	.24	.36	.30	.14	.18	-.01	.46	.22	1							
11. Marketing (vs other) factor	.23	-.04	.04	.17	-.01	-.02	-.02	.02	.01	.12	1						
12. Modern (vs. traditional) methods	.17	.09	.28	.26	-.05	-.04	.30	.15	.17	.06	.12	1					
13. High (vs. low) number of methods	-.01	.11	.04	.10	.07	.03	.39	-.06	.11	-.07	.21	.48	1				
14. Special (vs. traditional) indexes	-.06	.18	.13	.04	.15	.15	.53	.02	.14	.01	.07	.34	.33	1			
15. High (vs. low) number of indexes	-.03	.21	.14	.01	.06	.03	.36	.05	.08	.02	.31	.35	.72	.49	1		
16. Large (vs. small) enterprises	.14	.31	.57	.22	.08	.10	.03	.26	.21	.40	.02	.24	.18	.13	.27	1	
17. Services (vs. manufacturing)	-.01	.-11	-.12	.08	.10	.05	.40	-.21	-.03	-.20	.10	.10	.14	.32	.09	-.24	1
18. Well established (vs. new) enterprises	.01	.16	.25	.02	-.02	-.04	.64	.14	.27	.10	-.08	.31	.25	.42	.28	.31	.18

It is clear from Table 2 that strong correlation exists between number of developing and successfully launched products. Currently, a rather limited number of enterprises are engaged in innovations in Slovak Republic. One of the sources of increasing the country innovation performance is to stimulate innovative activity by attracting new enterprises to innovation activities. Higher focus on the need of developing innovations can drive number of new developing products and as a result number of successfully launched products that improve country's innovation level. H3 High number of developing products correlates with high number of successfully launched products – was confirmed (r=66, p<0.01). Since innovation field are characterized by high dynamic, there is a need to fill the gap between mature managers' knowledge and modern innovation paradigm values via trainings or other educational activities. Topics related to the role of innovations at enterprises, stimulating the spirit of competition, development of organizational structure, implementing of innovation thinking, case studies are of high importance.

Well-experienced and established enterprises have better market understanding, developed culture, and established procedures. Based on the analysis strong correlation recognized between company experience and share of successfully launched products. H4 Enterprises with higher experience on the market have higher share of successfully launched products – was confirmed (r=64, p<0.01). On the other hand, there was not determined significantly higher number of developed and launched products at well-experienced enterprises compared to the less experienced ones. Level of product innovativeness corresponds with the period of development. More innovative products require more time for development which also increase risks and required investments for developers. H5 Positive relationships exist between product innovativeness and period of its development – was

confirmed (r=55, p<0.01). Applied methods and measured indexes forms the quality of NPD at enterprises. Enterprises that use wider range of methods and indexes have higher share of successfully launched products, but the correlations are rather weak, measured as .39 and .36 respectively. Strong positive relationships were detected between number of applied methods and number of measured indexes. Enterprises still do not pay enough attention to modern innovation techniques trying to exploit their proved experience, but it doesn't work at the same efficiency due to changes in the external environment. Importantly, high share of successfully launched products directly corresponds with regular special indexes measuring like speed to market, product innovativeness vs. traditional for all products - sales, market share, product profit *etc*.

In addition, positive relationships exist between the key responsibility person for NPD and company size which is described above in the article. Enterprises operating in the service economy sector have higher share of successfully launched products compared to the others. Launching new services on the market usually related to lower resources volume and lower risk compared to innovative goods. Among the key factors only technological ones have correlations with the other researched indicators. Some positive relationships exist between the perceived importance of technological factors and the higher product innovativeness, technological factors and the period of new product development, technological factors and the size of enterprises.

3. Case studies

Despite high popularity of open innovation model when a company uses external sources to solve problems and opens knowledge and ideas for external usage, mix of closed and open innovations – model of ajar innovations takes place in majority of enterprises Nizhegorodtsev and Goridko (2016). Their success on the market is determined by the quality management of the innovation process – partly it is opened for partners, customers and other economic agents. According to modern global examples, successful enterprises build effective networks, change organizational structure, implement and stimulate innovative culture.

In addition to the fact of applying innovations in enterprises, the level of innovation plays an important role. The researched enterprises have different levels of product innovativeness. The highest share belongs to "new to the company" products and decreases in accordance with the growth of product innovativeness:

- 39.0% stated implementing only "new to the company" products;
- 30.5% stated implementing "new to the category" products as well as "new to the company" products;
- 20.7% stated implementing "new to the country" products and lower levels;
- 9.8% stated implementing "new to the world" products and lower levels.

Responsible person for the new products development success mainly depends on the company size, organizational structure and field of activity. General Director is usually responsible at small enterprises while marketing director, new business director, head of research & development department are responsible for NPD at medium and large enterprises. As for the NPD process itself, it usually lasts just over a year, preferring to be stable and highly predictable, requires a high level of technological and marketing capabilities, measured in the same way as others in enterprises, and uses traditional methods mainly.

Majority of enterprises try to be safer and more cautious in innovation activities. 62% of them are oriented to stable projects of the new products development. 31% of enterprises make stable and turbulent projects equally. Only 7% of enterprises make turbulent projects mainly compared to the stable ones. In average, four new products per company were successfully launched or sold to the other companies and about eight new products were developed at any stage for the last 3 years. The success rate figure is rather high in the conducted survey compared to the average European success rate mentioned in the beginning of the article. We can identify two key reasons for this. The first reason is that enterprises tend to overestimate their results and make them more positive. Failure rate is highly depending on the base of initially developed products. Some enterprises count all rough ideas, others only products in which they invested during NPD process. The second reason is that our survey includes not only goods but also services in which the success rate is usually higher.

According to the experience of the surveyed enterprises, new products developing process lasts 14 months in average – 18 months at enterprises in manufacturing and 11 months at enterprises in service sector. The difference is moderate due to the fact that enterprises in manufacturing field introduce both new goods and new services. With regard to the period of NPD, 46% of participants trying to reduce it mainly at the expense of test marketing stage shortage, business analysis stage or marketing strategy development stage mainly. Enterprises tend to implement types of innovations which is in line with their core source of business – innovative goods and innovative services mainly. Larger companies have more wide range of introduced innovations including innovative processes, marketing innovations, and organizational innovations.

Using the collected data, we observe different perception of influencing factors on the new products development performance. Technological and marketing factors scores as having the greatest impact. As expected, technological factors have a greater impact for the new goods development and marketing factors are more important for the new services development. Skills and financial factors follow with a minimal gap. They are connected with small enterprises mainly. Rules of law and socioeconomic factors are in the third position with a moderate impact. Cultural factors have an influence significantly below the average. Enterprises do not consider them as important ones.

The most used methods that enterprises apply during the new products development process are face-to-face consumer communication, expert analysis, traditional test marketing. Modern methods such as crowdsourcing, lead user method, opinion leaders, simulated test-marketing use much more rarely. Number of applied methods are two or three per each enterprise. To measure and estimate NPD performance success, enterprises use wide range of indicators as speed to market, product innovativeness, product quality perception, sales volume and value, market share, product profit, product distribution, product awareness, consumer satisfaction, trial purchase, repeated purchase, co-created new products, new product value for relationship with target audiences. The most popular indicators are sales volume and value, market share and product profits. Product quality perception, consumer satisfaction, speed to market and product awareness are used half as much. The other indicators are measured significantly rarely. In average, enterprises use five or six indicators.

Companies have stated a wide range of challenges that they face during a new products development process. They differ by a company size. Financial and human resources are among the first for smaller enterprises. The lack of funding restrains their innovation activities. Human resources challenges belong to shortage of employees or their qualifications and appropriate skills. The lack of time and administrative challenges are also important. Time corresponds in part to financial and human resources challenges. On the other hand, such general barriers as finance, human resources and time may reflect unwilling or inability of management to innovate. Administrative barriers, bureaucracy and corruption are remarkable for enterprises during NPD. Official statistics proves this fact as 66% of population considers corruption to be a serious problem when doing business in Slovak Republic (Eurostat 2014). The given answers show that enterprises don't feel support for innovation activities from current rules of law and local judicial system.

Larger enterprises faced technological, marketing and organizational challenges as the most important. Indeed, the technological part of production is the basis of any significant development. The willingness of economic agents as well as opportunities of external environment to innovate is especially important for radical innovations. Nevertheless, enterprises argue that one of the challenges is that their close external environment (*e.g.* partners) are not ready for innovations. Internal and external impacts are needed to enhance the innovation activity and effectiveness of NPD.

Consclusion

Insufficient understanding of innovative advantages at a firm level and neglecting of modern achievements has created a significant gap for the country's innovation performance. In terms of innovation activity, Slovak Republic performs below the average European Union level with minor changes in the analysed period.

In the article has shown that moderate country innovator status corresponds with the low level of innovation activities at a firm level as well as the relatively limited total number of all enterprises engaged in innovation activities (one third of all enterprises). Such challenges as financial and human resources are still the key for smaller enterprises during NPD process while larger enterprises face technological, marketing and organizational challenges in the first place. The inability or unwillingness of some managers to innovate takes place at enterprises. The environment does not provide enough support to bust innovations.

Set of impacts at different levels is required to improve the efficiency of innovations, a new product development process and achieve meaningful changes at a firm level. At the government level, it is necessary to effectively manage the conditions for financing innovations, strengthen local funds, cooperation of university – industry – government – civil society, and improve innovative infrastructure. Another need is to intensify efforts to combat corruption and reduce its level. Work in this direction will help to create a favorable investment climate and stimulate the development of strong innovators communities.

At a firm level, there is a need to raise awareness of innovation activity superiority as a way of development, to stimulate innovations more actively, to update sets of using methods, practices and to share successful innovation experience. It is required to stimulate implementation of more open innovation model with the purpose to decrease period of NPD, expenditures, share risks. Building effective communications should be conducted based on interactive network technologies, allowing to speed up the collection and processing of information.

The dominant part of enterprises prefers more stable and highly predictable projects. Nevertheless, the adoption of projects with a higher risk has positive relationships with the innovativeness level of the products being launched. Smaller enterprises should be aware that high innovativeness products are not developed only by large enterprises. Positive relationships between number of developing products and number of successfully launched products were confirmed. The more experienced enterprises usually have higher share of successfully launched products. Updating the sets of applied methods using modern methods based on ICT technologies, such as crowdsourcing, simulation test marketing etc., will help to improve the efficiency of the NPD process. It is necessary to predict and measure not only the results of a product launch, but also pay special attention to predict and measure the NPD stages before a product launch. The most innovative and open-minded enterprises will remain part of the future market.

As a measure of success, we took a number and a share of successfully launched products by enterprises active in Slovak Republic. At the same time, different products may vary a lot by importance and impact on financial performance. For a deeper understanding, both monetary values and quantitative parameters are required. On the other hand, it is worthwhile to collect a larger sample to analyze groups of enterprises from certain areas of economic activity, to compare approaches in local and multinational enterprises, which usually have higher level of standards, staff qualification and financial opportunities. We proved that positive relationships exist between number/quantity of methods, number/quantity of applying indexes and high share of successfully launched products. Taking into account technology advances, it matters to study innovative and financial performance of enterprises applying emerging technologies such as Artificial Intelligence, Augmented and Virtual realities, Internet of Things, 3D Printing, Robots, Drones etc. compared to the other firms.

Acknowledgments

References

1. Arnkil, R., Järvensivu, A., Koski, P., Piirainen, T. 2010. *Exploring the Quadruple Helix*. The CLIQ project, Tampere. ISBN: 978-951-44-8208-3. Available at: https://www.researchgate.net/profile/Robert_Arnkil/publication/265065297_Exploring_the_Quadruple_Helix/links/540453540cf2c48563b07829/Exploring-the-Quadruple-Helix.pdf

2. Barbero, J.L., Casillas, J.C., Garcia, A.R. and Wright, M. 2014. Do different types of incubators produce different types of innovations? *Journal of Technology Transfer*, 39(2): 151 - 168.

3. Boso, N., Story, V.M., Cadogan, J.W., Micevski, M., and Kadić-Maglajlić, S. 2013. Firm Innovativeness and Export Performance: Environmental, Networking, and Structural Contingencies. *Journal of Marketing Research*, 21(4): 62 - 87.

4. Caraça, J., Ferreira, J.L., and Mendonça, S. 2007. *A chain-interactive innovation model for the learning economy:* Prelude for a proposal. ISEG, WP no. 12/2007/DE.

5. Carayannis, E.G, Barth, T.D., and Campbell, D.F.J. 2012. The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, 1: 1-12.

6. Chang, W., and Taylor, S.A. 2016. The Effectiveness of Customer Participation in New Product Development: A Meta-Analysis. *Journal of Marketing*, 80 (1): 47–64.

7. Chesbrough, H. 2003. The Era of Open Innovation. *MIT Sloan Management Review*, 44 (3): 35-41.

8. Clayton, C. 2003. The Innovator's Dilemma: The Revolutionary Book that Will Change the Way You Do Business. NY: HarperCollins, ISBN: 0060521996, 9780060521998, 286 pp.

9. Colwell, K., and Narayanan, V.K. 2010. Foresight in economic development policy: Shaping the institutional context for entrepreneurial innovation. *Futures*, 42 (4): 295-303.

10. Cooper, R.G. 2000. Winning with New Products. *Ivey Business Journal*, 64 (6): 54-61.

11. Cooper, R.G. 2008. Perspective: The Stage-Gate® Idea-to-Launch Process – Update, What's New, and NexGen Systems. *Journal of Product Innovation Management*, 25 (3): 213–232.

12. Drucker, P.F. 1985. *Innovation and Entrepreneurship: Practice and Principles*. – NY.: Harper & Row. – ISBN: 0060154284, 9780060154288, 277 p.

13. Eisend, M., Evanschitzky, H., and Calantone, R.J. 2016. The Relative Advantage of Marketing over Technological Capabilities in Influencing New Product Performance: The Moderating Role of Country Institutions. *Journal of International Marketing*, 24(1): 41–56.

14. Etzkowitz, H., and Leydesdorff, L. 1995. The Triple Helix – University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development. *EASST Review*, 14(1): 14-19.

15. Fang, E. 2008. Customer participation and the trade-off between new product innovativeness and speed to market. *Journal of Marketing*, 72 (4): 90-104.

16. Gkypali, A., Filiou, D., and Tsekouras, K. 2017. R&D collaborations: Is diversity enhancing innovation performance? *Technological Forecasting and Social Change,* 118: 143-152

17. Godin, B. 2006. The Linear Model of Innovation. The Historical Construction of an Analytical Framework. *Science, Technology, Human Values*, 31 (6): 639-667.

18. Griffith, D.A., and Lee, H.S. 2016. Cross-National Collaboration of Marketing Personnel within a Multinational: Leveraging Customer Participation for New Product Advantage. *Journal of International Marketing*, 24(4): 1–19.

19. Hoyer, W.D., Chandy, R., Dorotic, M., Krafft, M., and Singh, S.S. 2010. Consumer Cocreation in New Product Development. *Journal of Service Research*, 13 (3): 283–296.

20. Huston, L., and Sakkab, N. 2006. Connect and development. *Harvard Business Review*, 84(3): 58-66.

21. Knošková, L., and Kollár, V. 2011. Success Factors of Innovation Activities in Firms Active in Slovakia. *Ekomomicky Casopis,* 59 (10): 1067-1079.

22. Kubičková, V., Benešová, D., Breveníková, D. 2016. Relationships between Innovations and Productivity in the Services in the Slovak Economy. *Journal of Technology Management & Innovation*, 11(2): 46-55.

23. Kuester, S., Homburg, C., and Hess, S.C. 2012. Externally directed and internally directed market launch management: The role of organizational factors in influencing new product success. *Journal of Product Innovation Management*, 29: 38-52.

24. Laursen, K., and Salter, A. 2006. Open for innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal.* 27(2): 131-150.

25. Makó, C., Csizmadia, P., Illéssy, M., Iwasaki, I., and Szanyi, M. 2013. Diffusion of Innovation in Service Firms (Hungarian versus Slovakian Business Service Firms). *Journal for East European Management Studies*, 18(1): 135-147.

26. Marinova, R., and Phillimore, J. 2003. *Models of innovation.* In V. Shavinina (Ed.), International handbook on innovation. United Kingdom: Elserver, 44-53 pp.

27. Nizhegorodtsev, R., Goridko, N. 2016. *Ajar innovation strategy for knowledge-intensive companies: reliable methods for change management.* Innowacyjność współczesnych organizacji: wybrane aspect / Redakcja naukowa Ewa Wszendybył-Skulska. – Toruń, Poland: "Dom Organizatora", 207-225 pp.

28. Oh, J., Lee, S., and Yang, J. 2015. A collaboration model for new product development through the integration of PLM and SCM in the electronics industry. *Computers in Industry*, 73(C): 82-92.

29. Rochina-Barrachina, M.E., Mañez, J.A., and Sanchis-Llopis, J.A. 2010. Process innovations and firm productivity growth. *Small Business Economics*, 34(2): 147–166.

30. Schatzel, K., and Calantone, R. 2006. Creating market anticipation: An exploratory examination of the effect of preannouncement behavior on a new product's launch. *Journal of the Academy of Marketing Science*, 34(3): 357-366.

31. Stevens, G.A., and Burley, J. 1997. 3000 Raw Ideas = 1 Commercial Success! *Research Technology Management,* 40(3): 16-27.

32. Von Hippel, E. 1998. Economics of Product Development by Users: The Impact of "Sticky" Local Information. *Management Science*, 44(5): 629-644.

33. Wan, H.H., and Quan, X.I. 2014. Towards a Framework of the Process of Open Innovation: Case of Acclarent in the Medical Device Industry. *International Journal of Innovation and Technology Management,* 11: 5.

34. Wei, C.C., Andria, A., Xiao, H.W., Wei, C.S., and Lai, T.C. 2016. A new fuzzy decision-making approach for selecting new product development project. *Concurrent Engineering Research and Applications*, 24(3): 240-250.

35. Wu, J. 2013. Marketing Capabilities, Institutional Development, and the Performance of Emerging Market Firms: A Multinational Study. *International Journal of Research in Marketing*, 30(1): 36-45.

36. Yawson, R.M. 2009. The Ecological System of Innovation: A New Architectural Framework for a Functional Evidence-Based Platform for Science and Innovation Policy. The Future of Innovation Proceedings of the XXIV ISPIM Conference, Vienna, Austria, June 21-24

*** European Commission. 2016. European Innovation Scoreboard 2011-2016. Available at: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

*** Eurostat. 2014. EU Anti-corruption report 2014. Available at: https://ec.europa.eu/home-affairs/ sites/homeaffairs/files/what-we-do/policies/organized-crime-and-human-trafficking/corruption/anti-corruption-report/docs/2014_acr_slovakia_factsheet_en.pdf

*** Inc. 5000. 2017. Europe start-ups. Available at: https://www.inc.com/inc5000eu

*** Nielsen. 2016. *Innovation analytics*. Available at: http://innovation.nielsen.com/innovationanalytics2

*** OECD 2007. Innovation and growth: rationale for an innovation strategy. Available at: http://www.oecd.org/sti/inno/39374789.pdf

*** OECD 2017. Science, Technology and Patents. Available at: https://stats.oecd.org/Index.aspxDataSetCode=PATS_IPC

*** Oslo Manual 2005. Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, 48 pp.

*** The Slovak Statistics. 2017. Available at: http://statdat.statistics.sk/cognosext/cgibin/cognos.cgi?b_action=cognosViewer&ui.action=run&ui.object=storeID("i3676DC3EFEC8473BBEE30F65B2E8D398")&ui.name=Innovation%20%5bvt0003rs%5d&run.outputFormat=&run.prompt=true&cv.header=false&ui.backURL=%2fcognosext%2fcps4%2fportlets%2fcommon%2fclose.html

*** The World Intellectual Property Organization. 2017. Available at: http://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=SK

Evaluations and Prospects for Developing Logistics System of the Commodity Distribution Network in the Regions of Kazakhstan

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Abstract:

The logistics system of the distribution network has the greatest impact on economic growth and structural development of the economy.

Despite the results achieved with the development and improvement of methods and models for constructing a commodity distribution structure for a country with a huge territory but sparsely populated regions like Kazakhstan and, accordingly, with undeveloped infrastructure of the commodity distribution network, further research and differentiation of approaches in managing the development of the commodity distribution structure, taking into account their investment attractiveness and logistic potential is required. Based on the formed group of indicators, characterizing the logistics infrastructure of the distribution network, an assessment of the investment attractiveness and development of the distribution network's infrastructure, describing the logistical potential of the regions of Kazakhstan through comparative analysis and ranking was carried out. Based on the regions' classification, three types of territories were identified depending on the level of the logistics business attractiveness and the potential for infrastructure development of the distribution network of regions. The recommended differential approach for state support and stimulation of the transport and logistics infrastructure development for these groups is based on considering the current state of economic development and the developing trends in the transport and logistics potential of the regions. In the program of regional development, it is proposed to differentiate measures for stimulating the commodity distribution network development: taxation system, investment, structure and composition of the logistics system for commodity circulation.

Keywords: logistics; commodity distribution network; logistics potential; region; investment attractiveness

JEL Classification: O18; L5; L9; R1; R5; H54

Introduction

The effectiveness of logistics development in general affects the development of the country's economy, its competitiveness and ability to attract investment, and reflects the levels of socio-economic development of the country's regions.

Therefore, the assessment of the potential for the distribution network infrastructure development is important, as it provides an opportunity to take measures for its further modernization and stimulation of development.

Analysis of international and domestic experience in the development of logistics and its infrastructure reveals the following tools for stimulating and developing logistics: the construction of infrastructure facilities at the expense of the state, the use of public-private partnership mechanisms, the provision of various benefits, as well as the creation of the necessary administrative conditions to attract private capital for the development of infrastructure facilities (Wilmsmeier, Monios and Lambert 2011).

However, in order to determine the optimal instrument for influencing the development of logistics and the providing infrastructure of the commodity circulation system in the region, it is necessary to classify regions

according to the extent of their economic attractiveness and the companies that work there, and then take actions to develop them.

1. Literature Review

The development of logistics and the infrastructure of commodity circulation in different countries, assessing and improving its development effectiveness are determined on the basis of its attractiveness and the investment potential of the country. These issues are considered in the following studies: (Ross and Parker 2012), (Brian, Fugate and Mentzer 2010), (Ng and Gujar 2009), (Bilovodska, Gryshchenko and Syhyda 2016), (Jevtic, Radmanovac, Barkovic and Runzheimer 2008), (O'Connor 2010), (Lean 2014), (Hesse 2004), (Tsamboulas 2013), (Roso 2008), (Wilmsmeier Monios and Lambert 2011), (Dybskaya and Sverchkov 2017).

Previously, the state was the owner and the responsible party for the infrastructure development, then since 1990 public-private partnership (PPP), especially in road projects, began to develop (Tsamboulas 2013), PPP started to be widely used in EU countries (Jevtic, Radmanovac, Barkovic and Runzheimer 2008).

Many factors influence the development of the logistics potential of commodity circulation, among them: infrastructure, land use, environment and rules (Ross and Parker 2012, O'Connor 2010) that limit the development of certain territories (Hesse 2004, Roso 2008) can be distinguished. The development of logistics and the priorities of its development through government support, PPP and other mechanisms are considered in studies (Ng and Gujar 2009, Jevtic, Radmanovac, Barkovic and Runzheimer 2008, Wilmsmeier, Monios and Lambert 2011).

In these studies, the emphasis is on assessing the development of logistics of the country or territory (city, district). The need to locate and develop the logistics of this region is determined by its economic potential, investment attractiveness and logistics environment.

At the moment, the countries of Western Europe and the developed Asian regions are taking the lead in logistics development level ("Global Rankings 2016" 2016). So, according to the Logistics Performance Index (LPI), determined by the World Bank, according to the overall level of logistics development in 2016, the world leader among 160 countries is Germany, with the index value of 4.23 points (Table 1), Luxembourg, Sweden and others.

Table 1. Data on the assessment of the logistics development level in the countries worldwide in 2016, in points

Countries	Rank LPI	LPI Rating	Customs	Infra-structure	International transportation	Competence in logistics	Possibility of tracking the goods	Observance of delivery terms
Germany	1	4.23	4.12	4.44	3.86	4.28	4.27	4.45
Luxemburg	2	4.22	3.90	4.24	4.24	4.01	4.12	4.80
Sweden	3	4.20	3.92	4.27	4.00	4.25	4.38	4.45
Holland	4	4.19	4.12	4.29	3.94	4.22	4.17	4.41
Singapore	5	4.14	4.18	4.20	3.96	4.09	4.05	4.40
…								
Kazakhstan	77	2,75	2,52	2,76	2,75	2,57	2,86	3,06
Ukraine	80	2,74	2,30	2,49	2,59	2,55	2,96	3,51
Russia	99	2,57	2,01	2,43	2,43	2,76	2,62	3,15
Belarus	120	2,40	2,06	2,10	2,62	2,32	2,16	3,04

Source: compiled according to the source "Global Rankings 2016"

Kazakhstan ranks 77th (with an LPI of 2.75 points) and is ahead of the former Union countries such as: Russia, Ukraine and Belarus. At the same time, the highest indicator of the existing logistics of our country, at the moment, is the observance of delivery terms (an estimate of 3.06 points).

The World Bank LPI evaluation methodology is not an ideal model for copying, since it is based only on the results of surveys of predominantly international (transnational) logistics companies. At the same time, there is no survey of the logistics services consumers. The peculiarities of individual countries, for example, the access to the sea, the area of the territory, *etc*., are not taken into account.

The Emerging Market Logistics Index developed by Transport Intelligence (UK) reflects the attractiveness of the logistics market for foreign investment. The index is determined on the basis of three intermediate indicators: the size and dynamics of market development, market compatibility, development of transport communications ("Agility Emerging Markets Logistics Index 2016" 2016).

According to data for 2016, out of 45 developing economies countries, Russia took 9th place (in 2015 - the 7th), Kazakhstan - 18th (in 2015 - 18th), Ukraine - 34th (in 2015 - the 38th). The first places in this ranking are occupied by China, the United Arab Emirates, India, Malaysia, Saudi Arabia, Brazil and Indonesia.

In terms of the logistics development level, Kazakhstan currently lags far behind developed countries. However, recently there has been a positive development trend in terms of the growth of state investment in the construction and rehabilitation of roads and railways throughout the country, modernization and expansion of the logistics system of postal services in Kazakhstan, the development of a regional logistics infrastructure through regional budgets and the private sector, *etc*.

A comprehensive analysis of the logistics formation and development in foreign countries shows the presence of the following options for state participation in its development (Wilmsmeier, Monios and Lambert 2011): the state takes a direct part in its development (*for example*, Sweden); the private sector develops terminals and logistics centers, and the government encourages this process in every possible way through spatial planning and financing (for example, Scotland); the state's participation share is insignificant (for example, the USA).

A successful model of regional logistics infrastructure development in the European Union is, first of all, provided by strong state support at all levels, which is based on federal laws and involves the involvement of the public sector both at the planning stage and the implementation of effective infrastructure development projects (Nyzhehorodtseva, Nikitenko and Hoosen 2012).

The purpose of the work: assessment of the commodity distribution network (transport, logistics and trade) infrastructure development potential of the Kazakhstan's regions and the definition of the optimal instrument for regulating the development of the commodity circulation network logistics infrastructure in the regions of Kazakhstan. The objectives of the study are: to carry out the classification of regions for a number of economic indicators that reflect the prospects for the distribution network infrastructure development, and to make the proposal for their development.

2. Methodology

As the methodology of the study the official statistical data of the Statistics Committee of Kazakhstan for 2014-2016 were used ("Statistical compilation" 2016), as well as expert methods of interviewing regional transport and logistics companies. The survey was carried out for indicators that are not available in statistical materials (respondents assess the logistics system of the region in which they work on a three-point scale). On their basis the integral index and the place among the regions of the country participating in the rating are calculated.

Groups of indicators are proposed, which, in our opinion, fully characterize the potential for the commodity circulation infrastructure development for a specific region. These include:

- The investment attractiveness of the region from the point of view of developing the infrastructure of the commodity circulation system;
    - 1.1. General economic indicators related to the transport-logistical and trade complex;
    - 1.2. Entrepreneurial activity in the region associated with the use of transport - logistical and trade infrastructure.
- The potential for the infrastructure of the commodity distribution network development in the region. The indicators of the level and potential of the regional commodity distribution network logistics development consist of two groups. The potential for the commodity distribution network infrastructure (CDNI) development of the region, consisting of a system of indicators that characterize, respectively, the performance of transport and logistics activity in the sector (2.1), the potential for the development of transport infrastructure (2.2), the potential for the development of a logistics infrastructure (2.3) (2.4), the production potential of the region (2.5), the institutional security potential of the sector (2.6).

Investment attractiveness of the distribution network infrastructure in the region:

1.1. General economic indicators include the population of the region; the purchasing power of the population of the region (rated from "low" -1 to "high" - n (where n is the number of regions); as well as the capacity of the market of transport and logistics services; the level of specialists' qualification in the transport and logistics industry; provision of transport and logistics infrastructure (rated: 1-low, 2-medium, 3-high);

1.2. Entrepreneurial activity of the region is characterized by the region's gross regional product; investment in transport and storage; level of labor productivity (rated from: "low" -1 to "high" – n), and also: regional investment risks (rated 1-low, 2-medium, 3-high);

The potential of the commodity distribution network infrastructure (CDNI) development of the region is determined by the rating in ascending order from: "low" - 1 to "high" - n (where n is the number of regions).

2.1. Transport and logistics industry activity indicators (in%) are: the share of goods passing through transport and logistics centers, freight terminals; the share of modern transport and logistics centers, freight

terminals in the regions to their total number; the share of employed in the industry to the average annual number of employed in the economy; the share of transport and logistics organizations implementing technological innovations in the total number of organizations.

2.2. The potential for the transport infrastructure development: the density of railway communication lines per 1000 sq. km. of territory; operational length of public railway lines; length of public roads; density of public roads with hard surface, km per 1000 sq.km, availability of airports, length of main pipelines, km.

2.3. Potential for the logistics infrastructure development: the area of modern warehouses of Class A, B; availability and capacity of cargo terminals; availability and capacity of the transport and logistics center; availability of information and logistics center and level of information support; capacity of warehouse equipment; number of logistic operators.

2.4. Potential for the trade infrastructure development: the number of wholesale and retail trade enterprises; the volume of retail and wholesale turnover; availability and area of the sales area; volume of foreign trade turnover per capita, USD.

2.5. Production potential: the volume of goods shipped, manufacturing; average range of 1 ton of cargo transportation; import into the region; transportation of goods and freight turnover by road; transportation of goods and freight turnover by rail; transportation of goods and cargo turnover by air transport; transportation of goods and cargo turnover by water transport; cargo transportation and pipeline turnover.

2.6. Institutional potential in the field of transport and logistics: the share of employed in small and medium-sized enterprises in the industry; number of forwarding companies, as well as: the unemployment rate in the transport and logistics complex; indices of tariffs for freight transportation by transport (rated from high -1 to low - n).

According to the above indicators, we calculate the quantitative values of the indicators that make up the potential of the CDNI of the region as the sum of the values of the corresponding indicators. The integral index of the CDNI of each region consisting of six groups of indicators was calculated according to the following formula:

$$I_{int} = \sqrt[6]{I_{2.1} \cdot I_{2.2} \cdot I_{2.3} \cdot I_{2.4} \cdot I_{2.5} \cdot I_{2.6}} \ , \tag{1}$$

3. The main results of the study

The ranking of the regions is conducted by two groups of indicators. The first group of indicators is the investment attractiveness of the region's infrastructure. The second group of indicators is the commodity distribution network infrastructure development potential in the region.

Ranking assesses the location of the region of the country according to the relevant indicators. The principle of ranking is presented more detailed in Table 2 on the example of the "population size" indicator.

Table 2. Example of ranking regions by the "population size" indicator

Region	Number of the population, people	Location of the region by indicator, in ascending order	Coefficient of the region by indicator
Akmola	744.386	6	0,006
Aktobe	834.768	8	0,008
Almaty	1.947.481	15	0,016
Atyrau	594.562	2	0,002
West Kazakhstan	636.852	4	0,004
Zhambylsky	1.110.907	11	0,011
Karaganda	1.384.889	12	0,012
Kostanay	883.640	10	0,010
Kyzylorda	765.171	5	0,005
Mangistau	626.793	3	0,003
South-Kazakhstan	2.841.307	16	0,017
Pavlodar	758.479	7	0,007
North-Kazakhstan	569.446	1	0,001
East Kazakhstan	1.395.797	13	0,014
Astana city	872.619	9	0,009
Almaty city	1.703.482	14	0,015

Source: Authors' research data

The ranking of the region (Table 2) is determined by an increasing principle: the first place corresponds to the minimum indicator. This approach will allow further to maintain direct dependence: the largest indicators reflect the most optimal sales markets.

Similar approaches were used to rank the regions of Kazakhstan according to the indicators of the group that characterize the investment attractiveness (Table 2) and the potential for the development of the infrastructure of the commodity distribution network in the region (Figure 1, Table 2).

As follows from Figure 1 the possibilities of the distribution network infrastructure in the regions of Kazakhstan are different. Regions that have a strategic export and raw materials orientation have a higher potential in comparison with agro-industrial regions. For example, the highest level of infrastructure potential is noted in Almaty, Aktyubinsk, Mangistau, East Kazakhstan and Karaganda regions. A high level of infrastructure growth is noted in Akmola, South Kazakhstan, West Kazakhstan. Low potential is noted in Zhambyl, Kyzylorda, North Kazakhstan and Atyrau regions.

Table 3 presents summary results of Kazakhstan's regions ranking by the criteria of investment attractiveness and logistic potential.

Table 3. Summary results of ranking regions of Kazakhstan

Regions	Integral indicator characterizing the investment attractiveness of the region	An integral indicator characterizing the potential of the distribution network infrastructure development
Akmola	0,054	0,167
Aktobe	0,058	0,22
Almaty	0,087	0,261
Atyrau	0,043	0,16
West Kazakhstan	0,056	0,162
Zhambyl	0,021	0,116
Karaganda	0,056	0,25
Kostanay	0,027	0,192
Kyzylorda	0,017	0,129
Mangistau	0,052	0,212
South Kazakhstan	0,076	0,201
Pavlodar	0,044	0,198
North-Kazakhstan	0,008	0,115
East Kazakhstan	0,054	0,274
Astana city	0,093	0,289
Almaty city	0,109	0,315
National average	**0,053**	**0,203**

Source: Authors' research data

Figure 1. Integral potential of the commodity distribution network infrastructure of the Kazakhstan's regions, data for 2015
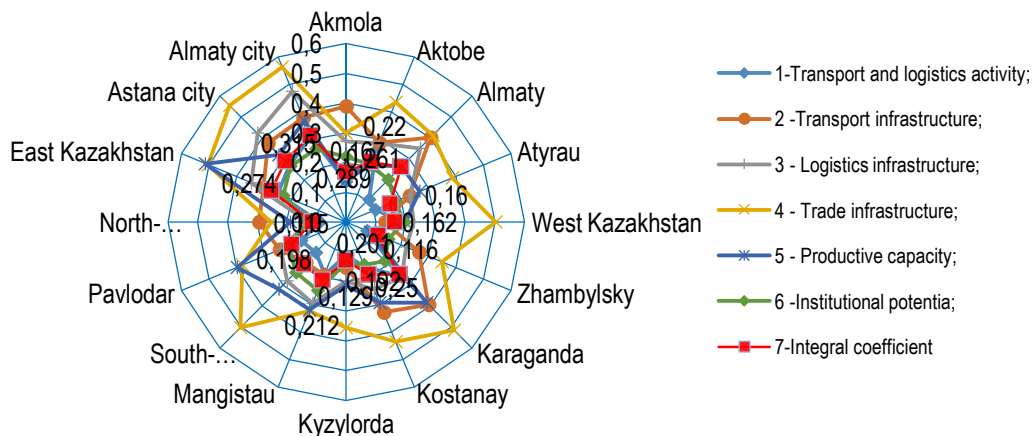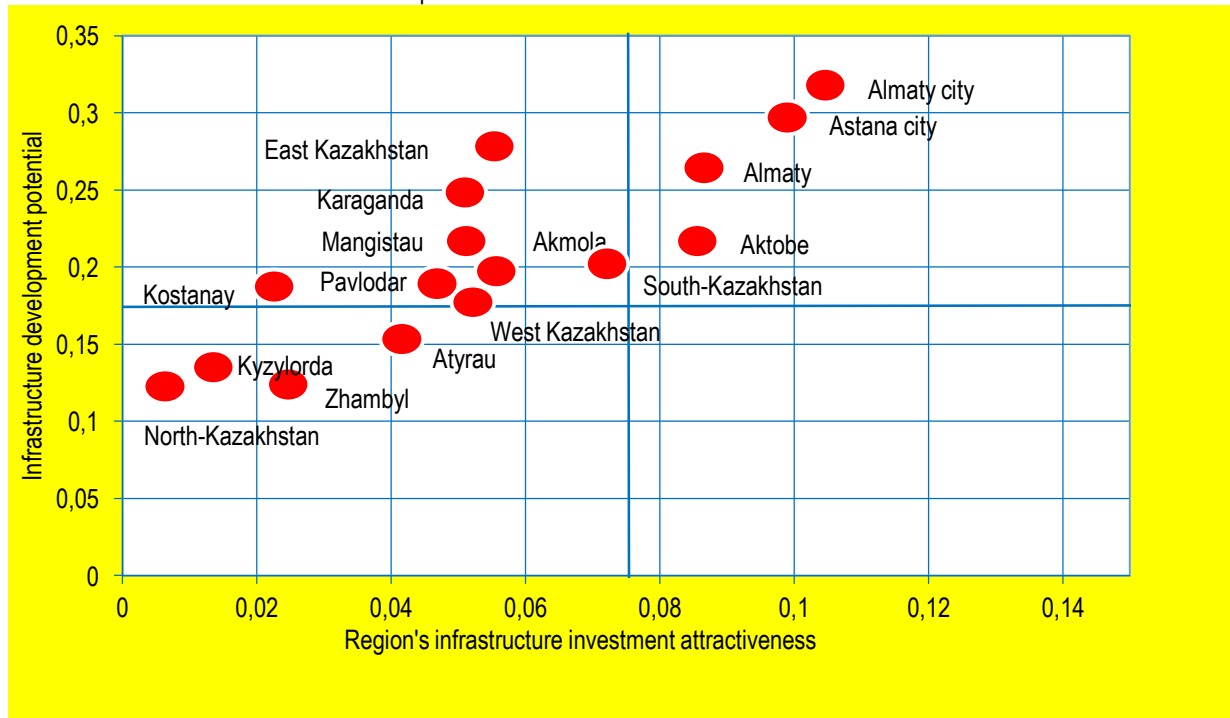

Source: Authors' research data

Comparative analysis of individual indicators allows us to make the following conclusion: although the infrastructure indicators are distributed more evenly by region, with the exception of Almaty city, Astana city and Almaty region where the growth rate is high, the infrastructure potential is low in economically underdeveloped regions.

The most conspicuous summary of the region investment attractiveness and the potential for the commodity distribution network infrastructure development are presented in Figure 2.

Figure 2. The distribution of the Kazakhstan regions in terms of investment attractiveness and the potential for the development of the distribution network infrastructure

Source: Authors' research data

The typology of the Kazakhstan regions in accordance with the level of use and the potential for the commodity distribution network logistics development in the regions is presented by groups:

Group 1 - regions that have high investment attractiveness and are characterized by a high demand for the development of the distribution network infrastructure: Almaty city and Almaty region, Astana, Aktobe, South Kazakhstan region. They can be attributed to investment attractive regions since they have developed infrastructure, characterized by high incomes of the population, high population.

Group 2 - regions with medium investment attractiveness and characterized by a high demand for the development of transport and logistics infrastructure: East Kazakhstan, Karaganda, Mangistau, Kostanay, Pavlodar, Western Kazakhstan. These regions are relatively attractive for business development as they are characterized by a fairly developed infrastructure, medium-high per capita incomes, medium-high density and population.

Group 3 - regions that have low investment attractiveness and are characterized by a low need for the development of transport and logistics infrastructure: North Kazakhstan, Zhambyl, Kyzylorda, Atyrau regions. These regions are unattractive from the economic point of view for private business. For such territories it is necessary either to organize infrastructure facilities at the expense of the state, or to provide direct subsidies for private companies doing business in these territories.

Thus, the study made it possible to classify the types of regions and assess the homogeneity of the population under study.

4. Discussion of the research results

Prospective programs to support the distribution network infrastructure development (transport, logistics, trade) by central and local governments for these groups should be presented differentially. Let us consider the mechanisms of state influence in various regions of Kazakhstan.

First group regions do not require investments from the state as characterized by high investment attractiveness. It proposes the introduction of a comprehensive program for the regions development, which includes both partial financing by the state of transport and transport logistics infrastructure construction, logistics and trade, and preferential incentives for transport and logistics infrastructure facilities projects. This is due to the fact that investors have a high degree of interest in developing the logistics infrastructure of these regions and can count only on partial state support at the first stages of development. A typical example is the cities of Almaty and Astana. As the main instruments and measures to support and stimulate the distribution network infrastructure development of logistics that do not require the diversion of public funds, the following may be mentioned:

- mandatory development of a program for the commodity distribution infrastructure development at the regional level;
- mandatory urban planning, providing for the allocation of necessary land areas for trade, logistics and other similar organizations;
- development at the state level of a uniform methodology for calculating the target population's supply of warehouse logistics facilities of various types and formats, depending on the population density, income level and other factors;
- at the regional level - development of town planning documentation in accordance with this methodology and ensuring its implementation;
- provision of land and space for the construction of logistics facilities and transport-warehouse infrastructure facilities based on open tenders / auctions;
- application of mechanisms related to public financing of the logistics infrastructure of goods movement development;
- expansion of the border customs infrastructure clearance points; simplification of the goods customs clearance procedure, including the renewal of the ability to control documents in the regions - the location of the recipients of goods.

For the second group of regions the regional development program assumes the state's participation in the design and financing of the region's transport and logistics infrastructure. It is advisable to coordinate the efforts and resources of this program within the framework of a single state program to support small businesses in the transport and logistics area. In this program, among other things, it is necessary to envisage the creation of a non-profit organization with branches in all regions of the second group, *i.e.* favorable for public investment. In this case, it is a large logistic system. As the world experience shows, the creation of a national logistics organization that has all the characteristics of a 3-4PL provider is practically impossible without governmental support.

For the regions of the third group it is necessary to develop an integrated development program that is not limited to investments alone. The program is based on incentives and other state support for already existing transport and logistics facilities. The main tools of state stimulation of the development of the logistics infrastructure that do not require government investments in disadvantaged regions in terms of economic efficiency are:

- provision of land to the logistics companies on preferential terms or free of charge;
- inclusion in the condition of a tender for gaining access for a logistics company to an attractive market for the obligation to open service points at a remote and economically unattractive territory;
- provision of tax incentives for logistic companies and logistics players by the legislative (representative) bodies of state power of the Republic of Kazakhstan and representative local authorities: property tax relief and other regional and local taxes; transfer of the collected corporate tax back to the logistic player.

Conclusion

According to the proposed groups of indicators, an assessment of the Kazakhstan's regions potential on investment attractiveness and the distribution network infrastructure development was carried out. Based on the classification of regions three types of territories were identified depending on the level of the logistics business attractiveness (attractive, relatively attractive, and unattractive) and the potential for the distribution network infrastructure development of the regions (high, medium, and low).

This approach has made it possible to divide the regions of Kazakhstan into three groups, for each of which differentiated measures of state and non-state support for the logistics infrastructure development of these regions

are proposed. The most important tools of state macro-logistical policy should be not only normative and legal documents development, but also programs for the development of regions in terms of their distribution network infrastructure development level and investment attractiveness, which allows introducing a differentiated system of taxation of logistics activities.

The recommended differential approach to state support and stimulation of the transport and logistics infrastructure development (taxation system) by central and local governments for these groups is based on taking into account the state of economic development and the transport and logistics potential regional development trend.

References

[1] Bilovodska, O., Gryshchenko, O., and Syhyda L. 2016. Specific features of regional logistics potential consideration in the process of the enterprise distribution system development. *Economic Annals-XXI*, 160(7-8): 105-110. DOI: 10.21003/ea.V160-21

[2] Brian, S., Fugate, J., and Mentzer, J. 2010. Logistics performance: efficiency, effectiveness, and Differentiation. *Journal of Business Logistics,* 31(1): 43-62. DOI: 10.1002/j.2158-1592.2010.tb00127.x

[3] Dybskaya, V., Sverchkov, P. 2017. Designing a rational distribution network for trading Companies. *Transport and Telecommunication*, 18(3): 181–193. DOI 10.1515/ttj-2017-0016

[4] Hesse, M. 2004. Land for logistics: Locational dynamics, real estate markets and political regulation of regional distribution complexes. *Tijdschrift Voor Economische En Sociale Geografie,* 95(2): 162-173. DOI: 10.1111/j.0040-747X.2004.t01-1-00298.x

[5] Jevtic, M., Radmanovac, M., Barkovic, D., and Runzheimer. 2008. Logistics in European traffic policy. *Interdisciplinary Management Research,* 4: 516-525.

[6] Lean, H., Huang, W., and Hong J. 2014. Logistics and economic development: Experience from China. *Transport Policy,* 32: 96-104. DOI: https://doi.org/10.1016/j.tranpol.2014.01.003

[7] Ngª, A.K.Y., Gujar, G.C. 2009. Government policies, efficiency and competitiveness: The case of dry ports in India. *Transport Policy,* 16 5): 232-239. DOI: https://doi.org/10.1016/j.tranpol.2009.08.001

[8] Nyzhehorodtseva, R., Nikitenko, S., and Hoosen, E. 2012. *The State-Private Partnership in the Innovation Sphere: World Experience and Prospects of Russia*. Kemerovo: Siberian Publishing Group.

[9] O'Connor, K. 2010. Global city regions and the location of logistics activity. *Journal of Transport Geography*, 18(3): 354-362. DOI: 10.1016/j.jtrangeo.2009.06.015

[10] Ross, A.D., Parker, H., del Mar Benavides-Espinosa, M., and Droge, C. 2012. Sustainability and supply chain infrastructure development. *Management Decision*, 50(10): 1891-1910. DOI: 10.1108/00251741211279666

[11] Roso, V. 2008. Factors influencing implementation of a dry port. *International Journal of Physical Distribution & Logistics Management,* 38(10): 782-798. DOI: https://doi.org/10.1108/09600030810926493

[12] Tsamboulas, D., Verma A., and Moraitia, P. 2013. Transport infrastructure provision and operations: Why should governments choose private e-public partnership? *Research in Transportation Economics,* 38(1): 122-127. DOI:10.1016/j.retrec.2012.05.004

[13] Wilmsmeier, G., Monios, J., and Lambert, B. 2011. The directional development of intermodal freight corridors in relation to inland terminals. *Journal of Transport Geography,* 19(6): 1379-1386. DOI:10.1016/j.jtrangeo.2011.07.010

*** Agility Emerging Markets Logistics Index 2016. *Transport Intelligence*. Accessed 23 March, 2017. Available at: http://www.transportintelligence.com.

*** Global Rankings 2016. *Logistics Performance Index*. Accessed 25 February, 2017. Available at: https://lpi.worldbank.org/international/global/2016

*** Statistical compilation. Committee on Statistics of Republic of Kazakhstan. Accessed 11 February, 2017. Available at: http://stat.gov.kz/eng

Foreign Direct Investment and Economic Development: A Long-run Examination for Three Emerging ASEAN Economies

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Abstract:

The paper examines and provides a comparative assessment with respect to the long-run dynamics of inward foreign direct investment (FDI) and economic development in Cambodia, Laos, and Vietnam during 1994-2016. Through a cointegration analysis, the paper first investigates whether a long-run equilibrium relationship exists between FDI and real GDP per capita. After cointegration is verified, it subsequently assesses the long-run effect of FDI on development. The results indicate that in each of the three emerging ASEAN economies inward FDI and real GDP per capita are cointegrated, and thus exhibit a stable long-run relationship over the study period. The magnitude of the quantitative impact of FDI differs among the three countries. The long-run elasticity of FDI is found to be at a similar level in Cambodia and Laos, whilst the elasticity estimate of Vietnam is considerably higher. This indicates that in Vietnam the size of the positive effect of inward FDI is significantly larger. Overall, our long-run analysis reveals that a steady upward trend in FDI has been achieved over the study period and that the inflow of FDI has had a substantial beneficial effect on real GDP per capita levels. Consequently, the findings imply that economic development would be expected to be strengthened by policies that facilitate inward FDI.

Keywords: FDI; economic development; Cambodia; Laos; Vietnam; cointegration analysis

JEL Classification: F21; F43; O47; O53; O57

Introduction

Due to successful efforts of intra- and extra-regional economic integration, the economies of the Association of Southeast Asian Nations (ASEAN) have become particularly outward-oriented and attracted a large number of multinational enterprises (MNEs) and foreign investors (*e.g.* Ambashi 2017, Mikic and Jetin 2016, Kawai and Naknoi 2015). Theory and empirical evidence, in general, suggest that inward foreign direct investment (FDI) is associated with favorable outcomes to host-countries such as long-term economic growth (*e.g.* UNCTAD 2017). Though there are many studies on Indonesia, Malaysia, Philippines, Singapore and Thailand, which are known as ASEAN-5 (*e.g.* Tan and Tang 2016, Flora and Agrawal 2015), little attention has been paid to the less developed ASEAN economies (such as Cambodia, Laos, and Vietnam), which joined the bloc around the mid and late nineties. As a result, there is only a rather limited accumulated stock of detailed information and evidence on the subject matter (*e.g.* Sothan 2017, Bhatt 2013, Kotrajaras *et al.* 2011, Srinivasan *et al.* 2010).

However, it has to be noted that though the emerging economies of Cambodia, Laos, and Vietnam are latecomers and less free market-driven and open, they nevertheless have over the years increasingly opened up their economies and have become the target of many multinational enterprises. This suggests that the positive economic growth effects of ASEAN integration and FDI are likely to have manifested in those member countries as well. Hence, as there is clearly scope to provide information and expand further the evidence for those emerging economies, the main objective of this paper is to examine whether foreign investment from MNEs contributes to economic growth and development in the long-term. More specifically, our analysis examines whether there exists a stable long-run equilibrium relationship between inward FDI and economic development during the 1994-2016 period, and estimates the quantitative impact that FDI has on development.

1. Literature Review

We review and provide only the key points with respect to theoretical and empirical aspects of the link between FDI and economic growth. A full presentation of the subject is rather intricate, requiring, on the one hand, a detailed theoretical analysis and, on the other hand, a comprehensive discussion of numerous empirical findings, which is

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beyond the scope of this section. A schematic illustration of the link between inward FDI and a host-country's economic development is presented in Figure 1. In a nutshell, inward FDI can have a positive impact on economic growth and development through two main causal growth channels that is, via direct effects and indirect effects. With respect to the direct effects, the most obvious beneficial influence on a host-country's economy arises from the capital that foreign investors and multinational enterprises (MNEs) provide to the domestic economy. The capital inflow expands the capital stock and the productive capabilities of the host-country.

Furthermore, in case FDI is directed towards sectors and activities, which exhibit higher value goods as well as a higher marginal product of capital, the productivity of the domestic economy increases significantly resulting in accelerated economic growth. Other direct effects of FDI come in the form of improved organizational structure and innovation, superior managerial skills, know-how, and technology of the affiliate firm (belonging to the parent MNE) operating in the domestic economy. As a result, the host-economy improves in those aspects which leads to more sophisticated production as well as international competitiveness contributing to more exports and long-term economic growth prospects.

With respect to the positive indirect effects of FDI, the literature identifies that those arise predominantly from technological spillovers to indigenous firms and entrepreneurs. The superior know-how and technology of MNEs can potentially spill-over to the rest of the host-economy in the form of imitation, transfer, and adoption of advanced management techniques, new production methods, product innovation, and superior human resources. Existing local firms and start-up companies benefit from those spillovers, resulting in increased entrepreneurship, economic activity, and aggregate output.

Moreover, additional beneficial indirect effects can come in the form of (other than technological and knowledge) horizontal and vertical linkages. In the case of horizontal linkages, the presence of MNEs in an industry increases the productivity and growth prospects of local firms within the same industry due to, for instance, agglomeration economies or certain business to business relationships. With vertical linkages there exist vertical input-output relations between the MNEs and local companies operating in different industries. Those linkages provide the potential for economic benefits and growth of other industries in the host-country.

Figure 1. The link between inward FDI and economic development
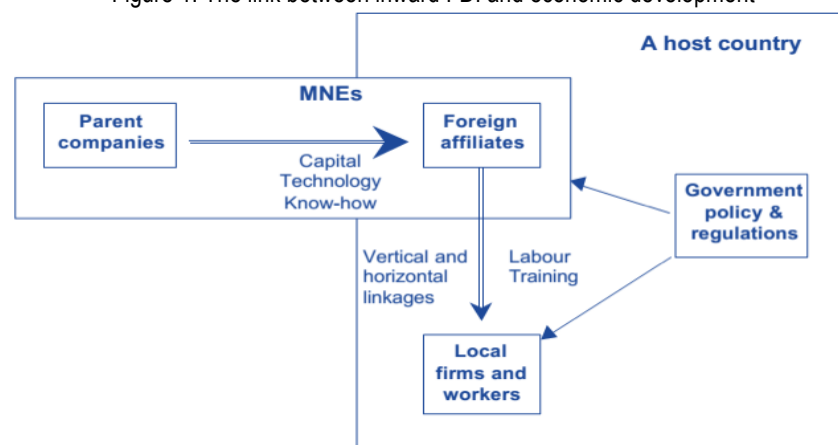
Source: Reproduced from JBIC Institute (2002).

As regards the empirical evidence on the growth effect of inward FDI in Asia, we may first note that the relevant literature has predominantly focused on the founding ASEAN countries (that is, Indonesia, Malaysia, the Philippines, Singapore, and Thailand) as well as on certain South and East-Asian economies (*e.g.* China, Hong-Kong, India, and Korea). Low-income countries in Southeast Asia have received relatively less attention. Without going into the exhaustive details, the main insight that generally emerges from the findings of empirical studies, is that increasing FDI inflows have contributed to economic growth (*e.g.* Ridzuan *et al.* 2016, Sothan 2016, Bhatt 2014, Fakher 2012, Hussin and Saidin 2012, Choong and Liew 2009, Marwah and Tavakoli 2004). More specifically, studies that are based on a long-run perspective find that in most cases there is evidence of a long-run equilibrium relationship among the two economic phenomena. However, the magnitude of the positive FDI effect and the long-run relationship can differ substantially between the countries under examination. This suggests that generalizations are less useful for country-specific information and policy implications and that empirical assessments of individual countries and their long-run experiences are required.

2. Variables and Research Methodology

As we investigate the long-run causal linkages between FDI and economic development, we consider the following two series over a long time period (1994-2015):

- real inward FDI stock (FDI), as an indicator of an economy's extent of inward foreign direct investment;
- real GDP per capita (DEV), as an indicator of an economy's level of economic development.

DEV is obtained from the United Nations National Accounts database, and the inward FDI stock is taken from the United Nations FDI database. Both series are in constant 2005 prices in US dollars. DEV is already in constant 2005 prices in United Nations statistics database. For the inward FDI stock, which is originally in current prices (nominal), we convert it into real inward FDI stock, using each country's GDP deflator with base year 2005 (obtained also from United Nations statistics database). Finally, we convert both series into natural logarithms, Log (FDI) and Log (DEV). Thus, as presented in detailed below, the long-run analysis includes variables in logs and the cointegrating regression equation (which is log-linearized in this way) indicates the marginal effect of FDI on DEV as an elasticity (which is the usual approach in this literature).

Since the study aims at assessing the individual country long-run dynamics and FDI-development nexus and providing a comparative view, the empirical long-run analysis is conducted for each of the three emerging ASEAN economies (Cambodia, Laos, and Vietnam) during 1994-2016, using the same time period, data source, and definitions of the series. The latter is particularly important with respect to FDI, where various measures or concepts of FDI are used in the literature, which differ substantially and make direct comparisons less applicable. Our empirical approach allows us to provide country-specific information as well as a comparative assessment. Thus, as we analyze the links over time for each country separately, our empirical analysis is based on time-series modeling, with which we examine the existence of a long-run equilibrium relationship between economic development and FDI. The appropriate time-series methodology for this examination depends on a variety of issues such as, the series' stationarity properties, order of integration, time-series observations, required number of parameters to be estimated, and so forth.

Given that:
- our primary aim is to investigate the long-run relationship and impact of FDI on development;
- the number of time-series observations is not large;
- all our series are I(1), integrated of order 1, we employ an Engle-Granger single-equation cointegration framework (Engle and Granger 1987).

As reported in Section 4, by conducting augmented Dickey-Fuller (ADF) unit root tests we have confirmed that our two series are indeed non-stationary in levels, but stationary in first-differences, that is they are I(1). The Engle-Granger approach is suitable for I(1) series and for empirical analyses with a relatively small number of observations, due to the very small number of parameters that are needed to be estimated. It is also particularly appropriate for investigations where only one cointegrating vector is the primary focus of the research. In our case, this refers to the long-run equilibrium relationship between FDI and economic development, with DEV as the dependent variable. The choice of focusing solely on those two series, without considering other relevant series, is also motivated by the limited time observations available.

Essentially, the Engle-Granger methodology for testing the presence of cointegration between two I(1) series proceeds first with the estimation of the (assumed but not yet confirmed) cointegrating regression (long-run equilibrium relationship):

$$Log(DEV_t) = \beta_0 + \beta_1 Log(FDI_t) + z_t \qquad (1)$$

t=1994, 1995,...,2015

where: β_0 is the constant (intercept of the equation); β_1 is the long-run effect of FDI on DEV; z_t is the residual error of the time-series regression.

After the estimation, the residual error is tested whether it is (mean) stationary, by conducting the appropriate ADF unit root test for z_t. This ADF test does not include a constant and a trend term in the unit root test equation, but it may contain lags of Δz_t, given the suitable lag structure determined by lag information criteria (*e.g.* BIC):

$$\Delta \hat{z}_t = \rho \hat{z}_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta \hat{z}_{t-j} + u_t \qquad (2)$$

The null hypothesis (H0) is that z_t is non-stationary (there is a unit root), which in the context of the Engle-Granger cointegration test means that the two I(1) series are not cointegrated. In such a case there is no long-run

equilibrium relationship, and the results of equation (1) are not valid (spurious regression). Hence, rejection of H_0 means that z_t is stationary, and therefore evidence in favor of cointegration between the two I(1) series. In this case, equation (1) is valid and is to be interpreted as the cointegrating equation which shows the long-run equilibrium relationship between FDI and DEV with the estimated long-run effect of FDI on economic development. It has to be noted that the critical values for the Engle-Granger cointegration test are not the usual ADF critical values, but special ones that are applicable to cointegration testing, which have been created by MacKinnon (2010). Those critical values are more robust and set higher standards as regards the rejection of H_0. The first tables of critical values where provided by MacKinnon in 1990. The 2010 paper extends to more cases and sample sizes and improves the accuracy of those tables.

Finally, it has to be stressed that in the original Engle-Granger framework, equation (1) is estimated by OLS. However, though OLS is consistent, it is not asymptotically efficient and does not account and control for serial correlation and endogeneity or long-run dependence. Those statistical issues usually arise in a time-series cointegration estimation. Thus, we apply the Feasible Generalized Least Squares (FGLS) corrected dynamic estimator suggested by Choi *et al.* (2008). This estimator is robust to the above mentioned issues, and it has been shown to perform better than dynamic OLS in the presence of serially correlated errors in the cointegrating regression.

3. Long-run Patterns and Dynamics

Before proceeding with the cointegration analysis, we briefly examine the long-run patterns and trends in the three main macroeconomic series of interest for each of the three emerging ASEAN economies. Figure 2 shows the long-run trends in inward FDI over the 1994-2016 period for all three economies considered in our analysis. First, it is apparent that Vietnam receives by far the highest amount of foreign investment compared to the other two countries. Secondly, there has been a remarkable increase in the inward foreign direct investment stock in Vietnam and in Cambodia.

From Figure 2 it is visible that in Cambodia and Laos the scale (the absolute amount or level) of the FDI stock is substantially lower than that of Vietnam. A closer look at those countries reveals that Cambodia shows a very strong upward trend, whilst in Laos the increasing trend in inward FDI is relatively less pronounced. Finally, with respect to the trends in economic development across the three countries, it is evident from Figure 3 that there has been a continuous improvement over time in all countries under consideration. As evidenced by the value of real GDP per capita, Vietnam appears to be the most developed country among this country group, whilst Cambodia and Laos are at a similar development level, with the latter exhibiting a slightly higher level of per capita real GDP.

Figure 1. Long-run trends of inward foreign direct investment (billions of US dollars)
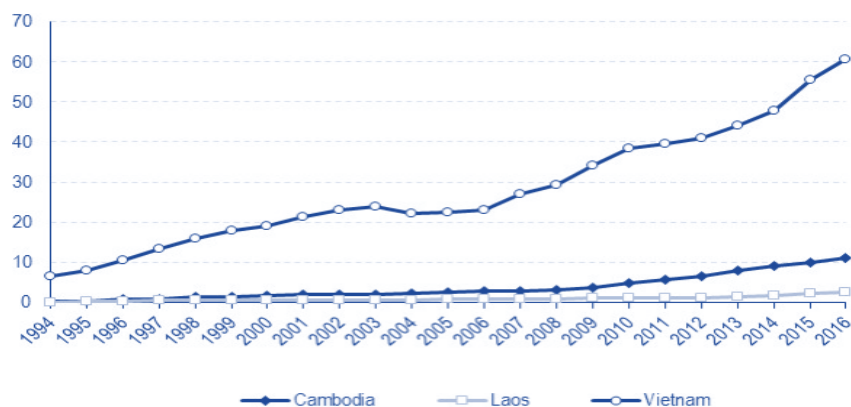
Source: Own compilation based on data from United Nations FDI database.

Figure 2. Long-run trends of real GDP per capita, (US dollars)
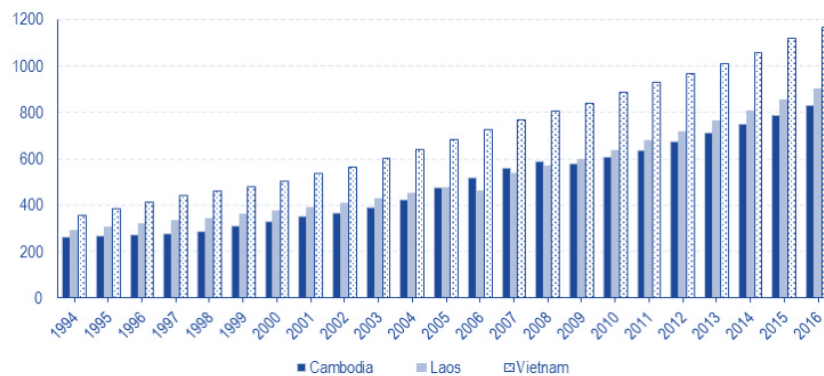
Source: Own compilation based on data from United Nations National Accounts database

4. Cointegration Analysis

First, Table 1 shows the results with respect to the stationarity properties of our two series. We find that both series are I(1), and thus they are appropriate for our cointegration framework that has been already presented. The results for the cointegration analysis are reported in Tables 2 and 3. In Table 2 we perform the Engle-Granger cointegration test to examine whether real GDP per capita and FDI are cointegrated. It is apparent that in all countries there is evidence of cointegration. More specifically, for Cambodia the cointegration analysis indicates that DEV and FDI are found to be cointegrated at the 5% significance level. The findings for Laos and, especially, for Vietnam are more statistically significant (at the 1% level). Thus, the evidence of cointegration is relatively stronger in those economies.

Table 1. Results of unit root tests for levels and first differences

Country	DEV (Levels)	FDI (Levels)	DEV (1st differences)	FDI (1st differences)
Cambodia	-1.949	-1.208	-3.095(b)	-3.855(a)
Laos	-1.890	-2.006	-6.132(a)	-4.906(a)
Vietnam	-2.372	-2.364	-4.667(a)	-4.295(a)

Note: (a) and (b) denote significance at the 1% and 5% levels, respectively.
Source: Own statistical results.

Table 2. Engle-Granger test for cointegration between DEV and FDI

Country	Test statistic	1% Critical Value	5% Critical Value	10% Critical Value
Cambodia	-3.650	-4.469	-3.643	-3.253
Laos	-4.591	-4.469	-3.643	-3.253
Vietnam	-6.241	-4.469	-3.643	-3.253

Source: Own statistical results.

Having established that DEV and FDI are cointegrated, thereby revealing that the two economic phenomena are linked in a stable long-run relationship, we next present the results of the estimated cointegrating regression equation in Table 3, which are based on the FGLS corrected dynamic estimation methodology. Since our cointegrating regression is in log-linearized form (also known as log-log model), the estimated regression coefficient of FDI shows the long-run effect of FDI on economic development as an elasticity. Hence, the estimated slope parameter indicates the relative impact of FDI on DEV, where a 1% increase in FDI leads to a β_1 percent increase in DEV. First, it is evident that in all three ASEAN economies there is a highly statistically significant long-run impact of FDI on real GDP per capita (as indicated by the very small p-value). However, though significance at the 1% level is found in all countries, the magnitude of the long-run effect differs greatly. This difference is relatively larger between Cambodia and Vietnam, where the FDI impact is the smallest in the former and the largest in the latter country.

More specifically, the estimated long-run elasticities suggest that 1% increase in inward FDI is associated with an increase in real GDP per capita by 0.37% in Cambodia, by around 0.4% in Laos, and by over 0.65% in Vietnam. The findings suggest that the long-run effect of inward FDI on real GDP per capita is rather considerable, especially in Vietnam. It has to be noted that this estimated long-run impact, represents only the direct effect on DEV without considering FDI effects on other variables (economic factors) that potentially affect DEV as well as

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without the possible effect of DEV on FDI which could lead to more FDI and thus, in turn, to more DEV and so on. The elasticity shows the response of the dependent variable entirely from the perspective of a one-time 1% increase in FDI (the equilibrium relationship between the two series).

It is informative to contrast these estimates to those found for other developing countries in the empirical literature. Generally, though the long-run elasticity varies greatly across economies, various studies have found that on average the elasticity estimates take values in the range between 0.2 and 0.4 (*e.g.* Edwards *et al.* 2017; Hansen and Rand 2006, Hsiao and Shen 2003). Only a relatively small number of transition and developing economies exhibit exceptionally large long-run elasticities, which approach or even surpass a value of 1 (*e.g.* Fidrmuc and Martin 2011). Thus, taking all of the above considerations and discussion into account, it can be argued that the long-run effect is significant and inward FDI has indeed been an influential factor of economic development in Cambodia, Laos, and particularly in Vietnam during the 1994-2016 period.

Table 3. Cointegrating regression (long-run equilibrium relationship between DEV and FDI)

Country	Coefficient	S.E.	t-statistic	p-value
Cambodia				
β_1: Log(FDI)	0.370	0.035	10.610	0.000
β_0: Constant	-1.968	0.768	-2.560	0.019
Adj. R2	*0.848*			
F-statistic	*112.5*			
Prob. > F	*0.000*			
Laos				
β_1: Log(FDI)	0.397	0.021	19.130	0.000
β_0: Constant	-2.044	0.433	-4.730	0.000
Adj. R2	*0.948*			
F-statistic	*365.9*			
Prob. > F	*0.000*			
Vietnam				
β_1: Log(FDI)	0.651	0.068	9.620	0.000
β_0: Constant	-9.086	1.631	-5.570	0.000
Adj. R2	*0.821*			
F-statistic	*92.6*			
Prob. > F	*0.000*			

Source: Own statistical results.

Conclusion

The paper has analyzed the long-run dynamics of inward foreign direct investment and economic development in Cambodia, Laos, and Vietnam during the 1994-2016 period. In addition to trends and patterns, the study has assessed the long-run linkage between the two economic phenomena as well as the quantitative impact of FDI on development for each country separately. Thus, by providing information on the growth effect of FDI, the empirical study has contributed in expanding the rather still limited evidence on the subject for those emerging economies, using the same sample period, data source, and series in all countries examined. In particular, the results of the cointegration analysis indicate that there exists a long-run equilibrium relationship between inward FDI and economic development in all of the three emerging ASEAN economies over the study period. Our analysis also reveals that the countries differ with respect to the quantitative impact of FDI.

The long-run elasticity of FDI shows a similar magnitude in Cambodia and Laos, with the latter country having a slightly higher one. Vietnam exhibits a substantially higher elasticity compared to the other two emerging ASEAN economies. This suggests that the long-run impact of FDI on economic development is considerably larger in Vietnam. The findings support the view that FDI and economic development are closely linked in a stable interrelationship over the long-term and that the inflow of foreign capital in the form of direct investments has contributed towards rising levels of real GDP per capita in the three countries under examination. Finally, the long-run dynamics reveal that there has been a steady and sizable upward trend in FDI over the study period, during which Cambodia, Laos, and Vietnam have been increasingly integrating with ASEAN and other countries. Thus, overall our empirical analysis implies that policies promoting further economic integration and inward FDI would be expected to foster significantly the economic development process in the three emerging ASEAN economies examined.

References

[1] Ambashi, M. 2017. *ASEAN as an FDI Attractor: How Do Multinationals Look at ASEAN?* Policy Brief Paper No. 2016-04, Economic Research Institute for ASEAN and East Asia, Jakarta, Indonesia.

[2] Bhatt, P.R. 2014. Foreign Direct Investment in ASEAN Countries 1990-2012. *Revista Galega de Economía*, 23(4):133-144.

[3] Bhatt, P.R. 2013. Causal Relationship between Exports, FDI and Income: The Case of Vietnam. *Applied Econometrics and International Development*, 13(1):161-176.

[4] Choong, C.K., and Liew, V. 2009. Impact of foreign direct investment volatility on economic growth of ASEAN-5 countries. *Economics Bulletin*, 29(3):1829-1841.

[5] Choi, C.Y., Hu, L., and Ogaki, M. 2008. Robust Estimation for Structural Spurious Regressions and a Hausman-type Cointegration Test. *Journal of Econometrics*, 142 (1): 327-351.

[6] Edwards, J.A., Naanwaab, C.B., and Romero, A.A. 2017. Effect of FDI on real per capita GDP Growth. A Rolling Window Panel Analysis of 60 countries, 1982-2011. *Applied Econometrics and International Development*, 17(1): 19-36.

[7] Engle, R.F., and Granger, C.W.J. 1987. Cointegration and error correction: representation, estimation, and testing, *Econometrica*, 55(2): 251-276.

[8] Fakher, A. 2012. The impact of economic integration on FDI: applied study on ASEAN. *International Journal of Trade and Global Markets*, 5(3/4): 214-234.

[9] Fidrmuc, J., and Martin, R. 2011. *Capital Inflows, Exports and Growth in the CESEE Region.* In: Ewald Nowotny, Peter Mooslechner, and Doris Ritzberger-Grünwald, (Eds.), Post-Crisis Growth and Integration in Europe: Catching-up Strategies in CESEE Economies. Edward Elgar Publishing.

[10] Flora, P., and Agrawal, G. 2015. A Co-integration and Causality Analysis of Highest FDI Recipient Asian Economies. *Journal of the Knowledge Economy*, 6(4): 1078–1089.

[11] Hansen, H., and Rand, J. 2006. On the Causal Links between FDI and Growth in Developing Countries. *World Economy*, 29(1): 21–41.

[12] Hsiao, C., and Shen, Y. 2003. Foreign Direct Investment and Economic Growth: The Importance of Institutions and Urbanization. *Economic Development and Cultural Change*, 51(4): 883-896.

[13] Hussin, F., and Saidin, N. 2012. Economic growth in ASEAN-4 Countries: A Panel data analysis. *International Journal of Economics and Finance*, 4(9): 119-129.

[14] Kawai, M., and Naknoi, K. 2015. *ASEAN Economic Integration through Trade and Foreign Direct Investment: Long-Term Challenges.* ADBI Working Paper No. 545, Asian Development Bank Institute, Tokyo, Japan.

[15] Kotrajaras, P., Tubtimtong, B., and Wiboonchutikula, P. 2011. Does FDI Enhance Economic Growth? New Evidence from East Asia. *ASEAN Economic Bulletin*, 28(2): 183-202.

[16] MacKinnon, J.G. 2010. *Critical Values for Cointegration Tests.* QED Working Paper No. 1227, Queen's University, Department of Economics, Kingston, Ontario, Canada.

[17] Marwah, K., and Tavakoli, A. 2004. The Effect of Foreign Capital and Imports on Economic Growth: Further Evidence from four Asian countries (1970–1998). *Journal of Asian Economics*, 15(2): 399-413.

[18] Mikic, M., and Jetin, B. 2016. *ASEAN Economic Community: A Model for Asia-wide Regional Integration?* Palgrave Macmillan, Hampshire, UK. ISBN: 978-1-137-53710-2, 350 pp.

[19] Ridzuan, A.R., Mohd Noor, A.H., and Ahmed, E.M. 2016. ASEAN4 prospective of export-led economic growth. *E3 Journal of Business Management and Economics*, 7(1):1-12.

[20] Srinivasan, P., Kalaivani, M., and Ibrahim, P. 2010. FDI and economic growth in the ASEAN countries: Evidence from Cointegration Approach and Causality Test. *The IUP Journal of Management Research*, 9(1): 38-63.

[21] Sothan, S. 2017. Causality between foreign direct investment and economic growth for Cambodia. Cogent Economics & Finance, 5(1): 1277-1286. DOI: http://dx.doi.org/10.1080/23322039.2016.1277860.

[22] Sothan, S. 2016. Foreign Direct Investment, Exports, and Long-Run Economic Growth in Asia: Panel Cointegration and Causality Analysis. *International Journal of Economics and Finance*, 8(1): 26-37.

[23] Tan, B.W., and Tang, C.F. 2016. Examining the Causal Linkages among Domestic Investment, FDI, Trade, Interest Rate and Economic Growth in ASEAN-5 Countries. *International Journal of Economics and Financial Issues*, 6(1): 214-220.

*** JBIC Institute 2002. *Foreign Direct Investment and Development: Where Do We Stand?* JBICI Research Paper No. 15, Japan Bank for International Cooperation (JBIC), Tokyo, Japan.

*** UNCTAD 2017. *World Investment Report 2017: Investment and the Digital Economy*, New York and Geneva: United Nations Conference on Trade and Development, United Nations.

Competitive Advantages through Entrepreneurship Orientation and Innovation in Creative Batik Industry in Jember District

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Abstract:

This study aims to examine and analyze the effect of Entrepreneurship Orientation and innovation to gain the competitive advantage of batik entrepreneurs in Jember. The research used explanatory research and quantitative approach method. Path analysis was used to analyze the data of 10 batik entrepreneurs under the guidance of the department of industry and commerce in Jember as sample. The results of this study are the independent entrepreneurial orientation, (X1) has signification effect to innovation capacity (Z), intervening innovation capacity competitive advantage (Y) and entrepreneurial orientation (X1) has significant effect to competitive advantage (Y). It can be concluded that the entrepreneurial orientation plays an important role in developing innovative products and results, innovation and entrepreneurial orientation and competitive advantage.

Keywords: competitive advantage; entrepreneurial orientation; innovation capacity; Batik

JEL Classification: O31; O32

Introduction

In the 1990s, the emerging 'creative industry' as a policy discourse and instrument signaled the government's desire to harness cultural production of a new economic era (Banks and O'Connor 2009). The creative industry which includes audiovisual products, design, new media, performing arts, publishing and visual arts is not only one of the most rapidly growing sectors of the world economy. Around the world, the creative industry has become an increasingly important part of the global economy, serving as a bridge of culture, business, and technology. The creative industry has shown its prominence as it continues to expand during the recent global financial and economic crisis. With the growth of technology and income from developing countries, it seems that the creative economy will be the future of the global economy. The world sees challenges in the development of the creative economy, not to mention Indonesia with various untapped potential markets.

In Indonesia, creative industry defined as an industry which came after the use of individual creativity, skill, and talent to create welfare and job occupancy by creating and exploring individual creativity and innovation (Kementerian Perdagangan 2009). The creative industry is a group of industries that consist of different groups that linked to the process of the idea or intellectual property exploration to change something worthy that would create welfare and job vacancies ((Kementerian Perdagangan 2009). Based on Creative Industries Mapping Study Based Department of Commerce Republik Indonesia, creative industries are advertising, architecture, arts, crafts, design, fashion, video, film and photography, interactive games, music, art performing, publishing and printing, computer services and software, television and radio, research and the last is culinary (Kementerian Perdagangan 2009).

When the scope of creative industry is viewed, most of does not need a high production scale. It is not the same as manufacture industry that focus on product quantity, but the creative industry depends on human resource creativity. Creative industry mostly has arisen from the group of middle-up industries. Although the products not in

a huge number available, the creative industry could deliver the significant positive contribution to our national economic situation.

1. Literature Review

Entrepreneurship is a process to create something new or make a change of something old fashion with innovations in order to bring the welfare of individual and society higher (Gray 2006). According to Carland *et al.* (2002) entrepreneur is someone who does something by creating a new idea and bring it into reality. Shane and Venkataraman (2000) stated that the root of entrepreneurship is making a new innovation of any kind of product.

Lumpkin and Dess (1996) stated the difference between entrepreneurial orientation and entrepreneurship. Entrepreneur orientation determined the picture of how a new way done by a company, presented by the process, practice an activity that supports a new way of breaking through. While entrepreneurship defined to bring a new product and service or a new company as a new way to do by entering an exist to the market and a new one. So entrepreneurship can be said as a product of entrepreneurial orientation. Process, practice and the activity of decision making create a new way for new market-oriented. Entrepreneurial orientation mostly brings a company involved in an innovative action, dare to take a risk and proactive to defeat the competitor. Companies that involved would develop effectively or increasing company performance and competition level.

As written in previously, the root of entrepreneurship is a new way facing new market/ target. Facing a new market or target by new product and service that already exist, making a new business by starting a corporate business is one of new way facing a new market or target. Alizade, Mehrani, and Didekhani (2014) explain that the marketing mix is a set of marketing tools the company uses to achieve marketing objectives in the target market. A picture of how a new way facing a new market or target is an entrepreneurial orientation (EO). For that situation, EO is shown as a process, practice and activity of decision making that creates a new way facing a new market or target (Lumpkin and Dess 1996). Conceptually, entrepreneurship is a product of Entrepreneurial Orientation (EO).

Innovative is defined as the root of willingness to go step ahead over the existing technology and operational process leaving the old situation (Kimberly and Evanisko 1981). Innovation is a step that should be taken by a company to stay still and became the former in its competition of this new global era, where everything is changing very fast. A company won't stay on the same strategy for a long period.

Competitive advantage is the ability of a company to create a product that when a competitor tries to imitate it will always experience a significant failure. When companies implement such strategies and competitor companies do not continually implement them and other companies are not able to imitate the benefits of the strategy, the company is said to have sustained competitive advantage (Ireland *et al.* 2001).

For the purposes of the research, we define entrepreneurship as the identification and exploitation of previously unexploited opportunities. As such, entrepreneurial actions entail creating new resources or combining existing resources in new ways to develop and commercialize new products, move into new markets, and/or service new customers (Ireland *et al.* 2001, Kuratko, Ireland, and Hornsby 2001, Sexton and Smilor 1997). On the other hand, strategic management needs the set of decisions, commitments, and actions designed and executed to produce a competitive advantage and earn above-average returns (Hitt, Ireland, and Hoskisson 2012).

2. Methodology

2.1. Research Plan

This research is a kind of research with quantitative explanatory approach applied, it means this research explains object in details with some orders applied that is the effect of entrepreneurial orientation through business innovative capacity on product positioning and competitive advantages of batik entrepreneurs in creative industry of Jember district. The population of this research is batik entrepreneurs who are coached by trade department of Jember district. This research is using saturated sampling method. It's handling all population as the respondents. Saturated sampling determined that all population are the sample.

Data analysis technique is using SPSS v.16.00 program application for Windows. There are some techniques in this research, *i.e:* validity test, reliability test, path analysis, and normality test. Validity test used for making sure the accuracy of measurement tools that are used. The validity questionnaire of this research is using product moment correlation technique which is testing the correlation between each question score and total of questions score for measuring the instrument validity. Each question will be the valid one if r (correlation coefficient between each question score and total score) greater than df (degree of freedom) table (Landau 2004). Reliability test is close to belief. A test will be believed if it gives an exact result. In this research, we are using alpha Cronbach formula as data reliability measure instrument, based on research instrument internal consistency (Landau 2004).

Path Analysis is part of regression analysis that is used for analyzing the causal connectivity of variables, since dependent variables affecting independent variables, directly or indirectly by one or more than one intervening variable. The path analysis system is presented in Figure 1.

Figure 1. Path Analysis System
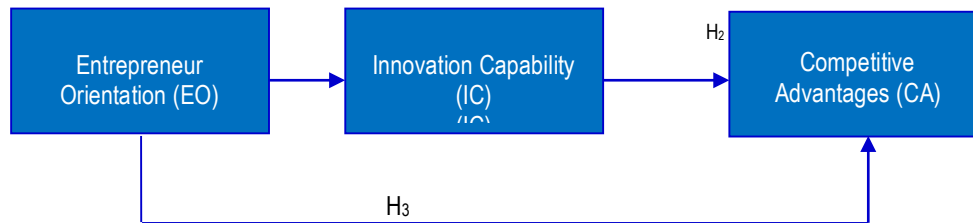
Path analysis will be explained with the equation below:

$$Z = \beta_{zx}X + \varepsilon 1 \tag{1}$$

$$Y = \beta_{yx}X + \beta_{yz}Z + \varepsilon 2 \tag{2}$$

where: X = entrepreneurial orientation (EO) ; Z = innovation capacity (IC); Y = competitive advantage (CA); ε1,2,3 = residual variable (error)

Decision making on normality test based on the situation of data spreads on the diagonal line and flows with the diagonal line, it means data analysis model is available for normality assumption.

3. Results and Discussions

3.1. Validity and Reliability Test

Research instrument or questionnaire validity test runs on correlation index of product moment Pearson, by comparing r of each score of the questionnaire and total score of each variable by stating the *r* point on believing level on 5% and degree of freedom (df) on 7-2 is 0.75. If *r* point of product moment is higher than 0.75, it means that it's valid.

Table 1. Result of Validity and Reliability

	Variable	Corrected item-Total correlation	Cronbach's alpha based on standardized item	Notes
X (EO)	X1.1	0.899	0.942	Valid and reliable
	X1.2	0.891		
	X1.3	0.809		
	X1.4	0.812		
	X1.5	0.809		
Z(CI)	Z1.1	0.878	0.940	Valid and reliable
	Z1.2	0.786		
	Z1.3	0.925		
	Z1.4	0.883		
	Z1.5	0.740		
Y (CA)	Y1.1	0.846	0.951	Valid and reliable
	Y1.2	0.863		
	Y1.3	0.820		
	Y1.4	0.905		
	Y1.5	0.863		
	Y1.6	0.775		

Source: Primary data processed (2016)

Figure 2. Path diagram of path coefficient test result
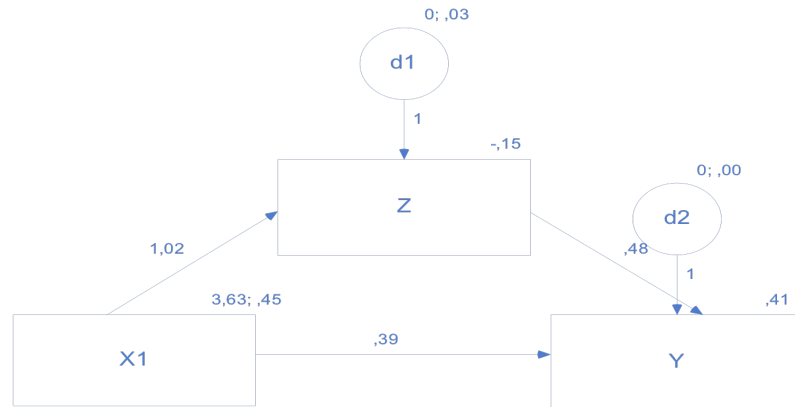
Based on the value coefficient test result as shown in Figure 2, it can calculate the coefficient path diagram of path coefficient this below:

Z = ρyX1 + e1   (3)
Z = 1,02X1 + e1

Y = ρyX1 + ρ yZ+ e2   (4)
Y = 0,39X1 + 0,48Z + e2

3.2. Hypothesis Testing and Causal Relationship

For knowing how is the effect of variables that are measured, we will find out on the result of hypothesis testing between variables in Table 2.

Table 2. Hypothesis Testing Result

Variable	Estimation	Error Standard	Critical Ratio	Probability	Notes
$X_1 \rightarrow Z$	1.018	0.105	9.689	0.000	Significant
$Z \rightarrow Y_1$	0.481	0.106	4.558	0.000	Significant
$X_1 \rightarrow Y_1$	0.395	0.111	3.552	0.000	Significant

Source: Primary data processed, 2016

The relationship between Independent Variable X1 (entrepreneurial orientation) and Intervening Variable Z (innovation capacity) is significant because the score of P is ≤ 0.05, it's 0.03. The relationship between Intervening Variable Z (innovation capacity) and dependent variable Y (competitive advantage) is significant because the score of P is ≤ 0.05, it's 0.00. The relationship between of Independent Variable X1 (entrepreneurial orientation) and dependent variable Y (competitive advantage) is significant because the score of P is ≤ 0.00, it's 0.02. Normality test goal is knowing whether in regression, intervening variable or residual has normal distribution or not t and f test assumed that residual point folowing normal distribution. If it's crossed over, statistics test will be invalid for small number sample (Ghozali 2008).

A method of seeing normal probability plot which comparing the cumulative distribution and normal distribution, as normal distribution will set a diagonal line, and residual plotting data will be compared with the diagonal line. If data distribution is normal, the line which reflects the real data will follow its diagonal line, by seeing the result of analysis graphic, means that data had already fulfilled the normality assumption.

Based on hypothesis test which was done in the previous chapter, here is the discussion of hypothesis test result of the research. There are variables here, *e.g*: entrepreneurial orientation (EO), innovation capacity (IC), and competitive advantage (CA)." Here is the result of research hypothesis in details:

▪ Entrepreneurial orientation significantly effects innovative capacity in the creative industry, the first hypothesis is proven. It means that entrepreneurial orientation is handling the important key to develop product innovation, *etc*. This research was supported study result of Atuahene-Gima and Ko (2001). Entrepreneurial orientation is reflecting that mostly business owner involved in innovative acts because entrepreneurial orientation illustrated by the process, practice and decision making activity which is supporting the new way of innovation. Entrepreneurship is covering the steps of: innovation process, stimulate process, implementation process, and growth process. So as what batik entrepreneurs did in

Jember district, especially for those whose orientated on hand-print Batik, they have to do innovation periodically. It's the concept of creative economic which innovation and creativity are two things that enhance the image and local identity for establishing the culture and local heritage value. Batik Entrepreneurs in Jember district could increase the local value on special and specific Batik ornaments which reflect Jember's iconic, such as tobacco, clove and Jember Fashion Carnaval (JFC) has become the trademark of Jember district;

▪ Innovation capacity affects competitive advantages significantly on creative industry, so the second hypothesis is accepted. It means that innovation could bring Batik Entrepreneurs in Jember district got the competitive advantages. This result supported by Parkman, Halloway, and Sebastiao's research (2012) "Creative industries: aligning entrepreneurial orientation and innovation capacity" which one of those research is innovation capacity which can be partial media on the relation of EO (entrepreneurial orientation) and CA (competitive advantage). Barney (1991) used competitive advantages to observe more aspects of company performance that supported by many findings which proves that ability to elevate and explore organization creativity is a great potential resource and became a sustainable competitive advantage. That's one of Jember's uniqueness, Batik with tobacco shades, it's not the same as general Batik which pays attention to traditional Batik pattern, Sogan hand-print Batik from Jogjakarta or Solo, Jember hand-print uses tobacco shades which is the symbol of Jember. Just the same as Batik shades from other places that full with shades, Jember Batik also full with tobacco shades. Those Batik shades are not the standard one, but it's a creation of Batik and never been taught by the ancestors, and that's Batik entrepreneurs creativity of Jember district whose asked to make something which can not be copied perfectly. That uniqueness had already brought competitive advantages, which are price, quality, the creativity of product, business image, higher profit, product positioning at the market and business growth;

▪ Entrepreneurial orientation affects competitive advantages significantly in creative industry is proven. It means entrepreneurial orientation could give a competitive advantages for Batik entrepreneur in Jember district. Parkman *et al.* (2012) stated that the case of entrepreneurial orientation affected competitive advantages significantly in creative industry. The entrepreneurial orientation which is indicated by innovation capability refers to the target market, proactiveness, dare to take a risk, and ability to create a product with differentiation which had given a positive and significant effect on competitive advantages. It's indicated by relatively competitive price, unique and good product quality, entrepreneur put innovation as the priority, better business image, organized business management, better profit, became the leader of all, good business growth. It means that whenever a company is on the highest level of Entrepreneurial orientation, it would support the creation of high-level marketing performance.

Conclusion

Here are some general conclusions based on the researched fact of Batik small-medium enterprises in Jember district. The concept of creative economics is innovative and creativity, both of them could elevate local image and identity in order to establish culture, heritage and local value that proven by a fact that Batik entrepreneur in Jember district could elevate local value on Batik shades which has its specific character and reflecting Jember, such as tobacco, clove and Jember Fashion Carnaval (JFC) which became the priority product of Jember district.

Upgrading and exploiting organization creativity are great resource for all and become the sustainable competitive advantages.

Jember Batik uniqueness with tobacco ornament is not common because it's not a traditional Batik pattern, not standard, creative and never been taught by the ancestors. Thus Batik entrepreneurs in Jember district is requested to keep Jember Batik uniqueness authentic and cannot be copied either perfectly or not.

At the time a company has a high level of Entrepreneur Orientation, it will support marketing performance to be created at a high level to gain competitive advantages. An extra approach and coaching are required for small-middle enterprises that geographically so hard to be reached by public transportation, since they are on the remote area, and human resource management approach is also needed to be done.

Since the potential local asset, Jember Batik, specifically Sumberjambe has still not known widely. Thus the local government is suggested to have the specific programme, especially in localizing Batik and prioritizing. Batik as special product of Jember District. Jember Fashion Carnaval which is held annually is a potential event for Batik entrepreneurs in Jember district and local government may conduct a promotion programme in this event.

References

[1] Alizade, R., Mehrani, H., and Didekhani, H. 2014. A study on the effect of selected marketing mix elements on brand equity with mediating role of brand equity in etka chain stores-Golestan province. Kuwait Chapter of the *Arabian Journal of Business and Management Review*, 3(11A): 184. DOI: 10.12816/0018797

[2] Atuahene-Gima, K., and Ko, A. 2001. An empirical investigation of the effect of market orientation and entrepreneurship orientation alignment on product innovation. *Organization Science*, 12(1): 54-74. DOI: https://doi.org/10.1287/orsc.12.1.54.10121

[3] Banks, M., and O'Connor, J. 2009. After the creative industries. *International Journal of Cultural Policy*, 15 (4): 365-373, DOI: https://doi.org/10.1080/10286630902989027

[4] Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management,* 17(1): 99-120. DOI: https://doi.org/10.1177/014920639101700108

[5] Carland, H., Carland, J.W., Hoy, F., and Carland, J.A.C. 2002. Who is an entrepreneur? Is a question worth asking? *Entrepreneurship*: *Critical Perspectives on Business and Management*, 2(178): 47-67.

[6] Ghozali, I. 2008. *Model persamaan struktural: Konsep dan aplikasi dengan program AMOS 16. 0*. Semarang, Badan Penerbit Universitas Diponegoro.

[7] Gray, C. 2006. Absorptive capacity, knowledge management and innovation in entrepreneurial small firms. *International Journal of Entrepreneurial Behavior & Research*, 12(6): 345-360. DOI: https://doi.org/10.1108/13552550610710144

[8] Hitt, M.A., Ireland, R.D., and Hoskisson, R.E. 2012. *Strategic Management Cases: Competitiveness and Globalization.* Cengage Learning, ISBN: 1111825874, 9781111825874, 952 pp.

[9] Ireland, R.D., Hitt, M.A., Camp, S.M., and Sexton, D.L. 2001. Integrating entrepreneurship and strategic management actions to create firm wealth. *The Academy of Management Executive*, 15(1): 49-63. DOI: 10.5465/AME.2001.4251393

[10] Kimberly, J.R., and Evanisko, M.J. 1981. Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(4): 689-713. DOI: 10.2307/256170

[11] Kuratko, D.F., Ireland, R.D., and Hornsby, J.S. 2001. Improving firm performance through entrepreneurial actions: Acordia's corporate entrepreneurship strategy. *The Academy of Management Executive*, 15(4): 60-71. DOI: 10.5465/AME.2001.5897658.

[12] Landau, S., Everitt, B.S. 2004. *A Handbook of Statistical Analyses Using.* Taylor & Francis, ISBN: 1584883693, 9781584883692, 354 pp., Available at: http://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS_Statistical_Analyses_using_SPSS.pdf

[13] Lumpkin, G.T., and Dess, G.G. 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, 21(1): 135-172. DOI: 10.5465/AMR.1996.9602161568

[14] Parkman, I.D., Holloway, S.S., and Sebastiao, H. 2012. Creative industries: aligning entrepreneurial orientation and innovation capacity. *Journal of Research in Marketing and Entrepreneurship*, 14(1): 95-114. DOI: https://doi.org/10.1108/14715201211246823

[15] Sexton, D.L., and Smilor, R.W. (Eds.). 1997. *Entrepreneurship 2000*. Kaplan Publishing, ISBN: 1574100645, 9781574100648, 426 pp.

[16] Shane, S., and Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1): 217-226. DOI: 10.5465/AMR.2000.2791611.

*** Indonesia, D. P. R. 2009. *Studi industri kreatif Indonesia 2009*. Jakarta: Kementerian Perdagangan RI.

Managing Competitiveness of Agro-Industrial Production in Russia

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Abstract:

The paper analyses the issue of competitiveness of the Russian Agro-Industrial Complex (AIC). Basing on the main factors of competitiveness there is presented the assessment of the competitive potential of the industry. The authors evaluate the dynamics of the AIC complex indicators and determine the level of agro-industrial production competitiveness with account for the three groups of factors: Natural biological resources, Capital and Labour. To calculate complex indicators of competitiveness factors of agricultural production there was used the methodology of data normalization. Based on correlation analysis there was revealed a relationship between the calculated complex indicators of competitiveness of agribusiness. The paper substantiates strategic directions which form the environment for raising competitiveness of the agro-industrial production in the Russian Federation.

Keywords: agro-industrial complex; competitiveness; factors of competitiveness

JEL Classification: Q10; Q13

Introduction

Competitiveness of a country is determined by the competitiveness of its industrial complexes. The strategic goals of ensuring food security of the Russian Federation (RF) in order to satisfy the demand in food products and to enhance the socio-economic efficiency of the RF agriculture stipulated the need to raise efficiency of managing competitiveness of the national Agro-Industrial Complex (AIC). Only highly efficient and competitive agro-industrial production can serve as foundation for addressing top priority goals of developing socially responsible economy of the country and building a civilized agro-industrial market.

The issue of the Russian AIC competitiveness became even more important when Russia joined WTO. Initial expectations of new opportunities for Russian producers on the global food markets were soon replaced by realities of tough competition with foreign producers on the domestic market. Such situation prompted an increase in research. A considerable part of the impressive body of the research on the subject considers AIC competitiveness on a regional level. This direction is represented by Kormishkina and Semenova (2014), Seredina and Anokhina (2010), Pecherceva (2016) and others.

Of particular interest are the research papers written by Kazakovtseva and Gumarova (2014), Kendjukh (2014) and others, which examine the impact of AIC competitiveness on food and economic security of the country.

Having been a focus of research of many experts and academics, nowadays, with the recent developments, AIC competitiveness should be explored at a more complex and deeper level. The aim of the present research is to substantiate the directions which will lead to building conditions for raising competitiveness of the AIC of the Russian Federation. This presupposes the necessity to find solutions for the following conceptual tasks:

- to develop methodology of assessing the complex indicator of AIC competitiveness taken as the function of three main groups of factors 'Natural biological resources', 'Capital' and 'Labour';

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▪ to determine strategic directions of managing the Russian AIC competitiveness.

1. Methodology and methods of research

The methodological basis for the concept of managing competitiveness is the competitive theory. The debate on the term 'competition' has gone through several stages. The classical economic theory adopted behavioural approach. For example, Smith (2008) understood the essence of competition as combination of independent attempts of different sellers to establish their position on the market. That is why the focus was on honest, without conspiracy or collusion, behavior of buyers and sellers competing for more beneficial terms of buying and selling goods. The main area of competition was pricing. A. Smith formulated the notion of competition as the one that raises prices, when there is a decrease in supply, and lowers them under conditions of excess of supply. There was also coined the main principle of competition – 'invisible hand', which manipulates agents or businesses, making them act in accordance with an ideal plan of economic development, ruthlessly squeezing out those who are producing goods that are not required by the market.

The behavioural approach to competition was characteristic also to neoclassical political economy. This school linked competition with the struggle for scarce economic goods and for consumers' money which enables buying these goods (Porter 1990 and 1998). Scarcity was understood in quantitative dimension, when the volume of goods did not match the consumer demand.

Starting from the end of the 19th century, alongside the behavioural approach in economic theory, there was gaining popularity another concept of competition, structural one, which was soon to become dominant. It was developed by a number of economists, such as Edgeworth (1925), Cournot (1970), Robinson (1971), Chamberlin (1965). At present the western economic science treats the term 'competition' mainly in the structural way. A market is considered competitive, when there are many businesses selling a uniform product on the market and the share of a single business is so small, that no business can significantly affect the price of this product by changing the volume of sales.

Thus, under structural approach the focus is shifted from the rivalry of the businesses to the analysis of the market structure and the conditions which rule it. As Yudanov (2006) argues, the spotlight should not be on businesses competing in setting prices, or exploring who and why has won in this struggle. It is important to determine, whether it is possible or impossible, in principle, for a business to produce an impact on the total price level on the market. The author believes that if such influence is not possible, then we can speak about the market with perfect competition, otherwise, we can identify one of the cases of imperfect competition.

This understanding of competition differs significantly from that in classical theory, where there is no differentiation between competition and rivalry. The competition was understood as perfect one, where the interaction of independent buyers was so little, that it could be ignored. Under such circumstances no business could become the leader on the market and monopoly was not possible. With time the economists started to recognize the necessity to specify the notions of 'competition' and 'rivalry'. The current understanding of rivalry relates to behavior of the market agents who want to become market leaders, and the term is used to characterize the activities of the businessmen, but not the qualitative characteristics of the market structure. The word 'competition', however, is used to characterize the model of the market structure.

Apart from behavioural and structural approaches, there is also a functional approach in the economic theory, which considers competition as a range of its main functions on the market. The latter approach was set forth by an Austrian economist, J. Schumpeter, who in his theory of economic development defines competition as the struggle between new and old. This struggle is waged by entrepreneurs who advocate new ways of production and combining resources. Schumpeter (2008) believes that the task of an entrepreneur is to introduce innovations, to get off the beaten track, not to repeat what the others do and to become a 'creative destructor'. As the result, these businesses will win the competition and squeeze out from the market those, who use outdated technologies and produce goods, which are not in demand.

Another Austrian economist and political philosopher Hayek (1973, 1976, 1979) considered competition even in wider perspective, understanding it as 'discovery procedure'. He argues that an entrepreneur, guided by increase or decrease in prices for resources and produced goods, can work out what direction the business should take, what, how and for whom to produce. Prices and competition expose the hidden developments on the market. Only the 'procedure'/existence of competition 'discovers'/reveals which resources and in what volumes should be employed and what, how much, where and to whom should be sold.

In summary, there are evident three approaches to the notion of competition used in economic theory: behavioural, structural and functional. Analysis of the structure and content base leads to following conclusions: firstly, the offered definitions of competition do not fully correspond to the requirements of being systemic and

complex, as they characterize only one of the numerous aspects of competition identified by Smith and other authors in their respective areas of study. Secondly, given the variety of approaches to defining competition, there is no uniformity in understanding essential features of this phenomenon. Thirdly, existing definitions do not render uniformity for different systems (social, production, biological) and do not reflect the basic specifics of competition as unity of statics and dynamics of competitiveness and survival under predetermined or uncertain conditions.

Competitiveness is the basis for competition, and it is defined as ability to compete (to manage one's own competitive advantages) with similar economic entities on a certain market at a given time.

Various objects can demonstrate competitiveness, whether they are biological, technological or socio-economic ones. Competitiveness is a complex notion, denoting aggregate abilities of a country or any producer to create, launch and distribute goods and services. The factor of competition makes producers, who are under threat of being squeezed out, continuously monitor the quality and competitiveness of their produce, while the market can objectively and rigorously assess the results of their activities.

Analyzing different aspects of competitiveness one can conclude that it is a multifaceted concept, which means ability of goods and their producer to obtain and to maintain their position on a particular market within a given period while they are competing with other similar goods and their producers. The competitiveness manifests itself at all economic levels: individual, micro-, mezo-, macro- and global levels with close internal and external interrelations between different levels of competitiveness. In many cases it is benchmarked and can be determined on the evaluative basis. The subjects of assessment can be state bodies, organizations, investors, consumers, and etc. The objects of the assessment are goods, companies, businesses, regions or countries. The criteria or purpose of assessment can be a position on the market, growth rates, ability to pay out loans, consumer qualities in respect to prices of goods and others. That is why, depending on the purpose, the multifaceted concept of competitiveness can be defined in different terms.

In the hierarchy of the concept notions the basic one is the competitiveness of a product, which is assessed depending on different types of products, for example, those of production and technological application, consumer goods, products and services for mass media and communications. The producers of the products – organizations, industries, regions, countries – compete for consumers, markets (product, industrial, territorial markets), factors of production (natural and biological resources, production-technological, labour and financial resources), investments. In effect, it is the organizations / production units that provide the foundation for the competitiveness of the product. The hierarchy of the notions of the concept of the market agents' competitiveness is presented in Table 1.

When considering the issue of competition in agro-industrial production it is important to account for specific features of agriculture as its main component. To start with, sustainability of agricultural production is much lower, than in other industries due to changeable weather conditions. This leads to significant fluctuations in production volumes and prices. Because of lengthy production cycle there is a registered inertia in agricultural produce supply alongside changes in prices. In addition, seasonal production results in erratic distribution of the produce during the year. What is more, considerable volumes of perishable products (vegetables, milk) presuppose their rapid sale, which in turn increases competition during the periods of their bulk turn-in to the market. Immobility of resources in agriculture excludes it from inter-industry competition for more profitable investments of funds.

Basing on the undertaken research and with account for specific features and social importance of the agrarian sector, the authors determine AIC competitiveness as its competitive ability to function and develop in the market environment while effectively ensuring the processes of reproducing the agrarian potential. The level of competitiveness aggregates the volume of main types of agro-industrial production per capita, their positive dynamics and ability to create conditions for sustainable development of the national economic system in the long-term perspective (Anokhina 2016).

To assess the factors of AIC competitiveness the group of indicators depending on their composition was divided into three subgroups (Anokhina 2017):

- Factors 'Natural biological resources', which ensure AIC competitiveness by providing natural and biological resources;
- Factors 'Labour', ensuring AIC competitiveness by providing workforce;
- Factors 'Capital', ensuring AIC competitiveness by using financial and material resources.

Table 1. Hierarchy of the notions of the concept of competitiveness of the market agents

Hierarchy level	Concept of competitiveness
Competitiveness of a country	Ability of a country to produce goods and services, that meet the requirements of the global markets, and to create environment for building up country's resources at such a rate, that will ensure sustainable growth rates of GDP and standard of living comparable to global indicators levels.
Competitiveness of a region	Ability of a region to produce goods and services, that meet the requirements of the domestic and global markets, and to create conditions for building up regional resources in order to ensure the increase in competitive potential of the economic entities at the rate, which will provide sustainable growth rates of GDP and standard of living in the region comparable to global indicators levels.
Competitiveness of an industry	Ability of an industry to produce goods and services, that meet the requirements of the domestic and global markets, and to create conditions for building up competitive potential of the industry production units (organizations) on the basis of macro-technologies: organizing production with high added value, high level of processing depth and high level of scientific and technological potential.
Competitiveness of a cluster	Ability to use the potential of macro-technologies to reach multiplier effect at all levels of vertical integration of product and services production, that will meet the requirements of the domestic and global markets, and building up competitive advantages through obtaining leading positions in production technologies, optimizing organizational forms and managing distribution as the basis for potential growth of competitiveness.
Competitiveness of an organization	*For consumers:* Ability to satisfy the demands of consumers (to solve their problems) on the basis of the provided goods and services that surpass the competitors in the required set of parameters. *For competitors*: Ability to produce goods and services, that meet the requirements of the global and domestic markets, and to create conditions for raising potential of competitiveness. *For investors*: Ability to use the resources of an organization for dynamic development and to expand the distribution markets, increasing the market value of an organization. *For market agents-partners (an industry, region, cluster, state)*: Ability to produce competitive products and to create the environment in order to increase competitiveness potential, basing on the innovational growth factors.

The authors determined the complex indicator for each subgroup by calculating relative indicators (normalization of data) with the help of the formula (1).

$$\delta = \begin{cases} \dfrac{F_u}{F_o}, if\_i \in M_1 \\ \dfrac{F_o}{F_u}, if\_i \in M_2 \end{cases} \tag{1}$$

where: F_u- value of the indicator, included in the corresponding group; δ – relative value; F_o –optimal (standard) value of the i-ed indicator.

It should be noted, that if the optimal (standard) value could not be given, then the value, reached over the examined period, was taken as such. Optimal value was taken as equaling the maximum value if the factor under examination was characterized by positive growth pattern (M_1 – indicator- stimulator). Optimal value was taken as equaling the minimal value if for the factor under examination the positive growth pattern indicated decrease (M_2 - indicator-destimulator).

The calculation of the normalized indicator for each group was done according to formulae 2 and 3. For indicators-stimulators there was used the following formula (2):

$$\frac{(x_{ij} - x_j^{\min})}{(x_j^{\max} - x_j^{\min})}, \tag{2}$$

For indicators-destimulators there was used the following formula (3):

$$1 - \frac{(x_{ij} - x_j^{\min})}{(x_j^{\max} - x_j^{\min})}, \tag{3}$$

where:

$$x_j^{\max} = \max x_{ij}(1 \le i \le m); \qquad x_j^{\min} = \min x_{ij}(1 \le i \le m).$$

The total complex indicator was calculated as the sum-total of the normalized indicators for corresponding groups.

2. Results

The conducted research confirmed that competition in agrarian sphere as an objective phenomenon in the market economic environment is fairly specific in its essence, scale, mechanisms and tools. In fact, agro-industrial market demonstrates a nearly perfect competition with many sellers and buyers of agricultural products on the market. In addition, traditional mechanisms of competition, such as differentiation and cost leaders are limited for agricultural producers in this sphere because of the industrial specifics of agro-industrial production. Opportunities for differentiation are restricted, as they do not render market power, free hand and choice in pricing.

Currently, in order to lower costs, there are being formed bigger food production units and large integrated agro-holdings. This trend is quite visible both, globally and in Russian agribusiness. At present in the Russian Federation there are about 200 state, municipal and non-state agro-holdings. The state ones are bigger in terms of area, the number of agricultural entities and employees, but they have considerably lower returns and much lower profits. The biggest in income volume are such groups as "Wimm-Bill-Dunn Food Products" and JSC "Cherkisovo Group". The leader in pork production is "Miratorg", in broiler chicken meat – ZAO "Prioskolyie". The largest producers of beet-root sugar in Russia are state holdings "Prodimex Holding" and "SH Dominant" (R.F. RBK 2015).

However, the integration processes in food production go alongside the negative developments. Some regions experience increase in social tension, because big agro-industrial structures 'pull' the better lands, machinery and workforce, while due to high level of concentration and specialization of production there can be excess workforce in the rural areas. What is more, a number of companies, setting up their own agricultural businesses, bring their own workforce as the available employees do not match the requirements of the modern production neither in their qualification, nor in their attitude to work.

Another typical feature of agro-industrial formations is a higher degree of employees' dependence from the subjective preferences of private business owners, who get all the rights to land and assets. Given the excess workforce supply and their low quality level, this has led to low payment rates in agricultural sector in rural areas, which are lagging behind any other industry indicators. This means that the effectiveness of integrated agro-industrial formations must be assessed not only with the view of their economic efficiency, investment attractiveness and ability to ensure food industry development, but also with the view of the role and place of people living in rural areas in the current processes of integration. The priority should be given to the processes, which ensure increase in welfare and quality of life of the Russian farmers.

Big agro-industrial formations use consolidation as effective alternative to competition. However, in many cases this causes insufficient integration, which is manifested in narrowing down the market relations and monopolization of the regional market. If under market conditions the increase in the number of private businesses results in expanding market space, the increase in the number of big agro-holdings, in contrast, has led to shrinking this space. As a result, the independent enterprises have to comply with price discrimination policy of the monopolists, who invariably demonstrate unfair competition and create industry entry barriers, thus enjoying the opportunity to get additional monopolistic surplus. The recent years saw a dramatic expansion of big companies' activities in Russian AIC, with significant investments in pig and poultry farming, sugar production, canned food industry and other areas of food processing. The experts indicate that big integrated agribusinesses show very good dynamics, which secure them a place in '200 Forbes' ratings (Table 2), though the industry dynamics cannot be considered promising. Over the period of 2010 – 2016 the annual growth rate of agricultural products production made up only 1.33%.

Table 2. Leaders of privately owned agribusinesses (agro-holdings and food producers)

No.	Agro Businesses	Earnings, in bn rubles.			'200 Forbes' Rating		
		2013	2014	2015	2014	2015	2016
1	GK «Yiug Rossiyi»	50.1	37.6	43.4	116	157	159
2	GK «Sodruzhestvo»	87.1	105.7	132.7	63	64	51
3	GK «EFKO »	50.2	61.4	81.6	115	99	87
4	GK «Agrokom»	25.1	65.7	45.6	186	92	152
5	APX «Miratorg»	53.7	74.05	96.3	99	81	68
6	GK «Prodo»	27.5	33.6	36.4	188	170	188
7	ZAO «Prioskolie»	37.0	33.8	35.4	146	168	192
8	GK «Solnechnyie Produkti»	24.2	332.0	42.1	196	176	163
9	GK «Agro-Belogorie»	-	57.6	68.9	-	113	102
10	APX «BEZRK-Belgrankorm»	26.6	34.0	46.3	177	166	149
11	MPK «Ostankinskyi»	27.2	32.3	36.8	191	183	185

| 12 | Group «Cherkizovo» | 52.8 | 69.3 | 77 | 100 | 88 | 93 |
| 13 | GK «Rusagro» | 36.5 | 59.1 | 72.4 | 148 | 107 | 98 |
| 14 | Firm "Agrocomplex" | - | - | 38.7 | - | - | 176 |

Source: Forbes 2016

In general, there is a much lower level of concentration in the area of production of agricultural products. In industrially developed countries there is a much stronger general trend of concentrating agrarian production, and is characterized by an increase in volume of production, in monetary earnings from sales, in expanding land area and an increase in workforce. Quantitative changes, accumulated in the agrarian sector as a result of these processes, lead to changes in supply structure, though not in such volumes as in industrial sphere. At the same time the concentration in agrarian production stays within minimally effective volumes. Another restricting factor for concentration is fewer possibilities for differentiation in crops and farming produce. This factor neither renders market power to agricultural producers, nor gives choices in pricing.

At present, there are fewer opportunities for the agrarian entities to maintain self sufficiency and survive in the conditions of commodity-money relationship. This trend is due to relatively lower development of productive forces in this sphere in contrast to the industrial one. Much higher volume of physical labour, much lower level of education and qualification of employees in agricultural production are typical not only of the Russian AIC, but also of agrarian sector in developed countries. In Russia it is exacerbated by the effect of dual economy which manifests itself in considerably lower payment levels in agriculture in comparison with other sectors of economy. According to the data of 2016, employees in agriculture had the lowest pay rate compared to other economic sectors, reaching 57.9% of the average Russian payment rate level.

Current global developments stress the importance for Russia of the issue of food security as the basis for social stability and national security. That is why, when taking decisions at the national level, the Agro-Industrial Complex as an intrinsic part of the Russian economy should be considered of primary focus for state policy. The goal of ensuring AIC competitiveness should be treated as strategic one, which, once solved, can not only help reach the required levels of food self-sufficiency, but also will be the engine for the entire economic system development through building agro-export potential.

The statistics show that over the period of radical-liberal reforms the national agrarian sector was not able to reach the pre-reform level of agricultural production, having lost considerably its competitive potential. It is undeniable, that at present there are quite evident positive dynamics trends in the sector (Figure 1), however, its competitiveness stays at a low level.

Figure 1. Index of AIC production in 2005-2016, in % to the previous year
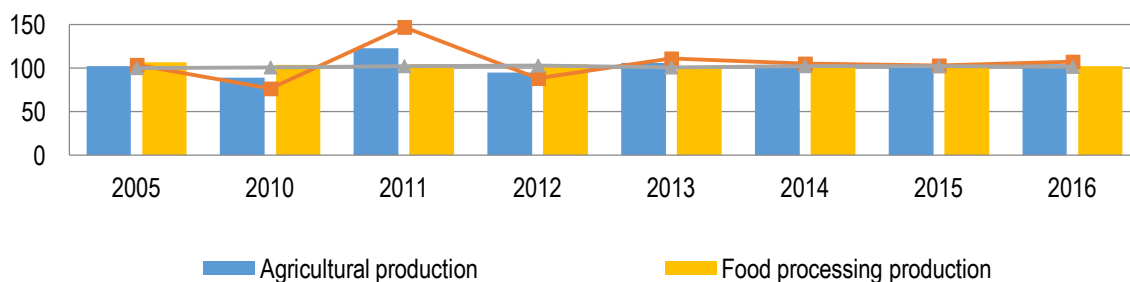
Source: The official website of the Federal State Statistics Service of the Russian Federation

The Russian AIC has a considerable potential in the main factors of competitiveness. Land resources constitute 1,708.9 million hectares including 386.5 million hectares of agriculturally used lands; the plantations of 220.2 million hectares with 121.5 million hectares of arable land. The land reform of the agrarian economy liberalization period failed to raise the land use efficiency, which resulted in degradation of the agricultural land resources. From 2000 to 2016 there were abandoned 467 thousand hectares of plantations, with decrease in arable lands of 5.5%. More than 70% of agricultural lands are affected by various negative factors, the main problem, as experts indicate, being soil erosion.

It should be noted, that in Russia the area of arable lands is comparable to that in the EU, but in contrast to the EU, it has a growth potential of 15-30%. The Russian economists believe that such growth can be possible mainly through cultivating abandoned arable lands (Buzdalov 2015). What is more, in addition to the lands already

under cultivation, it is possible to increase 2-2.5 times the volume of agrarian production through intensification and systemic modernization of the Agro-Industrial Complex.

Another important factor of competitiveness – livestock population – is showing a steady decline, being restricted by such factor, as livestock structure per farms / households categories. The number of households which objectively cannot ensure modern highly technological agro production is still very high.

It is evident, that the undertaken measures of increasing the pig and poultry reproduction numbers have already rendered positive results; there has been registered a steady growth over the past few years. However, this has not been the case with the main category of livestock - cows, which provide essential food products. The downward trend for this category has not yet been reversed.

Overall, the processes of agrarian sector capitalization as the factor of increasing its competitiveness show upward trend. However, the quantitative parameters still do not lead to ensuring qualitative changes which can boost the AIC competitiveness. Alongside the positive dynamics in capital assets availability, there is low coefficient of their renewal in agriculture. In comparison with all-Russian figures the agrarian sector does not measure up in rates and quality of capitalization.

Another important factor is agricultural machinery park, which should correspond to the modern level of industrially developed agrarian sector. At present it is characterized by dramatic decrease, which seriously impedes intensification of agrarian sector. Over the period of 2000 - 2016 the number of tractors and grain combine harvesters decreased 3.3 times, forage harvesters – 4.5 times, milking machines and units - 3.7 times. Given such negative dynamics the pressure on the agricultural machines increases sharply (Table 3), which serves as another limitation of the national AIC competitiveness.

The main factor of increasing competitiveness of agro-industrial production is undoubtedly human resources potential. Over the examined period there is evident a steady decrease in the number of employed in agriculture and of their share in the overall employment structure. At the same time, the labour productivity in the Russian agrarian sector stays at a very low level in comparison with the developed countries. This is due to low level of agro-production intensification, using worn-out machinery and equipment and low motivation for workforce performance. According to the data of the World Bank (2016), the added value of the agrarian production per one employee, which is a measure of labour productivity in agriculture, was $11,593 (in 2010 prices) in Russia in 2015. In France this indicator was 8.23 times bigger, in the USA - 6.74 times, in Germany - 2.85 times.

Table 3. Endowment of agricultural entities with tractors and combine harvesters (the end of the year figures) *

Indicator	2000	2005	2010	2011	2012	2013	2014	2015	2016
The number of tractors per 1,000 hectares of arable lands	7	6	5	4	4	4	4	3	3
Pressure on arable lands for one tractor, in hectares	135	181	236	247	258	274	289	307	305
The number of grain combine harvesters per 1,000 hectares of planting / bedding corresponding crops	5	4	3	3	3	3	3	2	2
The area of planting/bedding corresponding crops per one grain combine harvester, in hectares	198	253	327	354	369	399	408	422	425

Note: * - not including small (micro-) entities
Source: The official website of the Federal State Statistics Service of the Russian Federation

The level of payment in the agrarian sector indicates low public opinion of agricultural labour. Only in 2009 there was surpassed the 50% barrier as opposed to medium level of payment in Russia (Table 4). Such level of payment in agriculture cannot help increase the national AIC competitiveness.

Table 4. The level of payment in the Russian agrarian sector

Indicator	2000	2005	2010	2011	2012	2013	2014	2015
Average monthly nominal gross wage, in rubles: - all economic sectors;	2,223.4	8,554.9	20,952.2	23,369.2	26,628.9	29,792.0	32,495.4	34,029.5
- agriculture, hunting and forestry	985.1	3,646.2	10,668.1	12,464.0	14,129.4	15,724.0	17,723.7	19,721.1
Ratio of average monthly nominal gross wage of workforce employed	40.0	43.0	51.0	53.0	53.0	52.2	54.0	57.9

Indicator	2000	2005	2010	2011	2012	2013	2014	2015
by foreign trade operators in agriculture, hunting and forestry to medium Russian level, %								

Source: The official website of the Federal State Statistics Service of the Russian Federation

The analysis of the Russian AIC competitiveness in comparison with the leaders of the global agro-products market, examined by the main competitive factors (Figure 2), gives opportunity to highlight the 'gaps' in managing competitiveness of the national agro-industrial production. Russia is endowed with the considerable productive resources, and on this basis there should be formed the conditions and environment for building the competitive potential of the country.

Figure 2. Evaluation of competitiveness of the national AIC in comparison with the leaders of the global agro-products market
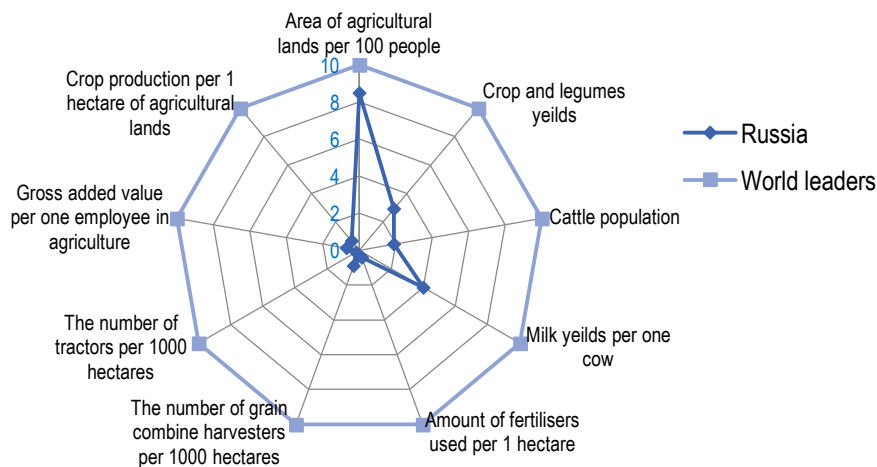
*Source:* FAOSTAT; World Bank.

3. Discussion

Using the calculations based on the presented in the current paper formulae 1, 2 and 3, and with the aim to discard the impact of the quantity of factors on the values of the complex indicators, the authors determined arithmetic mean values for these indicators. Their dynamics is shown in Figure 3.

In general, over the examined period the development of AIC competitiveness factors of the subgroup 'Capital' was characterized by the negative trend due to reduction of power supply in agrarian sector, reduced agricultural machinery park, growth of debts of the agricultural producers to banks in credits and loans. This led to a drop of the complex indicator level for this subgroup by 23.2 %.

The complex indicator for the competitiveness factor 'Labour' also showed the general trend of decline. The corresponding graph characterizes annual changes in the index of labour productivity in agriculture as an indicator in this subgroup. Over the period the level of the complex indicator 'Labour' fell by 2.25 times. This change took place because of decrease in the annual number of employed in agriculture and reduction of work places equivalent to full employment.

Figure 3. Dynamics of average complex indicators as per subgroups of AIC competitiveness factors
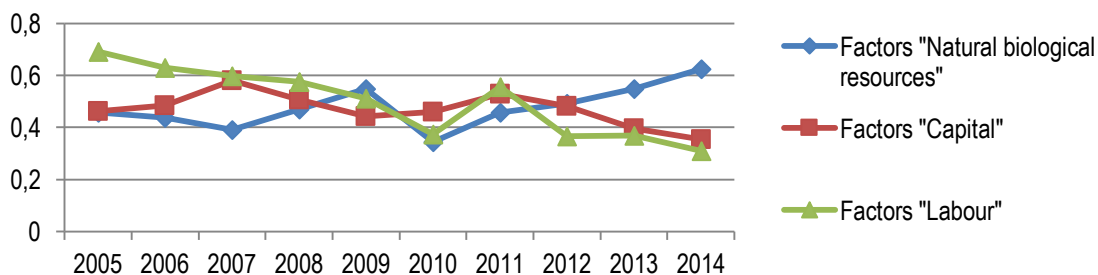
As it can be seen in Figure 3, the complex indicator for the competitiveness factor of the subgroup 'Natural biological resources' shows a general trend of growth. Over the examined period this indicator's level grew by 36.7 %. Given the considerable agrarian potential of the country in this group of factors and the achieved in the pre-reform period relatively high indicators in cattle population and area of arable lands, one cannot regard the present dynamics as sufficient for ensuring AIC competitiveness. Overall dynamics of the complex indicators for the competitiveness factors cannot be characterized by similar trends with the exceptions of the period of 2010-2014, when there were registered similarities for factors 'Capital' and 'Labour'. This interdependence is objective, because the processes of capitalization provide conditions for increasing efficiency of using labour resources. This is confirmed by undertaken correlation analysis. The matrix of paired correlation coefficients is presented in Table 5.

Table 5. The matrix of paired correlation coefficients of the complex indicators for the subgroups of AIC competitiveness factors

Subgroups of growth factors	Factors 'Natural biological resources'	Factors 'Capital'	Factors 'Labour'
Factors 'Natural biological resources'	1		
Factors 'Capital'	-0.727	1	
Factors 'Labour'	-0.425	0.633	1

Correlation coefficients show average in strength correlation link between factors 'Capital' and 'Labour', which is necessary to take into account in order to manage the competitiveness of agro-industrial production. There is no link between other factors, which characterizes their objectively independent development.

Conclusion

At present managing competitiveness of agro-industrial production in Russia reveals opposing trends and is not systemic. Basing on the revealed problem areas the following activities should be considered as strategically necessary to realize:

- To increase cost-effectiveness of the agricultural producers as the financial foundation of the AIC competitiveness.
- There should be ensured such level of cost-effectiveness and profitability of agriculture, which will be sufficient for extended reproduction, investments and scientific-technological progress. It is advisable to support the cost-efficient level of agricultural production through fixed prices for the main types of agricultural produce.
- To increase intensification of agro-industrial production as the technological foundation for AIC competitiveness.
- This should be done through differentiated subsidies, with the rates scientifically specified in accordance with the industrial and regional characteristic features. It is impossible to increase level of AIC competitiveness without large-scale modernization of the AIC, introduction of advanced technologies, cutting edge information technologies and qualified workforce.
- To give an impetus to the domestic market of food distribution as the structural foundation for AIC competitiveness. An increase in consumption of the main food products will encourage an increase in physical index of the corresponding segments of the food market and will prompt the food producers to increase their supply. As a result, this will create environment for raising AIC competitiveness. Within the framework of this strategic initiative and in keeping with the role of AIC in the national economy, the main directions should include the increase of household income, securing rational food consumption, protectionist policy towards the domestic agricultural producers, increase in quality and environmentalisation of the domestic food products.
- To ensure the development of the social sphere of the agro-industrial production as the infrastructural foundation for the AIC competitiveness.

This strategic initiative is the most difficult to be implemented because it focuses on creating a positive opinion of the public about the role and place of agriculture in the life of the nation. To be able to influence public opinion, the priority should be given to building the economic basis for such changes. First and foremost, there should be provided material conditions for people's life activities in the rural areas in keeping with social standards, including an increase in levels of payment comparable to average in economy and implementation of infrastructural projects in full volume in accordance with the current development programs. The goal of the long-term strategic initiative for rural social sphere development is to assign top-priority to the agriculture as the core structure of a

human society, which provides the powerful stimulus for overall progress of the national economy. This requires a significant change in the public perception of agricultural labour and will make it more attractive.

Acknowledgments

References

[1] Anokhina, M.Y. 2017. Examining the processes of AIC economic growth. *Economics of the Russian Agriculture*, 1: 41-55.

[2] Anokhina, M.Y., Zinchuk, G.M. and Petrovskaya, S.A. 2016. The development of the concept of economic growth of the agro-industrial complex. *Journal of Internet Banking and Commerce*, 21(3): 11.

[3] Buzdalov, I.N. 2015. Securing priority development of agriculture – the main strategy in the agrarian policy. *Economy of Agricultural and Food Processing Organizations,* 4: 2-13.

[4] Chamberlin, E. H. 1962. *The Theory of Monopolistic Competition: A Re-orientation of the Theory of Value.* 8th Edition Harvard: Harvard University Press, ISBN-10: 0674881257, 396 pp.

[5] Cournot, A.A. 1970. *Foundations for the theory of chances and probabilities.* Moscow: Nauka

[6] Edgeworth, F.Y. 1925. *Papers Relating to Political Economy*, 3 Volumes. London: Published on behalf of the Royal Economic Society by Macmillan and Company Limited, 310 pp.

[7] Hayek, F. 1973-1979. *Law, Legislation and Liberty (3 volumes):* Volume I. Rules and Order, 1973, ISBN-10: 0226320863, 9780226320861, 184 pp., Volume II. The Mirage of Social Justice, 1978, ISBN-10: 0226320839, 210 pp., Volume III. The Political Order of a Free People, 1979, ISBN-10: 0226320901, 258 pp, Available at: https://libsa.files.wordpress.com/2015/01/hayek-law-legislation-and-liberty.pdf

[8] Kazakovtseva, M.V., and Gumarova, F.Z. 2014. AIC competitiveness as the mechanism of ensuring economic security. *Current Problems of Science and Education,* 6. Available at: https://www.science-education.ru/ru/article/view?id=16910 (accessed Jule 1, 2017).

[9] Kendjukh, E.I. 2014 *Ensuring food security of the country basing on raising competitiveness of the AIC: theory, methodology, practice (on the case of Kazakhstan Republic).* Doctoral thesis (PhD in Economics). Siberian Research Institute, Novosibirsk

[10] Kormishkina, L.A. and Semenova, N.N. 2014. *Competitiveness of the Agro-Industrial complex of a region in the context of M. Porter's Diamond Model. Assessment and Prospects*. Regionology, 2. Available at: http://regionsar.ru/ru/node/1266 (accessed Jule 1, 2017).

[11] Pecherceva, O.N. 2016. Analysis of competitiveness of a regional AIC. *Scientific Journal "AIC of Russia"*. 23(3): 710-713

[12] Porter, M.E. 1990. *The Competitive Advantage of Nations* (Republished with a new introduction, 1998.) New York: Free Press, ISBN: 0029253616, 875 pp., Available at: http://www.economie.ens.fr/IMG/pdf/porter_1990_-_the_competitive_advantage_of_nations.pdf

[13] Robinson, J.V. 1971. *Economic Heresies: Some Old Fashioned Questions in Economic Theory*. New York: Basic Books, ISBN-10: 0333128834, 150 pp.

1 Schumpeter, J.A. 2012. *Capitalism, socialism and democracy: Second Edition Text,* Wilder Publications; 2 edition, ISBN-10: 1617208655, 428 pp. Available at: http://cnqzu.com/library/Economics/marxian%20economics/Schumpeter,%20Joeseph-Capitalism,%20Socialism%20and%20Democracy.pdf

[14] Seredina, N.S., and Anokhina, M.Y. 2010. Competitiveness of a regional AIC: features, methodology of evaluation, mechanisms of its raising. *The Issues of Theory and Practice in Management,* 10: 29-38

[15] Smith, A. 2008*. An Inquiry into the Nature and Causes of the Wealth of Nations: A Selected Edition*, Oxford University Press, ISBN-10: 0199535922, 688 pp.

[16] Yudanov, A. 2006. Choice of strategy – the crucial factor of competitiveness. *Higher education in Russia*, 9: 39-46.

*** FAOSTAT. Available at: http://www.fao.org/countryprofiles/ru (accessed Jule 1, 2017).

*** Forbes 2016. Available at: http://www.forbes.ru/rating/200-krupneishikh-chastnykh-kompanii-rossii-2016/2016?full=1&table=1 (accessed Jule 1, 2017).

*** RBK. Survey: Analysis of the agro-holdings activities in Russia. 2015. Available at: http://marketing.rbc.ru/research/562949994780770.shtml (accessed Jule 1, 2017).

*** The official website of the Federal State Statistics Service of the Russian Federation. Available at: http://www.gks.ru/ (accessed Jule 1, 2017).

*** World Bank. Available at: http://data.worldbank.org/indicator/ea.prd.agri.kd (accessed Jule 1, 2017).

Development of the Meat and Dairy Area of the Procesing Industry in the Republic of Kazakhstan under the Modern Conditions

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Abstract:

The article reveals basic tendencies and dynamics of developing the meat and dairy area of the processing industry in the Republic of Kazakhstan. The provision of meat and dairy production with raw materials, dynamics of production, and changes of prices for raw materials, and ready products are analyzed. The meat and dairy production is strategically important for the Republic of Kazakhstan because it is one of those industries that provide the food security of the country. Due to the geographical position and natural and climate conditions, Kazakhstan has a rather high potential for developing this area not only to service the domestic market, but also to expand export. Cattle breeding and meat and milk processing are traditional for the Kazakh population. These types of activity were formed in the ancient times. That is why the development of cattle breeding and meat processing industry is a top priority task for Kazakhstan due to the rooted lifestyle and traditional nutrition. Due to the changing market conditions, under the impact of various factors, meat and milk processing enterprises suffer a crisis because volumes of the national raw materials are limited, production funds are not sufficiently modernized, and imported products are often cheaper. It is possible to successfully solve the existing problems only subject to joint work of agricultural producers, meat and milk processing enterprises and support of state authorities. The authors defined the main problems of the meat and dairy processing industry and showed the ways to solve them.

Keywords: meat; milk; production; cattle breeding; import; agriculture; industry; processing.

JEL Classification: O10; O13

Introduction

The reproduction and processing of agricultural products, and high quality and affordable food production are a top priority task of the state. It is substantiated not only by the need to provide the Kazakh population with food, but also by the opportunity to develop this area as one of the priorities for the country's economy.

The main share in the structure of food production is related to the grain processing industry (19.4%), dairy area (16%), bread and bakery (15.5%), meat processing (13.8%), fruit and vegetable (9.4%), fat and oil (9%), and other industries (16.8%) (Master plan for developing the processing industry in the Republic of Kazakhstan 2013).

The meat industry is a branch of the food industry that processes livestock. Enterprises of the industry manufacture and slaughter livestock, poultry, rabbits and produce meat, sausages, canned meat, semi-finished products, cutlets, dumplings, and pre-cooked food. This sector gives ¼ of the republic's products in the volume of the whole industry. According to its ratio, it is on the top. Along with the production of food, dry animal feeds, valuable medicines (insulin, heparin, linocaine, *etc.*), as well as glues, gelatin and feather products are produced. Based on the developed livestock breeding, an extensive network of meat and milk enterprises was established

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(Food industry in the Republic of Kazakhstan. Basic areas of development, and their centers. Development dynamics, *n. d.*).
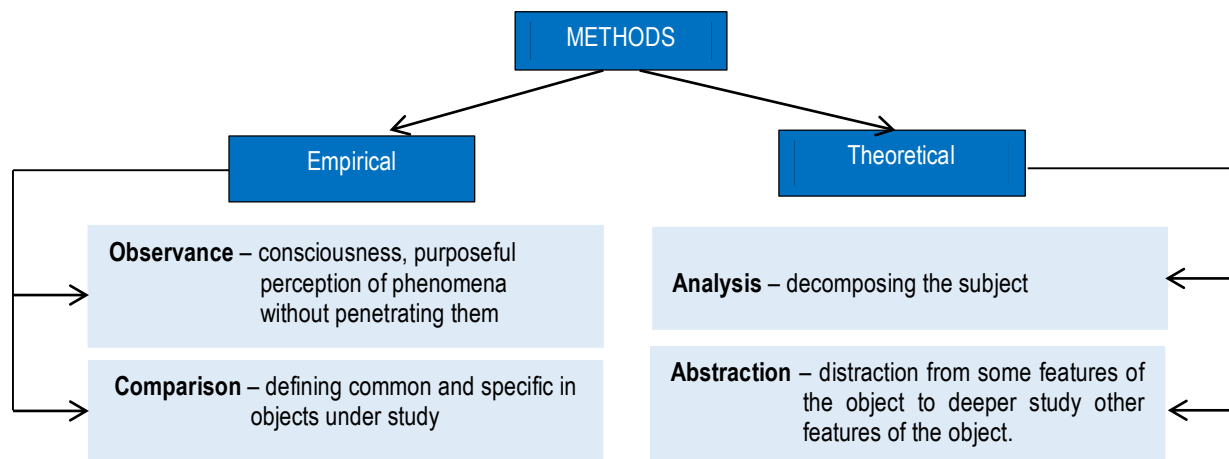
Enterprises specializing in meat processing quite often extend their activities towards processing milk and producing dairy and fermented milk products. The most important part of the country's economy is the agro-industrial complex because the economic potential and the vital agricultural production are concentrated here (Fadeyev 2011).

One of the top priority branches of the agro-industrial complex of Kazakhstan is livestock production. It is primarily due to the national characteristics and traditions of the nomadic people's life historically established in the past. The dairy and meat processing industry of the national economy aims at full meeting the demand of the country's population for meat and dairy products as the main source of nutrition. In each region of Kazakhstan, there are hundreds of both small and medium-sized meat and milk processing enterprises. The majority of them face the problem related to the shortage of raw materials. The state and enterprises take certain steps to solve this problem.

1. Methods

In the scientific literature methods are interpreted as tools, ways of cognizing the object under study. In its turn the methodology combines a set of certain methods. The whole variety of methods of the scientific knowledge is divided into empirical and theoretical. The methods used in this study are shown in Figure 1.

Figure 1. Methods of Scientific Knowledge

3. Results

3.1. Current State of the Meat and Milk Processing Sector

Enterprises specializing in meat and milk processing belong to the processing area of the food industry. They produce a rather diversified range of finished products from meat semi-finished products to sausages and canned meat, dairy and fermented milk products.

An extensive network of meat and milk processing enterprises has been established on the territory of Kazakhstan. Moreover, large enterprises having a full cycle of production from raising livestock to its slaughter and processing operate along with quite small enterprises specializing only in processing both cattle meat and poultry, or specializing only in processing milk.

The efficiency of the activity of such enterprises directly depends on the food market situation, its range and the changing demand that depends on various factors. At the present time agriculture and the meat and dairy processing industries are actively developing. Above all, this is due to the growing demand for meat and dairy products, and the growing requirements to their quality and assortment.

The state actively supported agrarians by introducing various programs, *e.g.* "Agro-Business -2020", a unified business support and development program "Business Road Map 2020", a livestock breeding cluster, "Sybag" (Fund of Financial Support of Agriculture) program, Program on financing projects on creating slaughterhouses, *etc*. (Business support programs, *n. d.*).

Table 1 shows the analysis of data provided by the Kazakh Agency on Statistics on the meat and dairy food production for 2013-2016 in physical terms (in tons).

Table 1. Dynamics of Meat and Dairy Food Production in the Republic of Kazakhstan in Physical Terms for 2013-2016

Product	2013	2014	2015	Difference in 2015 as compared to 2014	2016	Difference in 2016 as compared to 2015
Meat, poultry meat and food byproducts, tons	210,268	218,868	334,084	115,216	280,048	-54,036
Sausages and analogous products of meat, byproducts, tons	41,914	41,965	57,714	15,749	57,642	-72
Liquid processed milk and cream, tons	440,347	472,866	453,624	-19,242	499,709	46,085
Butter and dairy spreads (pastes), tons	14,075	18,794	19,470	676	19,634	164
Cheese and curd, tons	22,120	22,211	60,085	37,874	49,384	-10,701
Other dairy products, tons	207,993	208,247	208,844	597	213,934	5,090

Note: Compiled according to the data of the Statistics Agency of the Republic of Kazakhstan (Statistics Agency of the Republic of Kazakhstan*, n. d.)*

During the period under consideration, in 2015 there was an increase in production of almost all types of products, mainly in categories "Meat, poultry and food byproducts" by 1,152,016 tons and "Cheese and curd" by 37,874 tons. The only category of products where the production was reduced in 2015 by 19,242 tons was "Liquid processed milk and cream". Above all, this situation is related to the decrease in the gross milk yield due to reducing the dairy herd livestock in the population's households that make up the main production.

In 2016, as compared to 2015, the volumes of production in some product groups, such as "Meat, poultry and food byproducts", "Sausages and analogous products of meat, byproducts" and "Cheese and curd" were reduced. First of all, it was related to the decrease in the number of meat and milk enterprises that failed to survive tough market conditions by 16%.

Natural and climatic conditions allow Kazakhstan not only to fully provide the domestic market with meat and dairy products but also to establish a high volume of export.

The global financial crisis affected the economy of Kazakhstan. Due to it, the market for meat and dairy products has decreased. It is substantiated by the close interrelation of the meat and dairy production and the development of agriculture in the country. Along with the reduction of the domestic market of meat and dairy products, the export of these products has decreased more than 10 times and the import has increased. Over the recent several years it has been possible to observe a growing tendency to increasing import of meat and dairy products by 60 percent (Shurr 2015).

Table 2 shows analytical information about the volume of production, import and consumption of basic meat and dairy groups for 2015-2016 in physical terms (in tons).

Table 2. Volume of Production, Import and Consumption of Basic Meat and Dairy Groups in the Republic of Kazakhstan for 2015-2016 in Physical Terms (in USD per 1 kg according to the Rate of the National Bank of the Republic of Kazakhstan as on 01.01.2017 being 333 Tenge per USD 1)

Products	Production		Import		Consumption	
	2015	2016	2015	2016	2015	2016
Meat and food byproducts, tons	334,084	280,048	110,000	160,000	348,742	357,643
Sausages and analogous products of meat, meat byproducts or animals' blood, tons	57,714	57,642	14,872	15,424	63,385	64,521
Processed milk and cream, tons	453,624	499,709	172,122	104,859	584,120	590,752
Milk in solid form, tons	19,470	19,634	1,120	857	20,317	20,411
Butter, tons	60,085	49,384	3,274	8,244	59,541	55,847
Cheese and curd, tons	208,844	213,934	75,621	74,217	248,329	251,172
Other dairy products, tons	208,823	212,583	25,784	23,875	211,642	212,564

Note: Compiled according to the data of the Statistics Agency of the Republic of Kazakhstan (Statistics Agency of the Republic of Kazakhstan, *n. d.*)

The above time period is characterized by a significant increase in the import of meat and food byproducts by 45%. This is due to the inability of the domestic market to meet the needs of the country's population. At the same time there is an increase in the consumption of this group up to 357,643 tons in 2016, which is 8,901 tons

more than during the previous year. It is related to the improvement of the demographic situation in the country and the population growth.

One of the main problems of the meat and dairy industry is the insufficiency of raw materials for production. The main source of raw materials is the population's households and peasants' and private farms. A quarter of the raw materials consumed is produced at own plants for breeding animals for slaughter. A rather large volume is imported (Kochubey 2009)

Table 3 shows dynamics of producing certain types of livestock products in the Republic of Kazakhstan as a base of raw materials for the meat and dairy processing industry.

Table 3. Dynamics of producing certain types of livestock products in the Republic of Kazakhstan in all categories of households for 2012-2016, thousand tons

Product	2012	2013	2014	2015	Difference in 2015 as compared to 2014	2016	Difference in 2016 as compared to 2015
Livestock and poultry slaughed in households or sold for slaughing (carcass weight basis), thous. tons, including:	844.7	871.0	900.2	931.0	30.8	962	31
Cattle	373.5	383.5	405.5	416.8	11.3	424.2	7.4
Sheep and goats	153.8	156.4	161.9	165.1	3.2	171.8	6.7
Horses	85.1	89.4	92.4	101.4	9	103.5	2.1
Pigs	103.3	99.9	99.8	95.3	-4.5	99.9	4.6
Poultry	123.1	135.8	134.2	146.1	11.9	152.7	6.6
Milk, thous. tons	4,851.6	4,930.3	5,067.9	5,182.4	114.5	5274.3	91.9
Eggs, mln. items	3,673.4	3,896.0	4,291.2	4,737.0	445.8	5,161.3	424.3

Note: Compiled according to the data of the Statistics Agency of the Republic of Kazakhstan (Statistics Agency of the Republic of Kazakhstan, *n. d.*)

During the period of 2012-2016, livestock production was growing sustainably. In the future there may be an opportunity to completely change over to providing the country's meat processing industry with raw materials.

Figure 2 shows the dynamics of meat raw materials production in the context of the categories of households specializing in the livestock production for the analyzed period of 2011-2015. According to it, among various types of producers of agricultural raw materials for processing meat, above 60 percent of the livestock and poultry slaughter volume falls on the population's households, although the analyzed period also displays dynamics of an increase in the volumes of supplying raw materials to meat processing enterprises by rural enterprises, peasants' and farmers' households.

Figure 2. Dynamics of livestock and poultry slaughter by all categories of Kazakh households for 2011-2015, thous tons
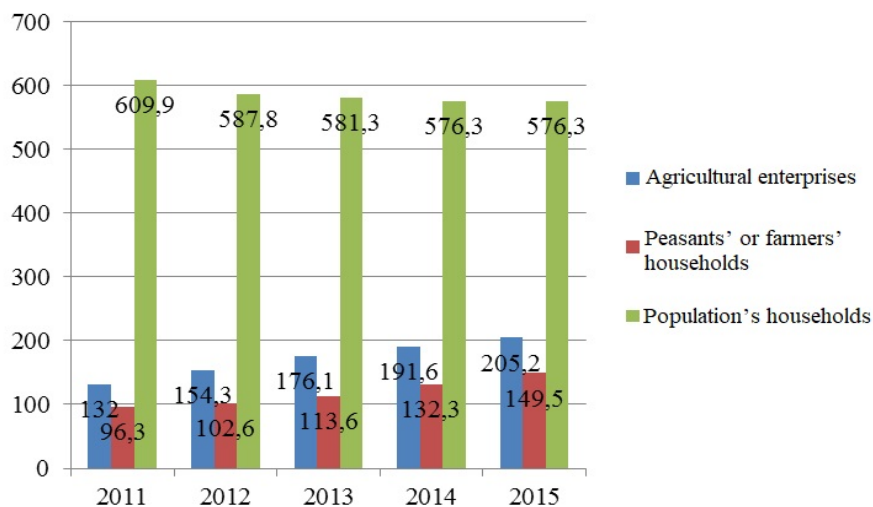
One of the important conditions for the sustainable development of meat and milk processing enterprises is the developed efficient mechanism of price formation. It should be rather flexible for the changing conditions of the

economic situation on the market because the correct price formation is primary in developing any producing enterprise or industry.

Many factors depend on the production cost. These are the economic efficiency of the production process, incentives and wages of workers involved in the production, extended reproduction, as well as general development of the branches of the national economy and the elimination of disproportions in their development (Seydakhmetov, Kukva and Nurgaliyeva 2006).

This mechanism must take into account laws of supply and demand, *i.e.* on the one hand, it has no shortcomings of the system of planned pricing (imbalance of the production and consumption, inconsistency of inter-sectoral interests), and, on the other hand, it has preferences before the spontaneous market pricing mechanism (market prices instability and lack of the economic growth sustainability) (Altaibaeva, Bauer-Kenzhebolatova, Zhaltyrova 2016).

The price for agricultural products, unlike prices in other industries, is formed on the basis of the socially required labor and resources needed for the worst conditions of agricultural production. Under the market economy, the price reflects not only the expenses or the cost of products, but also the conditions for the exchange of goods, demand and supply, market situation, product quality, tax policy, intra-industry and inter-sectoral competition, and product competitiveness (Alshynbay 2008).

The producer's price for industrial products is the price of a unit of the produced industrial output at the time of its release by the enterprise, excluding VAT, excises, other indirect taxes, trade, marketing margins and transport costs related to the movement of products from the producer to the buyer.

Changes in the producers' prices are observed in a selective network of basic enterprises of various forms of ownership, as well as organizational and legal forms. Prices are registered for a certain list of goods. This includes the most representative products that are close to the main quality parameters, used raw materials and production process (Shelomentseva and Davidenko 2013).

Table 4 shows the dynamics of changes in the prices for some types of dairy and meat processing products for 2011-2015.

Table 4. Dynamics of changes in average prices for some types of cattle products and meat and dairy processing products for 2011-2015 (in USD per 1 kg according to the Rate of the National Bank of the Republic of Kazakhstan as on 01.01.2017 being 333 Tenge per USD 1)

Products	2011	2012	2013	2014	2015
Beef	3.25	3.53	3.56	3.55	3.53
Lamb meat	3.13	3.44	3.54	3.54	3.47
Pork	2.51	2.87	2.92	3.14	3.20
Chickens	1.56	1.78	1.64	1.97	1.87
Cooked sausage	3.03	3.27	3.42	3.90	4.05
Semi-smoked sausage	3.58	3.83	4.02	4.56	4.66
Unsalted butter	3.72	3.89	4.09	4.44	4.32
Raw milk, liter	0.34	0.37	0.40	0.42	0.50

Note: Compiled according to the data of the Statistics Agency of the Republic of Kazakhstan (Statistics Agency of the Republic of Kazakhstan, *n. d.*)

Analyzing the price dynamics shown in Table 5, it is necessary to note the steady growth of prices for meat and dairy products from 8 up to 47% for different types of products. At the same time prices for sausages rose by more than 30%, and prices for milk increased by 47%. This fact points at the crisis situation on the market of these products that happened due to various factors, such as the raw materials deficit, the inflation of the national currency, and the insufficiency of capital for the development of enterprises in this sector.

At the present stage the development of meat and dairy production can be characterized by relative stability and sufficient potential for the further development, despite of the existing difficulties. One of the problems is the low level of the technical equipment of meat and dairy production as compared to the modern technologies and equipment that comply with the international level (Galimova 2014).

To further develop the food industry, it is necessary to increase the flow of investments not only in the food industry but also in agriculture as the main supplier of raw materials, thereby substantially increasing the production potential of enterprises engaged in meat and milk processing (Pritvorova and Dzhusupov 2009).

Figure 3 shows the structure of investments in agriculture in general in the Republic of Kazakhstan in 2016. It proves that the burden of investments almost entirely depends on the agrarians themselves, and other sources of financing are extremely small.

Figure 3. Structure of Investments in Agriculture in 2016, in thous. Tenge, %
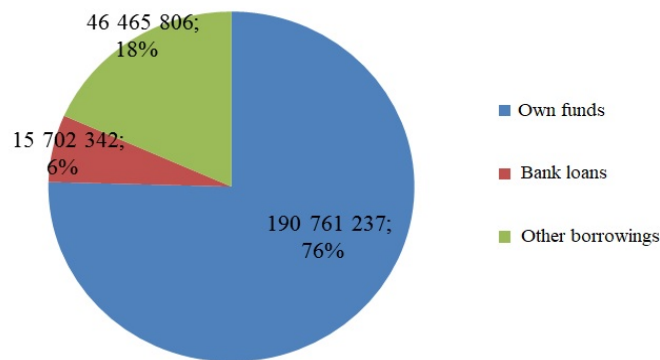

Table 5 shows investments in the agricultural capital stock in Kazakh regions, according to the results for 2016.

Table 5. Volumes of investments in the agricultural capital stock in Kazakh regions for 2016, thous. Tenge

Regions	Own funds	Bank loans	Other borrowings	Investments in the capital stock	Ratio of regions in republican volume of investments in capital stock, in %
Akmolinskiy	33,763,843	5,098,308	12,817,458	51,679,609	20.4
Aktyubinskiy	10,232,978	364,942	1,171,077	11,768,997	4.7
Almatinskiy	13,806,688	4,255,380	10,925,317	28,987,385	11.5
Atyrauskiy	1,671,887	-	3,721	1,675,608	0.7
West-Kazakh	617,425	703,026	101,873	1,422,324	0.6
Zhambylskiy	9,729,119	120,889	3,466,179	13,316,187	5.3
Karagandinskiy	6,908,664	677,024	1,569,252	9,154,940	3.6
Kostanayskiy	32,880,135	756,094	1,688,229	35,324,458	14.0
Kyzylordinskiy	3,141,183	-	681,168	3,822,351	1.5
Sount-Kazakh	7,840,465	924,040	1,920,127	10,684,632	4.2
Pablodarskiy	10,394,603	149,615	4,823,649	15,367,867	6.1
North-Kazakh	49,060,146	1,820,416	5,901,544	56,782,106	22.3
East-Kazakh	10,529,422	832,608	1,396,212	12,758,242	5.0
Almaty	184,679	-	-	184,679	0.1
In total in Republic of Kazakhstan	190,761,237	15,702,342	46,465,806	252,929,385	100.0

Note: Compiled according to the data of the Statistics Agency of the Republic of Kazakhstan (Statistics Agency of the Republic of Kazakhstan, *n. d.)*

According to the Statistics Agency of the Republic of Kazakhstan, the largest volume of investments in capital stock in agriculture falls on the North-Kazakh Region - above 22%. This fact is stipulated by the agrarian specialization of the region that has favorable natural and climatic conditions that allow farming (Ministry of Agriculture of the Republic of Kazakhstan, *n. d.).*

The Akmolinskiy Region is the second in terms of investments in the capital stock in agriculture - 20.4 percent. This region used not only its own funds for investments but also external sources of investment more than other regions. In this area, the development of agriculture is a top priority. The agricultural sector is developed within the Program for Sustainable Development of the Agro-Industrial Complex and the Program for the Rural Areas Development.

Along with the Almatinskiy and Kostanayskiy Regions, the Pavlodarskiy Region is among top five regions specializing in agriculture. According to the "KazAgro" National Management Holding, there are 259 enterprises specializing in meat processing and 214 enterprises specializing in milk processing ("KazAgro" national management holding, *n. d.).*

The largest enterprises specializing in the meat and dairy food production are "Becker and Co." LLP in Almaty, "Kubley" LLP in Uralsk, "Semipalatinsky Meat Processing Plant" LLP in Semipalatinsk, "Rubikom" LLP, "Akoba" LLP, "Myasnoy Dvor" LLP, with the production in Pavlodar.

There are rather many enterprises. However, the main production falls on sausage products and meat semi-finished products and dairy products. The share of products made by the above enterprises is constantly growing on the domestic market of meat and sausage products. Nevertheless, these enterprises have a lot of problems. The import of meat and dairy products often considerably complicates the work of even such large enterprises. Products that have as high qualitative characteristics as domestic products but are much cheaper are imported from the border territories of other countries.

Summarizing the above, there is the need to support domestic meat and milk producers that are often considered as the city forming enterprises and maintain food security not only in the region where they are located but also in the country as a whole. By assisting in the improvement of the efficiency of meat and milk processing enterprises, and extending their production, new jobs are created and new types of products that can be successfully exported are developed.

4. Discussion

At the present stage of the society development, the meat and dairy area is the largest in the food industry. Its assortment has a product, medical and technical value.

The profitability of meat and milk enterprises depends on many factors, from the breed of animals and the natural and climatic conditions they live under, the requirements for feeding and maintenance, up to the technical equipment of the production, quality control, efficient management and marketing conditions.

The researches carried out in the area of technogenic impact on the physiology showed that the human diet considerably exceeded the energy needs of the population. However, the need in animal proteins is not completely satisfied because of its low content as a result of heat treatment and other influences on meat and dairy raw materials. Therefore, there is a need for constant control and flexibility of the meat and dairy production process and the compliance of the end product with the changing physiological needs of various population groups.

The most important task of the meat and milk processing industry is to improve the quality. It depends not only on the technical characteristics of the production process, but also on agriculture as the sole supplier of raw materials.

The production of high-quality meat and dairy products that meet world standards is one of the top priority tasks. To solve it, it is necessary to develop a set of measures. The efficiency of the industry depends on the further comprehensive automation and mechanization of not only processing, but also agriculture, the introduction of non-waste technologies, the reduction of production costs, and the improvement of staff specialization. Solving problems in the food industry on processing meat and dairy raw materials can be effective only subject to the support from state authorities together with manufacturers (Miller, Miller and Davidenko 2015).

Conclusion

According to the Master plan for developing the processing industry in the Republic of Kazakhstan up to 2020, the following top priority areas for developing this industry were defined:
- processing of milk (production of butter, cheeses, milk powder);
- meat processing (production of sausages, canned meat);
- production of fat-and-oil products (margarine and vegetable oil);
- deep processing of cereals (production of pasta, cereals);
- processing of fruits and vegetables;
- production of sugar;
- primary processing of livestock skin ("Agrobusiness - 2020" program on developing the agro-industrial complex in the Republic of Kazakhstan for 2013 – 2020).

The main problems and ways to solve them in the area of meat and milk production are shown in Table 6.

Table 6. Problems and ways to solve them in the area of meat and milk production

Main problems	Ways to solve them
Low milk quality, irregular milk supply to processing enterprises	Establishing technically equipped milk reception stations in the areas of agricultural units; State investment subsidization for buying milk trucks by processing enterprises
Interruptions in the supply of meat and high cost of raw materials	The increase in the volume of meat raw materials, improvement of the meat purchase system, the use of cattle carriers by meat processing enterprises for the uninterrupted supply of meat, state investment subsidies for equipment and specialized transportation

Main problems	Ways to solve them
Insufficiency of the producers' working capital	Subsidizing credit lines to replenish current assets of the enterprise
Low quality of products that do not comply with international standards	Improving the quality of the ready meat and dairy products by implementing international quality standards, technical reequipment of the production process
Extending the range of ready products	Monitoring the meat products market, the purchasing power of the population and its preferences
Management improvement	Efficient management, systematic improvement of the level of employees' skills, stimulating their remuneration, as well as increasing the staff's interest in scientific developments in the industry.

State support for measures to develop the industry through subsidies, preferential credit conditions and tax remissions for enterprises of the meat and dairy industry are important.

Thus, the creation of comfortable conditions for the development of processing enterprises will help domestic producers to increase export, improve the quality of the product, expand production, create new jobs and enter new markets. In its turn, the development of the food processing industry will help Kazakhstan to create the worthy competition to other partners of the Customs Union.

References

[1] Alshynbay A.M. 2008. *Rynok i tsenoobrazovaniye [Market and price formation].* Almaty: Economics, 190 pp.

[2] Altaibaeva, Z., Bauer-Kenzhebolatova, M., Zhaltyrova, O. 2016. Development of the Flour-milling Industry in the Republic of Kazakhstan in Modern Times*. International Journal of Economics and Financial Issues*, 6(S2): 1-8.

[3] Fadeyev A.A. 2011. Problemy razvitiya zhivotnovodstva v Severnom regione Kazakhstana [Problems of developing cattle breeding in the Northern region of Kazakhstan]. *AlParis,* 1: 56-58.

[4] Galimova E.G. 2014. Sovremennoye sostoyaniye myasopererabatyvayushchey otrasli Zapadno-Kazakhstanskoy oblasti [Modern state of the meat processing area of the West-Kazakh Region]. *Regional Development,* 2: 5-8.

[5] Kochubey N.B. 2009. *Sostoyaniye, problemy i perspektivy deyatel'nosti sel'skokhozyaystvuyushchikh subyektov v usloviyakh mirovogo krizisa [State, problems, and perspectives of agricultural subjects' activity in the context of the global crisis].* Materials of the International Research and Practice Conference "Industrial and Innovational Development at the Modern Stage: State and Perspectives of Development". Pavlodar, December 10-11, 100-104 pp.

[6] Miller, A.Ye., Miller, N.V., Davidenko, L.M. 2015. Formation of integrated industrial companies under current conditions. *Asian Social Science,* 11(19): 70-81

[7] Pritvorova, T.P. and Dzhusupov, KH.S. 2009. *Sostoyaniye i perspektivy razvitiya agropromyshlennogo kompleksa Karagandinskoy oblasti [State and perspectives of developing the agro-industrial complex of the Karaganda Region].* Materials of the International Research and Practice Conference "Industrial and Innovational Development at the Modern Stage: State and Perspectives of Development". Pavlodar, December 10-11, 176-179 pp.

[8] Seydakhmetov, A.S., Kukva, I.N., and Nurgaliyeva, K.K. 2006. *Ekonomicheskaya otsenka sel'skokhozyaystvennogo potentsiala agrobiznesa [Economic estimation of agricultural potential of agricultural business].* Almaty: Economix, 256 pp.

[9] Shelomentseva, V.P., and Davidenko, L.M. 2013. Integration processes on the basis of state private partnership (Following the Materials of the Republic of Kazakhstan). *World Applied Sciences Journal*, 23 (2): 224-230

[10] Shurr A.V. 2015. *Agrarnaya spetsializatsiya Severo-Kazakhstanskoy oblasti Respubliki Kazakhstan [Agrarian specialization of the North Kazakh Region of the Republic of Kazakhstan].* Ogarev-online, 7, Available at: http://journal.mrsu.ru/arts/agrarnaya-specializaciya-severo-kazakhstanskojj-oblasti-respubliki-kazakhstan (accessed 28.09.2017)

*** Agentstvo Respubliki Kazakhstan po statistike [Statistics Agency of the Republic of Kazakhstan]. Available at: www.stat.kz (accessed 16.09.2017)

*** Master plan razvitiya pererabatyvayushchey promyshlennosti v Respublike Kazakhstan do 2020 goda [Master plan for developing the processing industry in the Republic of Kazakhstan]. Pandia. 2013. Available at: http://pandia.ru/text/80/148/39592.php (accessed 16.09.2017)

*** Ministerstvo sel'skogo khozyaystva Respubliki Kazakhstan [Ministry of Agriculture of the Republic of Kazakhstan]. Available at: http://mgov.kz/ (accessed 28.09.2017)

*** Natsional'nyy upravlyayushchiy kholding "KazAgro" ["KazAgro" national management holding]. Available at: http://www.kazagro.kz/documents/16882/115471/myasopererabotka.pdf/7fd9c2d0-cbd9-4700-9e3b-15e8d25c6fe7 (accessed 30.09.2017)

*** Pishchevaya promyshlennost' RK. Osnovnyye otrasli razvitiya, tsentry ikh razmeshcheniya. Dinamika razvitiya [Food industry in the Republic of Kazakhstan. Basic areas of development, and their centers. Development dynamics]. Available at: IntoRegions. http://www.intoregions.ru/gols-1066-1.html (accessed 16.09.2017)

*** Programma po razvitiyu agropromyshlennogo kompleksa v Respublike Kazakhstan na 2013 – 2020 gody "Agrobiznes – 2020" ["Agrobusiness - 2020" program on developing the agro-industrial complex in the Republic of Kazakhstan for 2013 - 2020]. Tengrinews, Available at: http://tengrinews.kz (accessed 16.09.2017)

*** Programmy podderzhki biznesa [Business support programs]. Territory of business. Available at: https://business.gov.kz/ru/business-support-programs/ (accessed 16.09.2017)

Agriculture Financing – a Basic Premise for Ensuring Food Security in Kazakhstan

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Abstract:

The main idea of the article is to prove the dependence of agriculture on the amount of financing, as an important condition for achieving food security in Kazakhstan. The urgency of ensuring food security is confirmed by an active interest on the part of scholars, international organizations and the world statistics. To date, there are also issues related to food security in terms of nutrition and food availability in some countries. For Kazakhstan, to maintain food security is one of the strategic tasks. There was a gap in Kazakhstan in studying the impact of agricultural financing on the formation of food security, which determined the purpose of the study. The research was conducted on the existence of a relationship between the productivity of the agricultural sector, the volume of investment in fixed assets, and the farm production expenses. Structural analysis of the agro-industrial complex financing is given, which showed that the main amount of financing is carried out at the expense of own funds and the volume of state investments is less than own resources. The Global Food Security Index figures calculated for Russia, the country having common historical past and large territories, and for South Korea, a country developing an active innovative agricultural policy and having high rates of agricultural productivity in the presence of smaller territories were used to compare the food security of Kazakhstan. The conducted analysis made it possible to draw conclusions about the dependence of agriculture on financing. A recommendation has been formulated on the need to increase government funding for the village economy as the main condition for ensuring food security.

Keywords: financing; agriculture; food security; Global Index; investment; government subsidies; agrarian sector; food products

JEL Classification: Q14; G00; Q18; O13

Introduction

At present, national food systems are affected by trends of a global scale, which lead to the formation of potential threats to food security and the need for government financial support for the agricultural sector of the economy. Economists and politicians call a number of arguments of a global nature in favor of such support.

1. *Rapid economic growth and population increase in many emerging economies.* The outpacing growth rates of the population's effective demand for food in comparison with supply in countries such as China, India, Brazil and other newly industrialized countries have violated the balance in the world food system. As known, demand exceeding supply leads to higher prices. Rising food prices undermine the country's development process, which also causes a slowdown in the growth of agricultural production, especially in the economically developed countries that are main exporters of farm products. At the same time, the world demand for food will always grow, as the population annually increases by 80 million people or by 1.4% (Altukhov 2010). The number of beggars and starving people is increasing approximately by as many annually. Every year they become more, and food is less.

In addition, the increase in food prices exacerbates the problem of poverty, increases social tensions and the stratification of the society.

2. *Accelerated development of biofuel production and use.* The use of agricultural feedstock for the production of liquid biofuels contributes to the growth of demand for agricultural products, and also affects the markets of other agricultural products. The growth of biofuel production not only affects the prices of agricultural crops used to produce it, but also leads to the emergence of a potential link between changes in the prices of oil and agricultural feedstock for industrial production and other food products. It should be noted that in recent years, rising oil prices have contributed to higher prices for food crops such as wheat, corn, and oilseeds, and resulted in an increase in retail prices for basic food products.

Rapid development of biofuel production and use caused a reduction in the supply of food to the world market, especially grain, which is a basic food product, not replenished by increasing production of agricultural products in the importing countries. In recent years, in foreign countries, farmers have massively reduced the planting acreage of food grain crops in favor of corn and rapeseed. About 80% of the EU biofuel produced is made from rapeseed. Brazil is the leader in its production among the developing countries due to cultivation of cheap sugar cane. The world production of ethanol and biodiesel is expected to increase rapidly (Dadalko *et al.* 2011)

3. *Reduction in the level of world food supplies and, in the first place, of the carry-over stocks of grain.*

4. *Global climate change.* Over the past 100 years, the global average temperature has risen by 0.3-0.6°C on the planet. In the future, it is also expected to rise by 1.5-4.5°C. Global climate change will significantly affect agriculture and cattle husbandry, it will increase the degradation of soil and water resources, and significantly complicate food security provision. An increase in the average annual temperature may lead to a reduction in the world output of food products and cause an increase in prices for them. And in the countries of the southern group, rainfall and crop yields are expected to decline, while in the countries of the northern group, crops yields may increase.

Thus, the considered modern global challenges to food security are the most important arguments in favor of the need for the government financial support in the agricultural sector of the economy.

The availability of food is a problem for all states, and especially for the developing countries. Food security means providing access to a sufficiently nutritious and culturally acceptable food for each member of the family for a healthy lifestyle, in socially acceptable ways.

1. Literature Review

1.1. Definition of the concept

Food security is a multidimensional phenomenon in the nature, requiring precise measurements and quite complicated for the developers of public policy goals in this direction. Food security means "consistent, dependable access to enough food for active, healthy living" (Coleman-Jensen *et al.* 2011).

On the other hand, food insecurity is the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Andersen 1990, FAO 2006). The definition of food security used in this study is based on the definition of FAO: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO 2010). This definition consists of four pillars of food security: availability, access, utilization, and stability. Thus, a food system is vulnerable when one or more of the four components of food security are uncertain and insecure (FAO 2008).

The food insecurity affects an increasing number of people who are undernourished, accounting for 842 million persons, which is approximately 12% of the total world population. Developing countries are particularly affected. And this is true, for example, in Asia and Africa, where more than 92% of the world's undernourished people live; making 552 and 226.4 million, respectively.

The data show that in 2013, about 294.7 million people were not provided with food, only in Southern Asia, which accounts for almost 35% of the world's total malnutrition (FAO 2013). According to recent estimates, about 795 million people in the world – just over one in nine people – were malnourished in 2002. Changes in large populous countries, notably China and India, play a large part in explaining the overall hunger reduction trends in the developing regions (FAO 2015). World hunger is on the rise: the estimated number of undernourished people has increased from 777 million in 2015 to 815 million in 2016 (FAO 2017).

Factors of food security vary depending on the level, i.e. ranging from the global to regional and national, to household and individual ones. Since food security is considered a multidimensional phenomenon that embraces climate change, civil conflicts, natural disasters and social norms, starting from the world food crisis of 1972-74 and

the shocking food prices in 2006-2008, the food insecurity required close attention from the state, due to mass hunger and malnutrition (Gebre 2012, Sasson 2012).

Food security factors have been investigated by various authors for various countries, including Amhara region – Ethiopia (Aragie and Genanu 2017), Bangladesh (Bidisha *et al* 2017), Brazil (Felker-Kantor and Wood 2012), China (Zhang *et al.* 2018), Ethiopia (Bogale 2012), Georgia (I.E Meskhia 2016), Ghana (Owusu *et al.* 2011), India (Debnath *et al.* 2017), Iran (Hosseini *et al.* 2017), Kenya (Kassie *et al.* 2014), Mexico (Shamah-Levy 2017), Nigeria (Arene, CJ 2010), Pakistan (Abdullah *et al.* 2017), Zimbabwe (Mango *et al.* 2014). Economic valuation of food was made by Chavas (2017).

The following authors have investigated the problems of financing agriculture, its various aspects, including from the point of view of achieving food security, as a case study of various countries: Bashir *et al.* (2010, 2009); Chisasa (2016, 2015); Shilpa *et al.* (2013), Galli *et al.* (2016), Picazo-Tadeo *et al.* (2011), Gorzelak (2017).

The study of food security and factors affecting it was conducted in Kazakhstan as well. Several authors examined various factors making impact on food security, *for example*: Aigarinova, Akshatayeva and Alimzhanova (2014), Yerkinbayeva, Ozenbayeva, and Nurmukhankyzy (2014), Baydildina, Akshinbay, Bayetova, Mkrytichyan, Haliepesova, Ataev (2000), Aigarinova, and Shulanbekova (2013).

However, the financial component affecting food security in respect of Kazakhstan has not been studied yet, therefore this research is planned to fill this gap. The purpose of this research is to study the impact of financing on Kazakhstan's food security. Low-income and food-deficit countries and emerging markets affected by the food crisis may face increased difficulties in financing food imports due to deteriorating balance of payments and devaluation of the national currency.

Exporting countries face a loss of income from the reduction in global demand for exports of their goods, which leads to difficulties in maintaining a social protection system, such as school meals and food subsidies. Negative macroeconomic consequences for agriculture and food security can be felt in the context of reduced borrowing, bank lending, official development assistance, and foreign direct investment.

The implementation of financial support for the agro-industrial complex (AIC) is one of the problems of market regulation of the economy. The problem is formed by the AIC specifics, *i.e.* high riskiness of the industry due to the large gap between the processes: investing and obtaining finished products. Thus, it becomes necessary to study the AIC financing, especially in the context of ensuring the country's food security. The structure and sources of agriculture financing in the Republic of Kazakhstan in the dynamics are given in Table 1.

Table 1. Sources of financing the agricultural fixed capital in the period from 2011 to 2017

Years	Investment, total		Budget funds		Internal funds		Bank loans		Other sources	
	M KZT	Share, %	M KZT	Share, %	M KZT	Share, %	M KZT	Share, %	M KZT	Share, %
2011	109,423.5	100	2,265.9	2.1	80,090.4	73.1	-	-	27,067.2	24.7
2012	133,944.4	100	792.3	0.5	103,564.4	77.3	-	-	29,587.7	22.1
2013	139,626.7	100	2,976.1	2.1	105,754.7	75.7	6,180.8	4.4	24,715.1	17.7
2014	173,208.5	100	2,518.0	1.4	132,303.8	76.3	10,086.2	5.8	28,372.5	16.3
2015	163,907.7	100	109.6	0.1	134,073.2	81.7	5,609.8	3.4	24,115.1	14.7
2016	253,951.4	100	0.0	0.0	188,272.7	74.1	17,492.7	6.9	48,186.0	19.8
2017*	237,016.8	100	175	0.1	190,380.2	80.3	14,915.1	6.3	31,546.5	13.3

Note: data as of October 2017
Source: Calculated by the authors on the basis of data from the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017)

In the structure of agriculture financing sources, the main share is occupied by internal funds; moreover, in the context of 7 years there is a tendency to increase the share of internal funds. There is a decrease in the share of other financing sources, despite the general picture of growth in the volume of investment in agriculture, the volumes of bank lending are insignificant, and the share of budget funds is negligible.

The share of annual government subsidies is extremely low and tends to decrease. According to the Committee on Statistics of the Republic of Kazakhstan, in 2017 state funds allocated from the republican and local budgets amounted to about KZT 175 million or 0.1% of the total investment. The volume of annual investments is increasing, except for 2017, when the reduction was 6.6%. In 2017, agriculture received the investment of about KZT 237 billion.

Table 2. SWOT-analysis of the AIC sector in the republic of Kazakhstan

STRENGTHS	WEAKNESSES
▪ Kazakhstan ranks ninth in the world in terms of square footage; ▪ Kazakhstan ranks second in the world in terms of arable land per capita; ▪ Kazakhstan is one of the largest exporters of grain and flour; ▪ the large number of rural population (43% of the total population), high proportion of the employed; ▪ large potential demand for food products of the CIS and Central Asian markets; ▪ constant growth of the gross product of the agroindustrial complex; ▪ high potential for production and export of organic products.	▪ a low share in the country's GDP; ▪ a low level of implementation of the results of research and development activities; ▪ an insufficient level of veterinary and food safety; ▪ high capital costs; ▪ a long payback period; ▪ the dependence on natural and climatic conditions; ▪ low labor productivity; ▪ low profitability of agricultural commodity producers.
OPPORTUNITIES	THREATS
▪ the possibility of increasing output for all types of agricultural products due to the growing number of the population and changing its nutrition structure; ▪ the formation of effective government support for agricultural commodity producers and agricultural cooperatives; ▪ - expansion of the geography of supplies and exports in the promising sectors.	▪ adverse changes in climatic conditions, instability of weather conditions, etc.; ▪ the spread of animal and plant diseases and pollution of the natural environment; ▪ increased competition in international markets, in connection with accession to the WTO for certain types of products; ▪ the risk of inefficient government regulation of the industry.

Source: PD RK No. 420, 2017

As compared with other branches of the republic, agriculture is profitable in Kazakhstan, although in different periods the values of this indicator are uneven. At the same time, the profitability of the crop sector, the average annual value of which is about 27%, is much higher than in the livestock sector, where profitability varies at a level of 14% for the period from 2010 to 2014.

In general, underutilization of the export potential of agriculture, a high share of imports of processed products led to a negative balance in foreign trade as to food products – minus USD 1.3 billion.

2. Methodology and Data

At the present stage of Kazakhstan's development, when the state has set a course for entering the number of the most economically developed countries of the world, the biggest and most responsible task is to raise the agrarian sector of the economy to a qualitatively new level of development, as agriculture allows ensuring the country's food security. During the period from 2011 to 2015, the state support programs were implemented, such as the Business Road Map 2020, Performance 2020, and Agribusiness 2020.

In 2017 there is a significant increase in the share of agriculture in GDP, which is determined by a sharp decline in exports in nominal terms due to fluctuations in the national currency. The share of annual government subsidies is extremely low and tends to decrease. According to the Committee on Statistics of the Republic of Kazakhstan, in 2017 state funds allocated from the republican and local budgets amounted to about KZT 175 million or 0.1% of the total investment. The volume of annual investments is increasing, except for 2017, when the reduction was 6.6%. In 2017, agriculture received an investment of about KZT 237 billion (MA RK 2017)

3. Results and Discussion

The research was aimed at studying the impact of financing on Kazakhstan's food security, since modern world food security issues are most relevant. The structure of the sources of financing has shown that the share of budgetary funds is negligible and the main volume of investments is carried out at the expense of the own internal resources of the agrarian sphere entities. The specific features of the Kazakhstan's agro-industrial complex development are the most important arguments in favor of the need for the government financial support for the agrarian sector of the economy.

Government financing is a prerequisite for ensuring food security in Kazakhstan. Based on the above goal, the dependence of the results produced by agriculture on investment in fixed assets, as well as on the costs of production of agricultural products, will be analyzed. The data analysis will be conducted using the Statistica package. The data necessary for the analysis are summarized in Table 3. To compare Kazakhstan's ration situation, an analysis is made of the Global Food Security Index indicators between Russia, having common

historical past with Kazakhstan, and South Korea, actively developing an innovative agricultural system in the country.

Table 3. Data for the regression and correlation analysis

Years	Y - Gross output of crop and livestock production, M KZT	x1 - volume of investments in the fixed capital of crop and livestock production, M KZT	x2 - crop and livestock production costs, M KZT	x3 – number of agricultural enterprises, units
2001	533,639.30	11,986.00	70,085.85	131,203
2002	557,391.50	15,972.00	87,144.15	150,696
2003	610,945.80	17,612.00	96,872.46	159,433
2004	691,965.70	34,321.00	106,755.99	187,139
2005	745,312.90	47,975.00	127,921.80	196,417
2006	821,212.10	47,143.00	152,947.36	200,812
2007	1084,668.30	57,679.60	204,870.54	201,890
2008	1,398,840.60	74,695.04	240,232.71	201,072
2009	1,635,479.60	69,317.00	445,612.88	200,876
2010	1,436,758.60	83,605.00	475,799.56	197,033
2011	2,279,578.70	109,423.50	600,625.22	214,008
2012	1,992,381.90	133,944.40	457,947.03	197,431
2013	2,377,341.60	139,626.70	185,708.69	187,630
2014	2,517,410.60	173,208.50	206,182.31	189,038
2015	3,295,159.70	163,907.70	813,153.57	184,608
2016*	3,684,393.20	253,951.40	890,974.15	184,180
2017*	3,560,164.00	237,016.80	850,132, 23	184,231

*Note: 2016 data are obtained from the preliminary reporting, 2017 data cover information over the period from January to October

3.1. Regression analysis

Based on the data of Table 1, where Y is the resultant attribute of factors x1, x2, x3 (factor attributes), the results of regression analysis will be obtained with a given significance level of 5%. Then the linear model equation has the form:

$$Y=12.94 \cdot x1+1.17 \cdot x2-3.74 \cdot x3 +812166.12 \tag{1}$$

where: $x1$ is the volume of investments in the fixed capital of crop and livestock production; $x2$ – crop and livestock production costs; $x3$ – the number of agricultural enterprises.

The value of 812166.12 evaluates the aggregated effect on the result of other factors unaccounted for in the model.

3.2. Testing of the hypotheses

3.2.1. Fisher's criterion

Estimation of the reliability of the regression equation as a whole (the statistical significance of the parameters) and the indicator of the strength of relationship is provided by the Fisher's particular F-criterion, which evaluates the statistical significance of the presence of each factor in the equation, *i.e.*, the significance of F. Since the *significance of F* = 2.091E-08 <0.05, the zero hypothesis about the simultaneous zeroing of all coefficients of the model is not confirmed and the statistical significance of the regression equation is recognized with a probability of 95%.

3.2.2. Student's test

The evaluation of the significance of the regression coefficients is calculated using the Student's t-criterion by comparing their values with a random error value. If α <p, then the null hypothesis is rejected and an alternative hypothesis about the statistical significance of the parameter under consideration is accepted.

With a probability of 0.05 or 5% parameter x1 – the volume of investment in the fixed capital of crop and livestock production – is statistically significant, because 10.9>α=0.05; x2 – crop and livestock production costs – is also statistically significant, because 4.08>α=0.05, x3 – the number of agricultural enterprises – is statistically insignificant, since -1.52> α=0.05. In other words, the dynamics of changes in volumes of Y – gross output of crop

and livestock production – is significantly affected by the first two indicators, and the third indicator does not have a significant effect on the result.

The same conclusion about the immateriality and non-informativity of the third factor and its formation under the influence of random factors can be made from the values of t-statistics of factors that are less than 2-3.

1) Confidence intervals are usually constructed for statistically significant parameters.

Table 4. Confidence intervals for net regression parameters

Lower limit 95%	Parameter	Upper limit 95%	Ratio of the upper and lower limits of the interval
10.33	< x1<	15.55	1.51
0.54	< x2 <	1.80	3.34
-9.17	< x3 <	1.68	-0.18

The range of the upper and lower limits of the confidence interval for the indicator x1 is 1.51 times, which indicates its reliability and accuracy. On the contrary, for the indicator x2 this ratio is 3.34 times, which indicates its unreliability and inaccuracy.

3.2.3. Analysis of variance

R^2 (determination factor) equaling to 0.97 shows that 97% of the indicator "Gross output of crop and livestock production" is explained by regression, *i.e.* a cumulative variation of the factors x1, x2, x3. The standard regression error is an unexplained variance, *i.e.* other factors not included in the model make accordingly 3% of the total variation of *Y*, which indicates a stable dependence of the volumes of gross output of crop and livestock production on the factors considered.

3.2.4. Correlation statistics

To assess the strength and direction of the relationship between the factors and the result, as well as between the factors themselves, let us consider the table of paired correlation coefficients.

Table 5. Correlation analysis

	y	x1	x2	x3
y	1			
x1	0.96	1.00		
x2	0.78	0.64	1.00	
x3	0.42	0.47	0.46	1

The values of the paired correlation coefficients indicate a close, and moreover, direct relationship between the indicator of the volume of gross output of crop and livestock production with the level of parameters x1 and x2, *i.e.* depending on the volume of investment in fixed assets and the production costs. The influence of the number of agricultural enterprises on the volume of gross output of crop and livestock production can be assessed as weak, which agrees with the conclusion about its statistical insignificance.

3.2.5. Elasticity of factors

With an increase in investment in fixed assets and production costs by 1% of their average level, the gross output of crop and livestock production increases by 0.6% and 0.2% of their level, respectively.

Thus, the results of the statistical analysis lead to the conclusion that the growth of the volume of gross output of crop and livestock production is significantly influenced by such factors as investment in fixed assets and production costs.

3.2.6. Comparative analysis of the indicators of the Global Food Security Index for Kazakhstan, Russia and South Korea based on the 2017 data

The Global Food Security Index considers the main issues of affordability, availability and quality of food products across developing and developed countries and includes the following categories:
- affordability which measures the ability of consumers to purchase food, their vulnerability to price shocks and the presence of programs and policies to support customers when shocks occur (GFSI 2017);
- availability which measures the sufficiency of the national food supply, the risk of supply disruption, national capacity to disseminate food and research efforts to expand agricultural output;

- quality & safety which measures the variety and nutritional quality of average diets, as well as the safety of food;
- natural resources and resilience which assesses a country's exposure to the impacts of a changing climate; its susceptibility to natural resource risks; and how the country is adapting to these risks.

The authors will conduct the comparative analysis of Kazakhstan and South Korea in terms of the food security index according to the presented methodology.

Food security is estimated from 0 to 100, where 100 is the best indicator. The rating evaluation is conducted for 113 countries, where 1 is the best indicator.

As can be seen from the data in Table 6 and in Figure 1, Kazakhstan is behind Russia and South Korea in the field of food security in many respects. Currently, South Korea's agriculture is a high-tech industry. The experience of innovative development of agriculture in South Korea is unique and can be used to solve the problem of ensuring food security in developing countries, including those with the limited agrarian potential. For both Russia and Kazakhstan, the Korean experience in the agriculture development can be interesting in the aspect of the formation of an innovative agricultural system in the country.

Table 6. The Global Food Security Index for Kazakhstan, South Korea and Russia as of September 2017

Category	Score				Rank		
	Kazakhstan	South Korea	Russia	All countries (average)	Kazakhstan	South Korea	Russia
OVERALL	56.0	74.7	**66.2**	**57.3**	60	=24	**=41**
1) AFFORDABILITY	65.5	71.2	70.7	54.8	45	35	36
2) AVAILABILITY	46.7	75.2	58.7	59.0	=90	22	52
3) QUALITY AND SAFETY	57.8	81.9	75.7	58.7	58	17	26
1.1) Food consumption as a share of household expenditure	48.4	88.0	58.7	58.6	73	18	61
1.2) Proportion of population under global poverty line	99.7	100.0	99.5	73.0	33	1	36
1.3) Gross domestic product per capita (USD PPP)	16.6	24.9	17.3	14.5	38	28	36
1.4) Agricultural import tariffs	83.8	6.2	83.7	76.4	29	112	51
1.5) Presence of food safety net programs	100.0	100.0	100.0	65.5	1	1	1
1.6) Access to financing for farmers	75.0	100.0	100.0	61.3	40	1	1
2.1) Sufficiency of supply	55.6	84.6	85.7	56.5	55	21	19
2.2) Public expenditure on agricultural R&D	0.0	50.0	12.5	15.0	62	8	32
2.3) Agricultural infrastructure	51.9	80.6	50.9	57.6	=59	=18	=62
2.4) Volatility of agricultural production	56.2	94.2	75.9	86.2	112	32	96
2.5) Political stability risk	23.5	52.9	29.4	46.8	93	40	81
2.6) Corruption	0.0	50.0	0.0	37.4	90	25	90
2.7) Urban absorption capacity	64.9	72.3	60.7	66.6	78	27	94
2.8) Food loss	85.3	88.0	95.5	84.9	76	62	11
3.1) Diet diversification	73.2	64.3	69.6	56.4	33	44	35
3.2) Nutritional standards	0.0	100.0	100.0	79.1	=111	=1	=1
3.3) Micronutrient availability	54.4	80.9	55.2	43.9	=42	1	=40
3.4) Protein quality	55.5	76.2	73.5	49.4	46	23	26
3.5) Food safety	94.0	98.0	97.4	80.5	60	=46	=49

Figure 1. The Global Food Security Index of Kazakhstan and South Korea, Russia as of September 2017
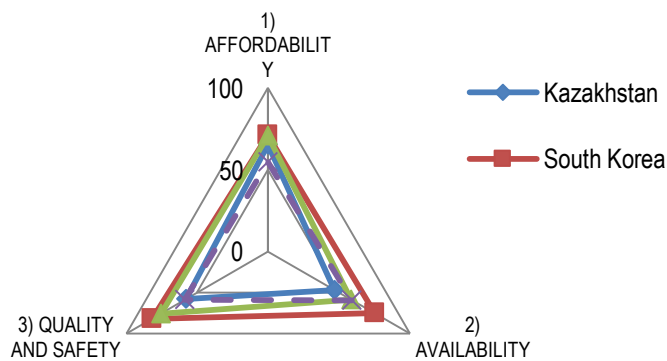
The necessity of providing of food and economic safety of the country, satisfying the needs of population in foodstuffs and height of socio-economic efficiency of agriculture brings the task to increase competitiveness of the domestic agroindustrial complex to the forefront. The decision of many primary and strategic concerns relating to the development of the country's economy and formation of the civilized agro-food market is impossible without high-efficient and competitive agroindustrial products.

Therefore, until the sufficient inflow of investments is not be provided in the agroindustrial complex of Kazakhstan with the purpose of realization of scale modernization and reconstruction of agricultural production, technical and technological lag will be saved in the industry, and, consequently, a problem of increase in competitiveness will be especially urgent. In this case the most crucial conditions affecting competitiveness include:

- positioning in the world market (stake of export in producing and its dynamics);
- positioning at the internal market (stake of import at the market and its dynamics);
- the technological level of industry, expressed in the amount of the accumulated investments and quality descriptions of powers;
- a level of concentration on markets, that suffices for a successful competition with the world companies – leaders in the respective industries;
- material well-being by the source of raw materials, development of co-operation, historical "attachment" of consumers to the producers.

Conclusion

The agro-industrial complex of Kazakhstan has both advantages and disadvantages, which make their impact on the productivity of AIC entities. When studying the composition and structure of investments in the agro-industrial complex of Kazakhstan, it can be stated that the internal funds of the agrarian sphere entities make up the main volume of financing; the share of budget funds is very low. In accordance with the regression-correlation analysis conducted, the agro-industrial complex, being the basis for the formation of food security in Kazakhstan, depends on the investment in fixed assets, as well as on the production costs. The results of the comparative analysis show that Kazakhstan has lower values of the Global Food Security Index, in comparison with Russia, having a larger territory, and South Korea, having a smaller territory; hence further development of the agro-industrial complex needs an active innovation policy.

According to the research results, it is obvious that food security of Kazakhstan depends on the volume of financing of the agricultural sector, but for the current period, agriculture financing is carried out at the expense of internal funds and the state does not influence food security sufficiently. Having proved the dependence of agricultural productivity on financing and expenditures, the state needs a significant increase in the amount of financing of the agro-industrial complex to achieve the country's food security and improve the technological effectiveness of the industry.

References

[1] Abdullah, Zhou, D., Shahb, T., Ali, S., Ahmad, W., Din, I.U., Ilyas, A. 2017. Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*. DOI: 10.1016/j.jssas.2017.05.003

[2] Aigarinova, G.T., Akshatayeva, Z., Alimzhanova, M.G. 2014. Ensuring Food Security of the Republic of Kazakhstan as a Fundamental of Modern Agricultural Policy. *Procedia - Social and Behavioral Sciences*, 143(14): 884-891. DOI: https://doi.org/10.1016/j.sbspro.2014.07.511

[3] Aigarinova, G.T., and Shulanbekova, G.K. 2013. Legal Backing of Food Security-as a Major Component of the National Security of the Republic of Kazakhstan. *Procedia - Social and Behavioral Sciences*, 81: 510-513. DOI: https://doi.org/10.1016/j.sbspro.2013.06.468

[4] Altukhov, A. 2010. World food crisis: causes of occurrence and problems of overcoming. *AIC: Economy, Management,* 2: 3-25. [in Russian]

[5] Andersen, S.A. 1990. Core indicators of nutritional state for difficult to sample populations. *Journal of Nutrition,* 120 (11): 1555–1660.

[6] Aragie, T., and Genanu, S. 2017. Level and Determinants of Food Security in North Wollo Zone (Amhara Region – Ethiopia). *Journal of Food Security*, 5(6): 232-247. DOI: 10.12691/jfs-5-6-4

[7] Arene, C.J., and Anyaeji, C., 2010. Determinants of food security among households in Nsukka Metropolis of Enugu State, Nigeria. *Pakistan Journal. Social Sciences,* 30 (1): 9–16.

[8] Bashir, M.K., Gill, Z.A., Hassan, S. 2009. Impact of credit disbursed by commercial banks on the productivity of wheat in Faisalabad district. *China Agricultural Economic Review*, 1(3): 275-282. Available at: http://www.researcherid.com/rid/B-7048-2012

[9] Bashir, M.K., Mehmood, Y., Hassan, S. 2010. Impact of agricultural credit on productivity of wheat crop: evidence from lahore, Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences,* 47(4): 405-409. Available at: http://www.researcherid.com/rid/B-7048-2012

[10] Baydildina, A., Akshinbay, A., Bayetova, M., Mkrytichyan, L., Haliepesova, A., Ataev, D. 2000. Agricultural policy reforms and food security in Kazakhstan and Turkmenistan. *Food* Policy, 25(6): 733-747. DOI: https://doi.org/10.1016/S0306-9192(00)00035-X

[11] Bidisha, S.H., Akib Khan, Imran, K., Khondker, B.H., Suhrawardy, G.M. 2017. Role of credit in food security and dietary diversity in Bangladesh. *Economic Analysis and Policy,* 53: 33-45. DOI: https://doi.org/10.1016/j.eap.2016.10.004

[12] Bogale, A. 2012. Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, 4 (4): 581–591. DOI: https://doi.org/10.1007/s12571-012-0208-x

[13] Chavas, J.P. 2017. On food security and the economic valuation of food. *Food* Policy, 69: 58-67. DOI: https://doi.org/10.1016/j.foodpol.2017.03.008

[14] Chisasa, J. 2016. Determinants of the demand for credit by smallholder farmers: survey results from South Africa. *International Journal of Economic Policy in Emerging Economies*, 9(1): 26. DOI: https://doi.org/10.1504/IJEPEE.2016.074944

[15] Chisasa; J., and Makina, D. 2015. Bank Credit and Agricultural Output in South Africa: Cointegration, Short Run Dynamics and Causality. *Journal of Applied Business Research*, 31(2): 489-500. DOI: https://doi.org/10.19030/jabr.v31i2.9148

[16] Coleman-Jensen, A., Nord, M., Andrews, M., Carlson, S. 2011. *Household Food Security in the United States in 2010:* AP-057 USDA, Economic Research Service, Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.1800&rep=rep1&type=pdf

[17] Dadalko, V.A., Mikhalko, E.R., Dadalko, A.V. 2011. *Food security: national interests, problems, trends, risks, prospects*. Minsk: Information and Analytical Center of the Ministry of Finance.

[18] Debnath, D., Babu, S., Ghosh, P., Helmar, M. 2017. *The impact of India's* food security *policy on domestic and international rice market.* IFPRI Discussion Paper 1635. Washington, D.C.: International Food Policy Research Institute (IFPRI). Available at: http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/131151

[19] Felker-Kantor, E., and Wood, C.H. 2012. Female-headed households and food insecurity in Brazil. *Food Security,* 4 (4): 607–617.

[20] Galli, F., Arcuri, S., Bartolini, F., Vervoort, J., Brunori, G. 2016. Exploring scenario guided pathways for food assistance in Tuscany. *Bio-Based and Applied Economics,* 5(3): 237-266. DOI: http://dx.doi.org/10.13128/BAE-18520

[21] Gebre, G.G. 2012. Determinants of food insecurity among households in Addis Ababa city, Ethiopia. *Interdisciplinary Description Complex Systems*, 10 (2): 159–173. Available at: http://www.indecs.eu/2012/indecs2012-pp159-173.pdf

[22] Gorzelak, A. 2017. Assessment of the implications of changes in income support policies on financial health of farms in Canada and the USA (at the industry aggregate level). *Problems of Agricultural Economics*, 2(351): 51-76. DOI: http://dx.doi.org/10.5604/00441600.1240389

[23] Hosseini, S.S., Pakravan Charvadeh, M.R., Salami, H., Flora, C. 2017. The impact of the targeted subsidies policy on household food security in urban areas in Iran. *Cities*, 63: 110-117. DOI: https://doi.org/10.1016/j.cities.2017.01.003

[24] Kassie, M., Ndiritu, S.W., Stage, J. 2014. What determines gender inequality in household food security in Kenya? Application of exogenous switching treatment regression. *World Development,* 56: 153–171. DOI: https://doi.org/10.1016/j.worlddev.2013.10.025

[25] Mango, N., Zamasiya, B., Makate, C., Nyikahadzoi, K., Siziba, S. 2014. Factors influencing household food security among smallholder farmers in the Mudzi district of Zimbabwe. *Development Southern Africa,* 31 (4): 625–640. DOI: https://doi.org/10.1080/0376835X.2014.911694

[26] Meskhia, I.E. 2016. Food security problems in post Soviet Georgia. *Annals of Agrarian Science*, 14(2): 46-51. DOI: https://doi.org/10.1016/j.aasci.2016.03.004

[27] Owusu, V., Abdulai, A., Abdul-Rahman, S. 2011. Non-farm work and food security among farm households in Northern Ghana. *Food Policy,* 36 (2): 108–118. DOI: https://doi.org/10.1016/j.foodpol.2010.09.002

[28] Picazo-Tadeo, A.J., Gomez-Limon, J.A., Reig-Martinez, E. 2011. Assessing farming eco-efficiency: A Data Envelopment Analysis approach. *Journal of Environmental Management,* 92(4): 1154-1164. DOI: http://dx.doi.org/10.1016/j.jenvman.2010.11.025.

[29] Sasson, A. 2012. Food security for Africa: an urgent global challenge. *Agriculture and Food Security,* 1: 2. DOI: https://doi.org/10.1186/2048-7010-1-2

[30] Shamah-Levy, T., Mundo-Rosas, V., Flores-De la Vega, M.M.F., Luiselli-Fernández, C. 2017. Food security governance in Mexico: How can it be improved? *Global Food Security*, 14: 73-78 DOI: https://doi.org/10.1016/j.gfs.2017.05.004

[31] Shilpa, A., Klapper, L., Singer, D. 2013. *Financing Businesses in Africa: The Role of Microfinance*. In: Gueyie, JP., Manos R., Yaron J. (Eds.) Microfinance in Developing Countries, 178-198 pp. Palgrave Macmillan, London. DOI: https://doi.org/10.1057/9781137301925_9

[32] Yerkinbayeva, L., Ozenbayeva, A., Nurmukhankyzy, D. 2014. The Ecological and Legal Aspects of Ensuring the Food Security of the Republic of Kazakhstan Under the Transition to a "Green" Economy. *Procedia - Social and Behavioral Sciences,* 143: 971-975. DOI: https://doi.org/10.1016/j.sbspro.2014.07.536

[33] Zhang, J., He, C., Chen, L. and Cao, S. 2018. Improving food security in China by taking advantage of marginal and degraded lands. *Journal of Cleaner Production*, 171: 1020 - 1030. DOI: https://doi.org/10.1016/j.jclepro.2017.10.110

*** FAO. 2006. The state of food insecurity in the world. Eradicating world hunger – taking stock ten years after the World Food Summit. Rome: FAO. Available at: http://www.fao.org/3/a-a0750e.pdf

*** FAO 2008. Deriving Food Security Information from National Household Budget Surveys: Experiences, Achievements, Challenges. Rome: FAO. Available at: http://www.fao.org/3/a-i0430e.pdf

*** FAO. 2010. The State of Food Insecurity in the World. Addressing food insecurity in protracted crises. Rome: FAO. Available at: http://www.fao.org/docrep/013/i1683e/i1683e.pdf

*** FAO 2013. The State of Food Insecurity in the World the Multiple Dimensions of Food Security. Rome: FAO. Available at: http://www.fao.org/docrep/018/i3434e/i3434e.pdf

*** FAO. 2015. The state of food insecurity in the world 2015. Meeting the 2015 international hunger targets: Taking stock of uneven progress. Rome: FAO. Available at: http://www.fao.org/3/a-i4646e.pdf

*** FAO. 2017. The state of food security and nutrition in the world 2017. Building resilience for peace and food security. Rome, FAO. Available at: http://www.fao.org/3/a-I7695e.pdf

*** GFSI. 2017. Global Food Security Index. Methodology. Available at: http://foodsecurityindex.eiu.com/Home/Methodology

*** MA RK. 2017. Official web-site of the Ministry of agriculture of the Republic of Kazakhstan. Available at: http://mgov.kz/

*** Official web-site of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. 2017. Available at: http://stat.gov.kz/

*** PD RK No. 420. 2017. Presidential decree of the Republic of Kazakhstan of February 14, 2017 "About approval of the State program of development of agro-industrial complex of the Republic of Kazakhstan for 2017 – 2021.

A Study on Agrarian Sustainability Impact of Governance Modes in Bulgaria

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Abstract:

Despite big academic and practical importance, in Bulgaria and other countries in East Europe, there are very few empirical studies on dominating governing structures in agriculture, and their impact(s) on agrarian sustainability. In this paper the interdisciplinary New Institutional Economics framework is incorporated, and the impact of diverse market, private, collective, public and hybrid modes of governance on agrarian sustainability at the current stage of development in Bulgaria assessed.

First, the methodological framework of the study is outlined. After that dominating governing modes in Bulgarian farms of different juridical type, size, specialization, ecological and geographical location are identified, and their impacts on agrarian sustainability and its economic, social, and environmental pillars evaluated. In conclusion implications for further research, public policy improvement, and private managerial strategy formation are presented. Agricultural producers of different type use quite unlike mixture of effective market, private, collective and hybrid modes for governance of their activities and relations. Individual factors and modes most contributing to improvement of agrarian sustainability at the current stage of development are: manager's personal convictions and initiatives, farms resources and innovation potential, near future profit and benefits strategies, market prices levels and dynamics, area-based EU subsidies, and informal agreements. Research on relations between the governing structure and agrarian sustainability is to continue though increasing representation, and the spectrum of specific governing modes used by farms of different type as well as assessments of the impact of institutions on agrarian sustainability and the impact of the governance at different hierarchical levels.

Keywords: agrarian governance; sustainability; market; private; collective; hybrid modes; Bulgaria

JEL Classification: Q13; Q12; Q18; D23; E61; H23; L14; L22; L33; L51

Introduction

Achievement of diverse economic, social, environment conservation, intergenerational, etc, goals of sustainable development greatly depend on the specific system of governance in different countries, industries, regions, communities, etc. (Furuboth, Richter 1998, North 1990, Williamson 1996). Having in mind the importance of agrarian sector (in terms of employed resources, contribution to individuals and social welfare, positive and/or negative impacts on environment, *etc*.), the improvement of the governance of agrarian sustainability is among the most topical issues in Bulgaria and around the globe (Bachev 2010), (Bachev 2016, 797-816), (Bachev, Ivanov, Toteva and Sokolova 2016, 639-663), (Raman 2006), (Sauvenier, Valekx, Van Cauwenbergh, Bachev *et al.* 2005), (Terziev and Radeva 2016, 175-179).

In Bulgaria, with very few exceptions (Bachev 2010) there are no empirical studies on dominating governing structures in agriculture, and their impact(s) on agrarian sustainability. In this paper interdisciplinary New Institutional Economics framework (combining Economics, Organization, Sociology, Law, Political and Behavioural Sciences) is incorporated, and the impact of diverse private, collective, public and hybrid modes of governance on agrarian sustainability at the current stage of development in Bulgaria assessed.

First, the methodological framework of the study is outlined. After that dominating governing modes in Bulgarian farms of different juridical type, size, specialization, ecological and geographical location are identified, and their impacts on agrarian sustainability and its economic, social, and environmental pillars evaluated. In conclusion implications for further research, public policy improvement, and private managerial strategy formation are presented.

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1. Research Background

Research on forms and efficiency of the governance of agrarian sustainability is at the beginning stage due to the "newness" of the problem, and the emerging new challenges at the current phase of development (environmental pollution and degradation, climate change, competition for natural resources with other sectors, etc.), and the fundamental institutional modernization during recent years, and the "lack" of long-term experiences and relevant data, *etc*.

Most studies in the area are focused on the formal modes and mechanisms while the important informal institutions and organizations are not included into analysis. What is more, research is commonly restricted to a certain form (contract, cooperative, industry initiative, public program), or a management level (farm, eco-system, region, international) without taking into consideration the interdependency, complementarities and/or competition of different governing structures. Besides, widely used complex forms of governance (multi-lateral, multi-level, reciprocial, interlinked, hybrid) are usually ignored.

Likewise, one-dimensional and uni-sectoral analyses are broadly used separating the management of agricultural activity from the governance of environmental and the overall households and rural activities. Furthermore, most studies concentrate on technology related ("production") costs ignoring significant transaction costs associated with the identification, assignment, protection, exchange and disputing of diverse property rights and rules. Moreover, "normative" (to some "ideal" or "model in other countries") rather than a "comparative institutional approach" (between feasible alternatives in the specific socio-economic and natural conditions of a country, region, sector, ecosystem) is employed.

Furthermore, uni-disciplinary approach dominates ("pure economic", "pure ecological", "pure juridical", "pure political", etc.) preventing a proper understanding of the driving factors ("logic") and the full consequences (multiple effects, costs, risks) of a particular governance choice. Consequently, a complete understanding and adequate assessment of the system of agrarian governance and its contribution to agrarian sustainability is impeded, and the effective assistance to public policy and private (individual and collective) strategy formation cannot be given by researchers and experts.
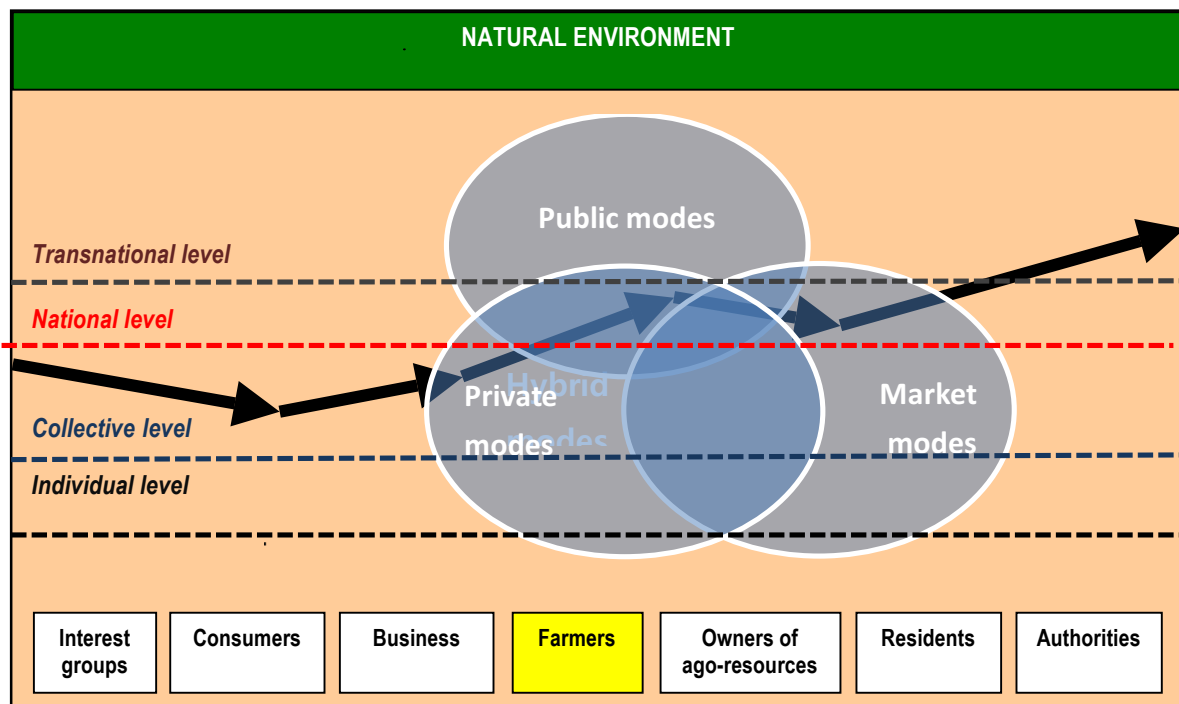
2. Methodology

Maintaining and improving the social, economic and ecological functions of agriculture requires an effective social order (a "good governance") - a system of "human created" mechanisms and forms regulating, coordinating, stimulating, and controlling behaviours, actions and relations of individual agents at different levels (Bachev 2010). The system of governance of agrarian sustainability is a part of the specific system of "agrarian" governance and includes: diverse agrarian and non-agrarian agents, and a variety of mechanisms and forms for governing of behaviour, activity, relations, and impacts of related agents.

The individual farms are the main organizational and production units in agriculture, which manage resources, technologies and activity, and maintain social, economic and ecological functions of the sector. Thus, farms and farm (production, service, innovation, marketing, etc.) organizations are the major elements of the system of governance of agrarian sustainability (Figure 1). Other agents also directly or "indirectly" participate in the governance of agrarian sustainability imposing appropriate conditions, standards, norms, demands, *etc*. These are the owners of agrarian (land, material, finance, intellectual, *etc*.) resources, who are interested in their effective utilization, conservation, and multiplication. Next, that is related business including suppliers of inputs, finance, innovations, buyers of farm produces, *etc*. They all impose socio-economic and ecological standards, specific support and demand for sustainable agrarian performance. Next, these are final consumers of farm and related produce, residents, visitors of rural areas, and diverse interests groups, which "impose" conditions (pressure, demand) for environmentally friendly, socially responsible, and economically viable agriculture and rural regions. Finally, those are the state and local authorities, international organizations, etc., which assist initiatives for agrarian sustainability of different agents, and/or impose mandatory (social, economic, environmental, animal welfare, *etc*.) standards for sustainable production, distribution, and consumption.

The system of governance of agrarian sustainability includes a number of distinct ("generic") mechanisms and modes, which manage behaviour and actions of individual agents, and eventually (pre)determine the level of agrarian sustainability (Figure 1).

Figure 1. System of governance of agrarian sustainability

NATURAL ENVIRONMENT						
Public modes						
Transnational level						
National level			Hybrid modes			
Collective level		Private modes		Market modes		
Individual level						
Interest groups	Consumers	Business	**Farmers**	Owners of ago-resources	Residents	Authorities

Source: Authors

First, institutional environment ("rules of the game") - that is the distribution of rights and obligations between individuals, groups, and generations, and the system(s) of enforcement of these rights and rules (Furuboth, Richter 1998, North 1990).

The spectrum of rights comprises material assets, natural resources, intangibles, activities, working conditions and remuneration, social protection, clean environment, food and environmental security, intra- and inter-generational justice, *etc*. The enforcement of rights and rules is carried out by the state, community pressure, trust, reputation, private modes, or self-enforced by agents. A part of the rights and obligations is constituted by the formal laws, official regulations and standards, court decisions, *etc*. In addition, there are important informal rights and rules determined by the tradition, culture, religion, ideology, ethical and moral norms, *etc*.

Institutional development is initiated by the public (state, community) authority, international actions (agreements, assistance, pressure, *etc*.), and private and collective actions of individuals and groups. It is associated with the modernization and/or redistribution of the existing rights; and evolution of new rights and novel (private, public, hybrid) institutions for their enforcement. For instance, agrarian sustainability 'movement" initially emerged as a voluntary (private) initiative of individual farmers, after that it evolved as a "new ideology" (collective institution) of agrarian and non-agrarian agents, and eventually was formally "institutionalized" as a "social contract" and part of the "new public order". Similarly, the European Union (EU) membership of Bulgaria is associated with adaptation of modern European legislation (Acquis) as well as better enforcement (outside monitoring, and sanction for non-compliance by the EU). At current stage of development many of the institutional innovations are results of the pressure and initiatives of interests groups (eco-association, consumer organizations, *etc*.).

Institutions and institutional modernization create unequal incentives, restrictions, costs, and impacts for different aspects of agrarian sustainability. In the specific socio-economic, institutional, natural etc. environment the „rational" individual agents tend to design and use such ("most effective") market, private, collective, hybrid etc. modes of governance which maximize their transacting benefits and minimize transaction costs (Williamson 1996, Bachev 2010)

However, if property and other rights are not well-defined or enforced, that leads to inefficient and unsustainable organization and exploration of natural and other resources, constant conflicts among interested parties, and low economic, social and ecological efficiency and sustainability, and vice versa ("Coase theorem").

Second, market modes ("invisible hand of market") – those are various decentralized initiatives governed by the "free" market price movements and market competition – *e.g.* spotlight exchange of resources, products and services; "classical" purchase contract, lease or sell contract; trade with high quality, organic, etc. products and specific origins, agrarian and ecosystem services, etc. Individual agents use (adapt to) markets, profiting from the

specialization of activity and mutually beneficial exchange, while their voluntary decentralized actions "direct" and "correct" the overall distribution of resources between diverse activities, sectors, regions, ecosystems, countries. However, there are many examples for the lack of individual incentives and choice and/or unwanted exchange, and unsustainable development in agrarian sector – missing markets, monopoly or power relations, positive or negative externalities, disproportion in incomes, working and living conditions between rural and urban regions, etc. Free market often "fails" to govern effectively (the overall, some) activity and exchange in agrarian sphere, and leads to low socio-economic and ecological sustainability.

Third, private modes ("private or collective order") – diverse private initiatives, and special contractual and organizational arrangements (long-term supply and marketing contracts, voluntary eco- and social actions, voluntary or obligatory codes of behaviour, partnerships, cooperatives and associations, brads and trademarks, labels, *etc*.). For instance, conservation of the natural resources is a part of the managerial strategy of many green (eco) farms. In the EU there are numerous initiatives of farmer organizations, food industry, retail chains, and consumer organizations, which are associated with improvement of socio-economic and ecological sustainability. Individual agents take advantage of the economic, institutional and other opportunities, and deal with institutional and market deficiencies through selection or designing (mutually) beneficial private forms and rules for governing their behaviour, relations and exchanges. Private modes negotiate "own rules" or accept (imposed) existing private or collective order, transfer existing rights or gives new rights to counterpart(s), and safeguards absolute and/or contracted rights of agents. A great part of the agrarian activity is managed by the voluntary initiatives, private negotiations, "visible hand of the manager", or collective decision-making. Nevertheless, there are many examples of private sector deficiency ("failures") in governing of a socially desirable activity such as environmental conservation, preservation of traditional structures and productions, protection and development of rural areas, etc.

Forth, public modes ("public order") – various forms of public (community, government, international) interventions in market and private sector such as public guidance, regulation, assistance, taxation, funding, provision, property right modernization, *etc*. For instance, in the EU there are huge programs for agrarian and rural development aiming at "proportional" development of agriculture and rural areas, protection of incomes and improving the welfare of rural population, conservation of natural environment, *etc*. The role of the public (local, national, and transnational) governance increases along with the intensification of activity and exchange, and growing interdependence of socio-economic and environmental activities. In many cases, the effective management of individual behaviour and/or organization of certain activity through market mechanisms and/or private negotiation takes a long period of time, and is very costly, could not reach a socially desirable scale, or be impossible at all. Thus a centralized public intervention could achieve the desirable state faster, more cheaply or more efficiently. The public "participates" in the governance of agrarian sustainability through provision of information and training for private agents, stimulation and (co)funding of their voluntary actions, enforcement of obligatory order and sanctioning for non-compliance, direct in-house organization of activities (state enterprise, scientific research, monitoring), etc. However, there are a great number of "bad" public involvements (inaction, wrong intervention, over-regulation, mismanagement, corruption) leading to significant problems of sustainable development in Bulgaria and around the globe.

Fifth, hybrid forms – some combination of the above three modes like public-private partnership, public licensing and inspection of private organic farms, *etc*.

In a long run the specific system of governance of agrarian sector and sustainability (pre)determines the type and character of social and economic development. Depending on the efficiency of the specific system of governance of agrarian sustainability "put in place", individual farms, subsectors, regions and societies achieve quite dissimilar results in socio-economic development and environmental protection, and there are diverse levels and challenges in economic, social and ecological sustainability of farms, subsectors, regions, *etc*. (Bachev 2010).

Efficiency of the specific system of governance of agrarian sustainability eventually finds expression in certain level and dynamics of the social, economic, ecological and integral sustainability of agriculture as whole or agricultural systems of different type (farm, industry, agro-ecosystem, region, *etc*.). Accordingly, a high or increasing agrarian sustainability means a high efficiency of the system of governance, and vice versa. Agrarian sustainability is defined in a number of ways and still there is no agreement about what agrarian sustainability is and how to evaluate its level (Raman 2006, Sauvenier, Valekx, Van Cauwenbergh, Bachev *et al*. 2005).

In this paper sustainability is understood as a "system characteristic" and the ability of agriculture to maintain its economic, ecological and social functions over a long period of time. Agrarian sustainability and its individual aspects have multiple dimensions. In order to assess the efficiency of the governance a holistic system for assessing the social, economic, ecological and integral sustainability is applied, presented in other publications (Bachev 2016, 797-816, Bachev, Ivanov, Toteva, Sokolova 2016, 639-663)

For identification and assessment of diverse market, private, collective, hybrid, etc. modes of governance and its impact on agrarian sustainability in Bulgarian agriculture, its major subsectors, in various geographical and ecological regions, as well as sustainability contribution of farms of different juridical type and size, in-depth interviews have been carried out with the managers of "representative" market-oriented farms of different kind and location. The study was carried out in the summer of 2017 and comprised 40 agricultural holdings from four administrative regions of the country – North-Central, South-East, South-Central, and South-West. Identification of the "typical" for the particular regions agricultural farms have been made with the assistance of the major producers' associations in the country (National Union of Agricultural Cooperatives, National Association of Grain Producers, Association of Livestock Raring, *etc*.), state agencies (National Agricultural Advisory Service, Executive Agency on Vine and Wine), processors, bio-certifying, and service providing organizations, and local authorities.

Agricultural producers of different type have been interviewed as entire spectrum of the farms in respective regions included: farms of major juridical types (Physical Persons, Sole Traders, Cooperatives, Companies); holdings with different sizes (Predominately for subsistence, rather Small for the sector, with Middle size for the sector, Large for the sector); farms of different production specialization (Field crops, Vegetables, Flowers, and Mushrooms, Permanent crops, Grazing Livestock, Pigs, Poultry, and Rabbits, Mix crop-livestock, Mix crops, Mix livestock); enterprises which are (vertically and/or horizontally) integrated in more complex forms such as Corporations, Holdings, etc.; farms in specific geographical and ecological locations (Plain, Semi-mountainous, and Mountain regions, less-favourable and protected areas, *etc*.). From initially selected 45 holdings for investigation the interviews with five managers (11,11% of total) have not been carried out because of the lack of availability, unwillingness to participate, or other reasons. The structure and the specific features of surveyed farms approximately correspond to the real structure of all farms in the studied regions.

The survey comprises multiple questions associated with the usage and the impact of diverse components of governing system (personal preferences, resource endowment, specific managerial strategies, applied contractual and collective forms, participation in public support schemes, community and counter parts initiatives and pressure, *etc*.) on agrarian sustainability, and its social, economic and environmental aspects. Initially the managers assessed the impact of each particular governing mode as "positive", "neutral", or "negative". After that, the relations between the "estimates" of the managers for the efficiency of governing modes, and the sustainability level of respective farms are specified. The integral estimates are arithmetic averages of the assessments of individual farms of a particular type.

The assessment is based on first-hand data collected from the managers of "typical" farms of different type and location. That approach is only feasible since there are no available "objective" statistical, monitoring, survey, etc. information about the employed (preferred, failed) governing modes, and the impact of a particular element of the governing system on agrarian sustainability. Besides, the farm managers are the most aware with the "efficiency" of dominating governance mechanisms and modes, and its relation (timing, direction, and extent of the effect) to agrarian sustainability in the specific conditions of their own farm, region, subsector, etc. Besides, when there is available aggregate data for certain mode(s) of governance (*e.g.* particular type of contract, public regulation or support schemes, *etc*.) there is no way to know how they contribute to sustainability since "rational" agents adapt modes maximizing their efficiency (minimizing private costs, maximizing private benefits) which may or often fail to maintain/improve the overall efficiency and sustainability (4). Furthermore, for certain data the farm managers are the sole or only reliable source of information – *e.g.* personal ideology, preferences, and satisfaction, interlinked and complex forms, widespread informal modes, level of sensibility and adaptation to outside pressure and demand, *etc*. Nevertheless, in order to diminish subjectivity, the assessments ("perceptions") of the managers are complemented with the "objective" assessment of sustainability level of their farms, and the correlation determined between the managers' estimates on the importance of a particular governing mode and the actual sustainability level.

Following section of the paper presents the impacts of diverse private, collective, public and hybrid modes of governance on agrarian sustainability in Bulgaria, while the impacts of the institutional environment is presented in another publication.

3. Results and discussions

Our surveyed has found out that, for all managers their "own personal conviction and initiatives" are important positive factor for maintaining and improving agrarian sustainability and its dimensions (Figure 2). Understandings, skills, and targeted actions of the agrarian entrepreneurs and managers of farms of all juridical types, sizes, production specialization, ecological and geographical locations, are a key factor for accomplishing socio-economic and environmental aspects of agrarian sustainability.

At the same time, merely a quarter of the managers indicates, that the "personal conviction and initiatives of workers" is a positive factor for agrarian sustainability (Figure 2). The latter is important for innovating enterprises of different type, which rely on and create conditions for involvement of all workers in improvement of farm activity and agrarian sustainability – selection of qualified stuff, continuing training, freedom to apply and experiment initiatives, delegation of management and responsibilities, strong incentives, output based compensation, *etc.* However, for the biggest part of Bulgarian farms the hired labour does not have needed quality, freedom, and/or motivation and contribute little to amelioration of agrarian sustainability.

Available and accessible resources and innovations are essential factors for effective and sustainable development. According to three quarters of the managers of surveyed holdings existing "resource and innovation potential of the farm" contribute positively to agrarian sustainability and its individual aspects (Figure 2).

Figure 2. Impact of private, collective and hybrid factors, forms and strategies on agrarian sustainability in Bulgaria (%)
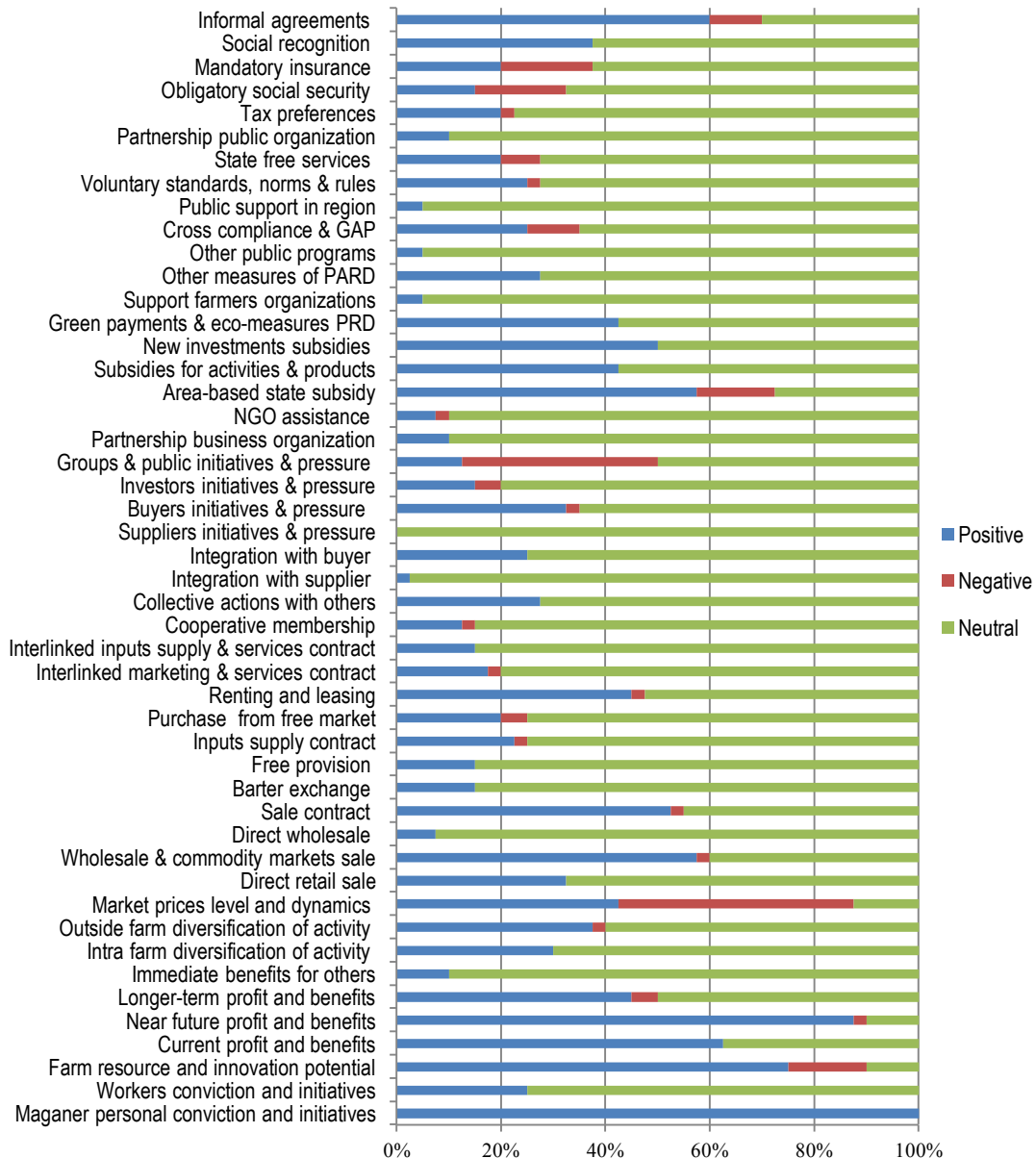
The majority of farmers appreciate highly the significance of that factor and believe that their holding possesses necessary human, land, material and intellectual resources for achieving socio-economic and environmental goals of agrarian sustainability. Commonly, the control on "critical" for the farm resources are secured through internal governance (acquiring ownership, permanent labour contract, *etc.*) or external collective

or leading organization (cooperative, association, holding, *etc*.). More "mobile" resources are governed through long-term lease contracts, while for the "universal" assets and products it is relied on market modes.

Nevertheless, 15% of the surveyed farms assess as negative the effect of their insufficient resource and innovation potential for the needs of sustainable development. Many farms with a smaller size, with lower public support, and poor regions of the country do not have sufficient own resources and innovations, neither access to external sources for effective and sustainable operations. On the other hand, every tenth manager does not suggest that existing resource and innovation potential of the farm is important for agrarian sustainability and some of its aspects. For that portion of the farmers, for the accomplishment of socio-economic and environmental sustainability are more important personal conviction, skills and strategies of the farmers, public stimulation, regulation and support policies, etc., rather than currently available resources.

The farms of different type and sizes, subsectors and locations are with unequal potential of own and external resources and innovations for successful implementation of sustainable development strategies. The greatest share of holdings with existing resources and innovation potential for sustainable development are among Sole Traders (87,5%) and Companies (81,82%), farms with Middle (85,71%) and Big (100%) sizes, holdings specialized in Grazing livestock (100%), Mix livestock (100%), and Permanent crops (90%), and located in Plain regions (81,25%) and Less-favoured non-mountainous regions (100%) as well as in South-East (85,71%) and North-Central (80%) regions of the country (Figure 3).

The smallest number of farms with effective resource and innovation potential for sustainable development are among Cooperatives (50%), holdings Predominately for subsistence (33,33%) and Small size (60%), and producers specialized in Pigs, Poultries and Rabbits (50%), Field crops and Mix crops (by 60%), as well as farms located in Mountainous regions (66,67%), with Lands in protected zones and territories (60%), and in South-Central region of the country (70,59%).

Strategies with a different time horizon to a different extent contribute for maintaining and achieving agrarian sustainability. For instance, realization of some economic objectives and most environmental and social goals of sustainable development often requires continuous long-term efforts and investments from participating agents. According to the majority of surveyed managers (60%) "current profit and benefits" are a substantial factor, which affect positively the governance of agrarian sustainability and its main aspects (Figure 2). Simultaneously, the rest significant part of the managers (37,5%) evaluate the importance of that type of strategy as neutral in relation to agrarian sustainability and its individual dimensions. The latter know that orientation of activity and efforts solely to present profit and benefits little contribute to agrarian sustainability and its aspects.

The best fraction of surveyed farms (87,5%) believes that "profit and benefits in near future" are important factors favourable for sustainable agriculture (Figure 2). The majority of managers are convinced that realization of the diverse socio-economic and environmental goals of agrarian sustainability requires longer-term efforts, and therefore undertake such managerial strategies. Only a tiny portion of questioned (2,5%) evaluate that orientation toward near future profit and benefits is negative in relation to agrarian sustainability and its aspects. Besides, every tenth manager thinks that undertaking a "short-term" strategy aimed merely at profit and benefits in near future is a neutral factor not contributing significantly to agrarian sustainability and its socio-economic and environmental aspects.

Figure 3. Positive impact of farm's resource and innovation potential on agrarian sustainability in Bulgaria (%)
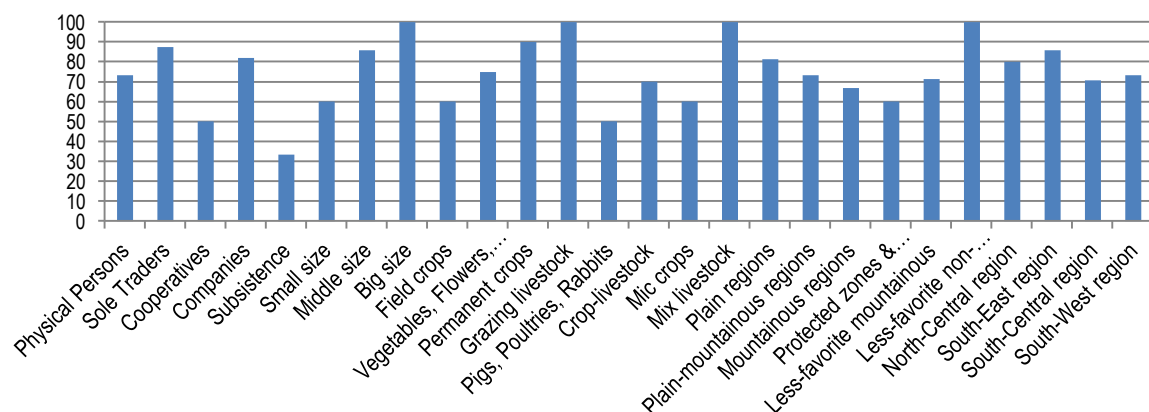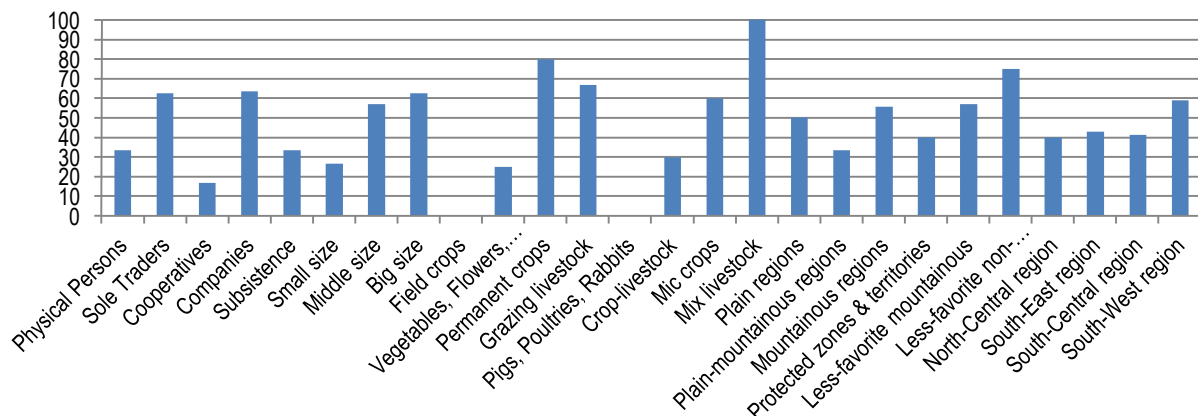

Source: interviews with managers of farms 2017

A relatively smaller segment of the Bulgarian farms applies strategies oriented to profit and benefits in a long-term (which are actually the means for achieving and maintaining agrarian sustainability). One considerable part of all surveyed managers (45%) assess as positive for agrarian sustainability and its main aspects directing the farm activity toward "profit and benefits in a longer-term" (Figure 2). Only a small portion of holdings (5%) suggests that such strategy for profiting and benefiting in a longer-term is negative for agrarian sustainability. At the same time, every another farm evaluates as neutral in relation to agrarian sustainability and its aspects the strategy for profit and benefits in a longer-term.

All these demonstrates that the best part of the Bulgarian farms does not direct their activities for achieving the long-term goals of socio-economic development of the sector, but are oriented toward specific goals in shorter time horizons. Many holdings are forced to direct their efforts toward immediate benefits in current period or in near future because of the necessity for "economic survival" in the conditions of intensive competition. Numerous farms are less interested in or able for long-term investments for improving its economic viability, social responsibility, and environmental stewardship. According to many interviewed presidents of Cooperatives "the young generation does not care for the future" and future development of the cooperative farms is associated with a great uncertainty. It is well-known that similar type of (short-term) private farming strategies does not correspond to (long-term) governance needs of sustainable development. That further necessitates the intervention of a „third party "(the state, local authority, private, non-governmental and international organizations, *etc*.) for effective achievement of agrarian sustainability.

Effective contribution of the various types of farms through long-term strategies for agrarian sustainability is quite different. In the greatest extent strategies directed to longer-term profit and benefits are applied by the firms of different type – Companies (63,64%) and Sole Traders (62,5%) as well as holdings with Big sizes (62,5%) (Figure 4). All these farms have greater financial and overall capabilities for long-term investments for agrarian sustainability, stronger incentives (goal) for development of the firm, and evaluate as positive the orientation of efforts toward long-term benefits. On the other hand, relatively smaller parts of the Cooperative farms (16,67%), Physical Persons (33,33%), holdings with Small size (26,67%) and Predominately for subsistence (33,33%) employ strategies for long-term profit and benefits. The latter is caused by the lack of funding, strive to survival in the conditions of low efficiency and high competition as well as the typical for these kind of farms short investment horizon due to the advance age of farmers, lack of successor ready to take up the farm, impossibility to trade unregistered farms or cooperative shares, low rent and lack of dividend for cooperative shares, *etc*.

Figure 4. Positive impact of strategy, oriented to profit and benefits in longer-term, on agrarian sustainability in Bulgaria (%)

Source: interviews with managers of farms 2017

Toward long-term profit and benefits orient their strategies most of the farms specialized in Permanent crops (80%), Mix livestock (100%), and Grazing livestock (66,67%). Those are predominately productions, requiring long-term investments and commonly "paying back" in longer periods of time. On the other hand, in productions with a rapid return on investments the long-term profit and benefits are to a lesser extent a factor for the strategy formation. Neither of producers in the Field crops and Pigs, Poultries and Rabbits assess as positive such a strategy, while in the Vegetables, Flowers and Mushrooms only a quarter of them. Obviously, these types of strategies little contribute to improvement of the social and environmental aspects of agrarian sustainability.

Similarly, in the regions with natural handicaps a relatively larger share of the managers assesses as positive the strategy oriented towards long-term profit and benefits – accordingly 75% in Less-favoured non-mountainous

regions and 57,14% in Less-favoured mountainous regions. At the same time, in Plain-mountainous regions solely a third of the agricultural producers apply long-term strategies for agrarian sustainability. In different geographical regions approximately similar portions of the farms (around 40-43%) implement long-term strategies for governing of agrarian sustainability. Only holdings in South-west region are exceptions where favourable effects of long-term strategies for diverse aspects of agrarian sustainability are appreciated to a greater extent (58,92 %).

Received benefits from other persons and groups from the farm activity are important (social and environmental) aspects of agrarian sustainability. Our survey has found out that, merely for 10% of interviewed managers the "immediate benefits for other persons and groups" are a positive factor for directing of activity (Figure 2). Such objectives are predominately important for the agricultural cooperatives, for which in addition to the members and workers, benefits are particularly of significance (or at least so declared) for farm households and rural communities as well. However, for a remaining greater portion of the farms the immediate benefits for other persons and groups, are not parts of strategies and has no importance (neutrality) in relation to agrarian sustainability.

Diversification of activity is an important strategy for amelioration of socio-economic and environmental sustainability in agriculture. That mode of management of agrarian sustainability is widely practiced by the Bulgarian farmers as well. According to 30% of questioned managers they implement a strategy for "diversification of activity in the farm" affecting positively the agrarian sustainability and its aspects (Figure 2). Many farms produce several products and services for better utilization of available land and other resources, application of effective agro-technics (crop rotation) and protection of natural environment, reduction of risk from climate and market prices variation, using free machinery (providing mechanization and other services), *etc*. At the same time, none of the holdings considers as negative for the agrarian sustainability the diversification of activity within the farm boundaries.

Nevertheless, most of the surveyed farms employ another more effective strategy – for specialization of activity in one or more products. For 70% of the managers the diversification of activity in the farm has no effect (neutral) on agrarian sustainability and its different aspects. A greater specialization allows exploration of economies of sizes and scopes, increasing productivity, investing in specialized skills and technologies, more efficient marketing (selling a single product in large volumes, negotiation of better prices, reputation building, establishing supply chain networks, *etc*.).

Many examples have been found among surveyed farmers of "experimenting" in production diversification in search for higher benefits, and depending on the outcome it is either given up or entered in the new productions. For instance, a strawberry producer invested in a large-scale potato production, while a livestock farmer experimented in open vegetable operation, but after realized losses both producers abandoned diversification strategy. Similarly, a cooperative and a farm tried with rapeseed or field vegetables (the latter quit due to a lack of profitability), another farmer is experimenting on the part of lands with organic production to test the efficiency and take advantage of provided public subsidies, *etc*. Many cooperatives sell yields immediately after harvesting and lose from not-waiting the best prices. Here diversification into grain storage is unbeneficial both temporary storing at farm (destructions by birds, rodents, bad weather, *etc*.) as well as long-term renting of external warehouses (a high price of 1 stotinka per kg).

Farms of different type, production specialization and location, to a various extent take advantage of the favourable effect of the diversification within the farm. To a greatest extent the diversification in the farm is employed and appreciated as positive for agrarian sustainability by the Companies (36,33%) and every third of the Cooperatives and Physical Persons (Figure 5). At the same time, most of the Sole Traders widely practice product specialization, and only 12,5% of them suggest that diversification in the farm is a positive factor for agrarian sustainability.

Our survey has also found out that to a greatest extent the diversification of activity within the farm is applied by the holdings with a Big for the sector size (62,5%). That type of farms possesses bigger capability for seeking benefits in many directions, incentives for distribution of risk, and agro-technological necessity for certain diversification for effective utilization of resources (land, labour, machinery) and environmentally friendly agriculture (needs for crop rotation). On the other hand, smaller farms to a lesser extent appreciate as positive the implementation of strategies for intra-farm diversification – only a fifth of holdings with Small sizes and 21,43% of those with Middle sizes. Every third holding Predominately for subsistence diversifies its activity in the farm for a greater satisfaction of its divers needs of agricultural products and better utilization of family resources.

Figure 5. Positive impact of diversification of activity in the farm on agrarian sustainability in Bulgaria (%)
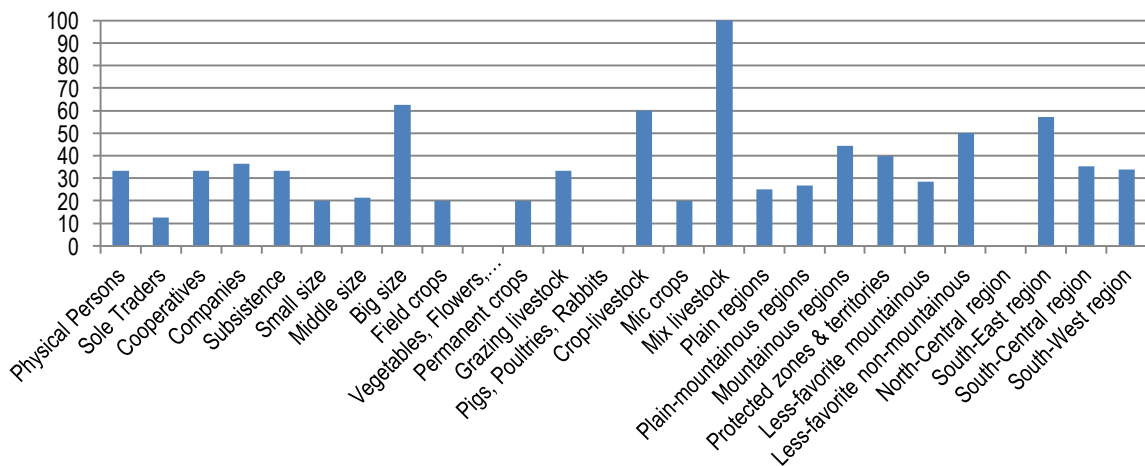
To the greatest extent diversification within the borders of the farm is implemented by holdings specialized in Mix livestock (all of them), and Mix crop-livestock orientation (60%). Simultaneously, none of the farms in highly specialized production like Vegetables, Flowers and Mushrooms, and in Pigs, Poultries and Rabbits applies product specialization in the farm. Relatively to a lesser extent that strategy is employed in the sectors Field crops and Mix crops – merely 20% of holding. A greater share of the farms, located in Mountainous regions (44,44%), in Less-favoured non-mountainous regions (every other one), and with Lands in protected zones and territories (40%) implement diversification within the farm for improving agrarian sustainability. Most part of farms in Plain regions (three quarters) and Plain-mountainous regions (73,33%) as well as in Less-favoured mountainous regions (71,43%) do not believe that diversification of activity in the farm is an effective strategy for enhancing agrarian sustainability. All these farms aim at specialization in particular product/s for increasing productivity of limited agrarian resources in such regions. To the greatest extent are diversified farms in South-East region of the country (57,14%), while none of the holdings in the North-Central region assess as positive that type of strategy in relation to agrarian sustainability.

Diversification of activity outside of the farm is another feasible strategy for improving efficiency and elevating agrarian sustainability. It gives possibility for specialization in the farm for achieving maximum productivity (efficiency) of agrarian resources, while simultaneously it is looked for new opportunities in related to agriculture (such as processing, marketing, supply of services, agro-tourism, restaurant, eco-system services, *etc*.) and/or unrelated activities (other industries, services) for assuring employment, additional income, profit, risk sharing, etc. outside the farm gates. A good portion of interviewed managers (37,5%) practice a strategy for diversification of activity outside the farm and evaluate its impact on agrarian sustainability as positive (Figure 2). A good fraction of holdings diversifies into farm produce processing (vine, dairy, *etc*.) or marketing (own shops, labels, trademarks, *etc*.), while others point out a great variety of other activities (inputs and technology supply for green houses, hotel and hospitality, transportation, mountain tourism, *etc*.).

Our study has also found out that many individuals and households, having another major (non-agrarian) business or temporary available resources (free time, unemployment, students, own farmland, *etc*.) "diversify" into farming activity in order to increase family incomes or utilize free resources. Those are mainly younger entrepreneurs with a successful (or developing) family business in other sectors of the economy (hotel, fitness club, mountain tourism, *etc*.) who invested in agrarian sphere (production of snails, strawberries, *etc*.). Some of them get involved in the activity and/or management of existing family farms (of parents, relatives) in order to take advantage of different forms of public support such as assistance to young farmers, etc. A manager of a modern vegetable greenhouse has been also interviewed, who "unwillingly" entered agrarian business. He has another main business in consulting, crediting, and import of modern greenhouse technologies (hydroponics, precision agriculture, *etc*.), crop varieties, and chemicals from Netherlands. In recent years, many of his clients-farmers have been experiencing serious economic difficulties, and unable to return provided by him (interlinked with inputs and innovation supply) credits, and failed down. In order to "save" one already well developed greenhouse and apply his good knowledge in that area, the entrepreneur exchanged the previous owner's debt for taking-over the greenhouse business.

The majority of surveyed farms (60%) are exclusively specialized in agricultural activity, they do not practice diversification outside the farms, and assess as neutral the impact of that factor on agrarian sustainability or some of its aspects. A small fraction of the managers (2,5%) even think, that diversification of activity outside the farm is a negative factor for agrarian sustainability or for its economic, social or environmental aspect(s).

To a greatest extent the extra farm diversification is implemented by the firms of different type - Sole Traders (62,5%) and Companies (63,64%) (Figure 6). Those are business oriented forms, which entrepreneurs have resources and constantly searching for profit opportunities in the agrarian sector and elsewhere. Contrary, a relatively smaller segment of the Physical Persons (13,33%) and Cooperatives (16,67%) practice diversification outside farm gates and believe that such a strategy is favourable for agrarian sustainability. Similarly, a half of the Big farms see diversification outside the farm as a vehicle to increase agrarian sustainability or some (mostly economic) aspects. On the other hand, Middle size holdings implement to the weakest extent extra farm diversification (21,43%).

Figure 6. Positive impact of diversification of activity outside the farm on agrarian sustainability in Bulgaria (%)
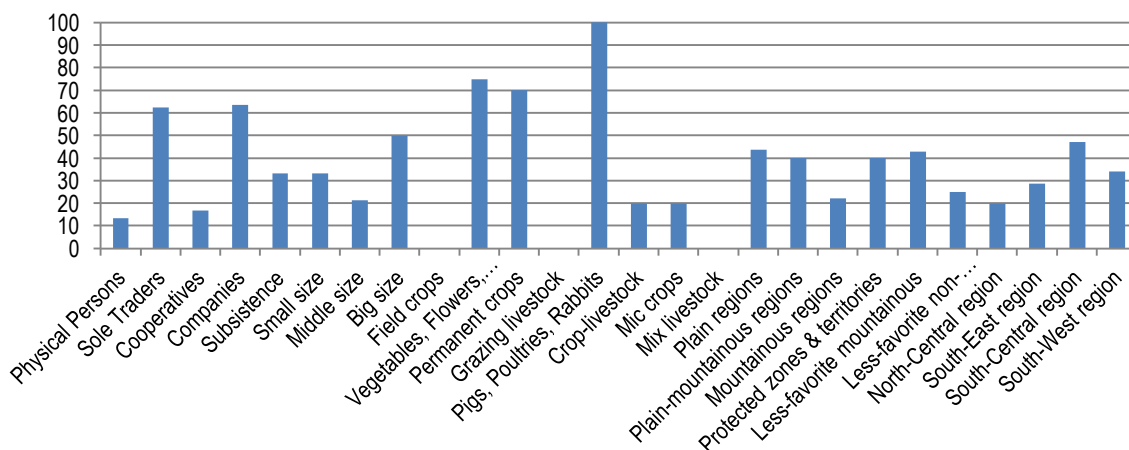
Agricultural producers specialized in different subsectors unequally apply diversification outside the farm-gates. No holding, specialized in Field crops, grazing livestock, and Mix livestock practices such a strategy or evaluates it as favourable for augmenting agrarian sustainability. At the same time, all farms specialized in Pigs, Poultries and Rabbits, as well as a good part of those in Vegetables, Flowers and Mushrooms (75%) and Permanent crops (70%) applies strategies for diversification of activity outside of the farm. The later are usually subsectors with significant economic problems (pig production, vegetable production, etc.) or production closely integrated with the processing (grape and milk production, *etc.*).

Holdings in Plain (43,75%) and Plain-mountainous (40%) regions to a greater extent use diversification outside the farm, comparing to the farms in Mountainous regions (22,22%). Farms located in Less-favoured mountainous regions (42,86%) and with Lands in protected zones and territories (40%) practice more broadly a strategy for outside farm diversification, comparing to the holdings in Less-favoured non-mountainous regions (25%). The biggest share of the managers assesses as positive for agrarian sustainability the outside farm in diversification of activity the South-Central region (47,06%), while to a smallest degree such diversification is practiced by the farms in the North-Central region (one fifth of them). All above is a consequence of the existing practical possibilities for diversification of the business (consumers demand, available resources, entrepreneurial skills, free time, etc.) as well as the real needs and perceptions of agricultural producers in referred regions.

Market prices and competition are an important mechanism for governing of activity of various agents (resource owners, entrepreneurs, farmers, consumers, *etc.*). According to a significant part of the interviewed managers (42,5%) "the level and dynamics of market prices" have a positive impact on (manages, coordinates, stimulates) their activity and agrarian sustainability (Figure 2). The favourable effect of market mechanisms is appreciated to a various degree by different type of farms and producers in diverse subsectors and regions taking advantage of their comparative advantages and competitiveness and profiting from price levels and dynamics. At the same time, a good portion of holdings (12,5%) think that the market prices level and dynamics do not affect agrarian sustainability and some of its aspects. Some small and situated in remote areas producers do not "feel" real market prices and their dynamics (undeveloped or missing markets). For another part of the managers the achievement of agrarian sustainability requires a loner-term strategy (management), rather than governance based

on the fluctuation of („current") market prices. What is more, certain "products" of the farm have a public good character (conservation of tradition, natural environment, biodiversity, *etc*.) for which there are no markets and prices at all.

For the biggest part of surveyed farms (45%) the level and dynamics of market prices at the present stage of development impact negatively agrarian sustainability and its individual aspects. The majority of managers underline the negative effect of the market as a dominant mechanism for maintaining (and achieving) economic, social, and environmental goals of agrarian sustainability. Most often it is pointed out that market prices are too low for effective (profitable) operations and sustainable agriculture. It is also emphasized that price fluctuations are great and unpredictable, and obstruct the governance of agrarian sustainability requiring long-term (permanent) investments in productive, socially responsible and environment preservation production. Moreover, the lack of any prices and markets for some of the socially important (public, quasi-public, collective, quasi-private, etc.) products and services of the farms (like conservation, improvement and restoration of natural resources and ecosystems) fail to induce sufficient incentives for effective actions in such directions.

The negative impact of the market prices level and dynamics on agrarian sustainability to a greatest extent affects Sole Traders (62,5%) and Physical Persons (46,67%), farms with Small and Middle sizes (60% and 42,86% accordingly), holdings specialized in Vegetables, Flowers, and Mushrooms (75%), Grazing livestock (66,67%), and Mix livestock (100%), farms located in Mountainous regions (66,67%) and with Lands in protected zones and territories (80%), as well as in North-Central region of the country (60%) (Figure 7). To the smallest extent the market prices level and dynamics negatively impact the Cooperatives (one third) and Companies (36,36%), Big farms (a quarter) and holdings Predominately for subsistence (every third), producers specialized in Field crops (every fifth) and Permanent crops (30%), farms located in Plain regions (3,25%) and in Less-favourite non-mountainous regions (25%), as well as in South-Central region of the country (41,18%).

Effective realization (marketing) of farm products and services is an essential factor for agrarian sustainability and for economically viable, socially stable, and environmentally friendly agriculture. In order to benefit from market opportunities and safeguard against market risks (low prices, price fluctuations, contractual asymmetry, likely opportunism, delayed payment, *etc*.) agricultural producers use and/or develop diverse effective forms of marketing of farm produce.

"Direct retail sale of products and services" is practiced as an effective form of marketing by 32,5% of surveyed farms (Figure 2). Those are holdings with different sizes, specialization, and location, for which direct sales are highly efficient due to superior "retail" prices, low costs for direct marketing (on farm or local farm market), low risk for opportunism, *etc*. Usually, those are producers with smaller sizes, having small volume of production and sales, loyal clients in the region and/or good location (proximity to highway, resort, large consumer centre), seasonable and high quality products with a big demand (fresh fruits and vegetables, lamb meat, eco-products). In some cases, agricultural produce is sold "in package" with another service and it is profited from the interlinked retail marketing – *e.g*. self-pick up of farm produce by client, serving of produced fresh or processed produces in own restaurant, *etc*.). Many of the biggest vertically integrated agricultural producers (vine growing and wine producing complexes and vineries, dairy and meat processors with own livestock, *etc*.) possess own brand shops for direct retail sale of final products in the region and/or big cities.

Figure 7. Negative impact of level and dynamics of market prices on agrarian sustainability in Bulgaria (%)
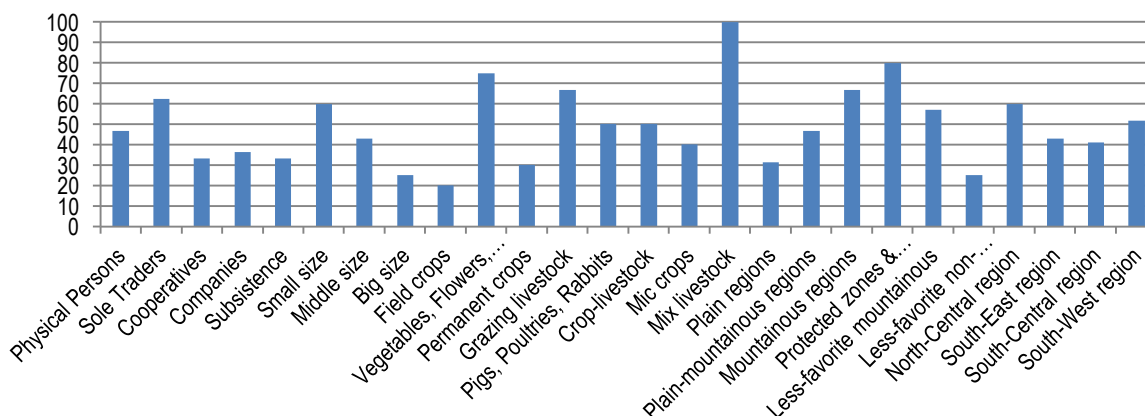
Source: Interviews with managers of farms 2017

None of the surveyed managers believes that such mode of marketing affects negatively agrarian sustainability. Simultaneously, for the majority of Bulgarian farms (67,5%) direct retail sale output does not have significant importance for the governance of agrarian sustainability or some of its aspects. The greatest portion of the Bulgarian farms uses other (more efficient) forms for realization of farm produce. Most of the surveyed farms (57,5%) widely practice "direct wholesale" of output and evaluate its impact as positive on agrarian sustainability (Figure 2). Those are bigger producers of different type having sufficient volumes and product standardization. The sale commonly is negotiated and implemented directly on farm (field) as most frequent buyers are large processors, retail chains, middlemen, exporters, *etc*. A considerable fraction of all farms in the country (40%) does not apply direct wholesale or do not believe that mode is having a significant importance for agrarian sustainability and some of its aspects. On the other hand, only a tiny fraction of the agricultural producers think that the direct wholesale marketing is not an effective form, mostly for the economic sustainability of agriculture due to lower prices and profit.

The "sale on wholesale and commodity markets" is not a popular form for realization of produced output in Bulgarian farms. For the great majority of surveyed farms (92,5%) that mode is not essential for agrarian sustainability and its all aspects (Figure 2). Simultaneously, for a small proportion of holdings (7,5%) possibility to trade on wholesale and commodity markets is a positive factor in the governance of agrarian sustainability. The latter considers predominately the economic aspect of sustainability for which "discovery" of actual (competitive) market prices through sale on official wholesale or commodity market is a crucial factor for maximum marketing efficiency.

The "sale contract for products and services" is another major mode for governing of marketing of farm produce. According to more than a half of the surveyed managers (52,5%) they often use a sale contract and it affects positively agrarian sustainability (Figure 2). Farms commonly deal with several buyers for securing a successful marketing and maximizing revenues. The contract for purchase, sale, or marketing is an important means for planning of realization of output and sale prices. That form is applied by commercial farms of different type, product specialization and location as primary a one year or a yield contact are used. A short-term contract form usually is a policy and requirement of big buyers (processors, food-chains, middlemen, exporters) or preferred by farmers. Very often farmers wish to preserve freedom in order to be able to change a buyer during the next season in case of unsatisfactory (low) prices, delayed payment for product, lack of complementary (crediting, interlinked services, *etc*.) benefits, change in structure of activity, emergence of a favourable new partner and/or more-effective marketing channel, *etc*.

Only a tiny segment of holdings (2,5%) assess as positive in regard to agrarian sustainability utilization of the sale contract for product and services. That is mostly in the cases, when farmers face a small number of gig buyers (situation of quasi or full monopoly) imposing unfavourable contract prices, conditions and/or not complying with negotiated terms and compensating affected farms. Frequently smaller producers are not able to comply with requirements of the buyers for certain volumes, timing and regularity of supply, produce quality, variety structure, etc. In other cases, the contract does not include payment for unsold by the retailer products which is returned to the farmer (fresh vegetables and fruits) additionally diminishing the profit for agricultural producers. A good part of the Bulgarian holdings (45%) does not employ the contact form for output realization and consider that mode as important for agrarian sustainability or its individual dimensions.

The majority of surveyed farms (85%) does not practice barter "exchange of products and services for other products and services" and think that governance mode has a significant importance in relation to agrarian sustainability (Figure 2). Similarly, for none of the holdings, such natural exchanges represent a negative factor for agrarian sustainability and some of its aspects. A small portion of the farms believe that product and service exchanges for other products and services have a positive impact on agrarian sustainability. Those are mainly farms with smaller sizes in depopulated and remote from residential places areas. In the condition of imperfect or missing markets for products and services, low incomes (cash) of farmers and rural households, lack of alternative employment or advance age of occupied persons, domination of monopolies etc., some farmers exchange (instead of trading) a portion of produce in mutual benefit and subsequently improve the overall economic, social and/or environmental sustainability of agriculture in the region.

The majority of interviewed managers (85%) does not use "free provision of resources, products, services and activities" and think they are important in regard to agrarian sustainability (Figure 2). Nevertheless, none of the holdings assess as negative the free provision of resources, products, services and activities from or to others. For a relatively small portion of the farms (15%) the free provision of resources, products, services and activities is a positive factor for amelioration of agrarian sustainability. Some of the smaller size producers receive free services from other agents and organizations (farmers, cooperatives, non-governmental and international organizations,

state and local agencies). Such assistance improves efficiency of the "beneficiaries" and increase agrarian sustainability in the region or subsector. However, often the "free" provision of certain goods and/or services between agrarian (and other) agents comes with an expectation of other or future "reciprocial" free products and/or services.

Some farmers report for informal "free "leasing-out of critical resources such as farmland, buildings etc. as a single form for keeping the land and other assets in a good condition of absent from the region (country) or old of age owners. Also examples are given for "free lease" of agricultural lands in exchange of giving up rights for area based, *etc.* subsidies from using farmers. The latter is illegitimate form for receiving mutual benefits from the landlords and farmers, which nonetheless maintain agrarian sustainability and do not adversely affect the taxpayers.

The effective governance of farms supplies with needed resources, materials etc. is an important factor for agrarian sustainability. According to the three-quarters of surveyed managers their holdings do not use special "contracts for supply of needed resources" and such a form have no importance regarding agrarian sustainability (Figure 2). Usually markets for supply with major inputs and resources in agriculture "work" well (strong competition, multiple suppliers, *etc.*) and it is not necessary to apply special modes of governance (guarantee) of supplies. Moreover, farmers are not big users of "external" resources and it is not necessary to develop special (contractual) forms for governing of standard supplies as commonly free markets are used when procurement needs arise. What is more, often long-term relations evolving (high frequency of deals between the farmer and the supplier), and counterparts get to know each other, and are interested in restriction of opportunistic behaviour (the bad reputation is punished easily through changing the supplier).

Only a small fraction of the holdings (2,5%) estimates as negative the existence of a contract for supply of required inputs in mind of unfavourable prices or terms of contracts (singe of a small number of supplier). A good portion of the managers (22,5%) thinks that employment of a contractual form for supply of needed resources is a positive factor for agrarian sustainability. The contractual mode is preferred in case of greater and frequent supplies of required by the farm resources. The special contract gives possibility to tailor the conditions of exchange and supplies for the needs of a particular farm, as well as to guarantee stable relations between counterparts, and possibility to protect (dispute) the rights through the formal (court) system. Some big producers point out examples for supply of special varieties (grape, wheat, *etc.*) from abroad – France and other leading countries. However, often the existence of quasi or full monopoly (in forage, electricity, water, essential materials *etc.* supply) leads to serious damages for farmers despite the presence of a contract. In such cases is impossible to effectively punish a supplier through switching to another supplier and/or enforcement of contract (getting compensation of damages) through a lawful way.

"Purchasing of needed resources and services from free market" is a positive factor for agrarian sustainability and is practiced by one fifth of the surveyed farms (Figure 2). Those are holdings of different type for which market governance of procurement of necessary resources and service is the most efficient. At the same time, for a fraction of farms (5%) regular purchase of resources and serviced from the "free" market is a negative factor for agrarian sustainability. The latter is consequence of already mentioned cases of occasional or small number of suppliers for certain farms, subsectors and/or regions of the country. The best part of the managers (75%) believes that supplying of necessary resources and serviced though a purchase from free market is a neutral mode of governance in regards to agrarian sustainability. That implies competitive (well working) markets for supply of standardized products, which are not associated with any special benefits or disadvantages for using farmers.

The lease is a widely used and efficient form for governing of supply of land and other long-term assets in agriculture. That mode allows a rapid and cheap expansion of farm size for better exploration of possibilities for economies of scale and scope, implementation of ecological and other projects, etc. According to a big portion of the surveyed managers (45%) "renting (leasing) of needed resources" is an effective form and it affects positively agrarian sustainability and its main aspects (Figure 2). The main part of the biggest holdings in the country is also large tenants from numerous small land owners as lease is a major form for expansion of farms sizes in last decades. Usually, a long-term lease is practiced when highly specific investments are made in permanent crops, long-term improvements of land, construction of buildings and equipment, *etc.* Most frequently the lease is an additional form for governing of the land supply as an acquisition of ownership is preferred by the big investors, particularly when investments are highly specific to a land (vines, orchards, buildings and facilities, *etc.*) or related productions (wine production, dairy processing). In many cases however, a short-term (a year or season) rent is applied, when there is a desire to experiment in new productions, in greenhouse operations, and monoculture with annual crops (both requiring a periodical change of land plots) or due to unwillingness of landlords for long-term contracts and/or cooperative memberships (facile change of tenant if market demand for farmland is high).

At the same time, more than a half of the holdings in the country (52,5%) does not rent or lease-in lands or other resources or believe that form is important for agrarian sustainability and some of its dimensions. Only a small fraction of farmers (2,5%) suggests that renting and leasing of needed resources impact negatively agrarian sustainability. Most often respondents have in mind environmental and social aspects of sustainability. Widespread utilization of large land plots for constant monoculture (lack of crop rotation) in past years has adverse effects on soil preservation (exhaustion, erosion), landscape and biodiversity. What is more, concentration of lands in a small number of large and highly mechanized farms is associated with extermination of the smaller size family holdings and diminution of employment affecting negatively social sustainability of agrarian sector.

To a greatest extent the positive impact on agrarian sustainability from renting and leasing of needed resources is reported by the Cooperatives (83,33%), and farms with Middle (57,14%) and Big (75%) sizes (Figure 8). Namely the latter to the greatest extent practice leasing and borrowing (mostly farmlands) and apply that specific mode for increasing sustainability of agricultural production. Employment of lease and rent of resources is most favourably reported by farms specialized in Field crops (60%), Grazing livestock (66,67%), and Mix livestock (100%). Simultaneously, resource lease and rent has greater importance for holdings in Plain (56,25%) and Plain-mountainous (46,67%) regions, in farms with Lands in protected zones and territories (60%), as well as located in the South-East region of the country (71,43%). For the best part of all other categories of farms and regions that specific mode for extension of farm sizes and governance of agrarian sustainability is less significant or assessed as neutral.

Figure 8. Positive impact of renting (leasing) of needed resources on agrarian sustainability in Bulgaria (%)
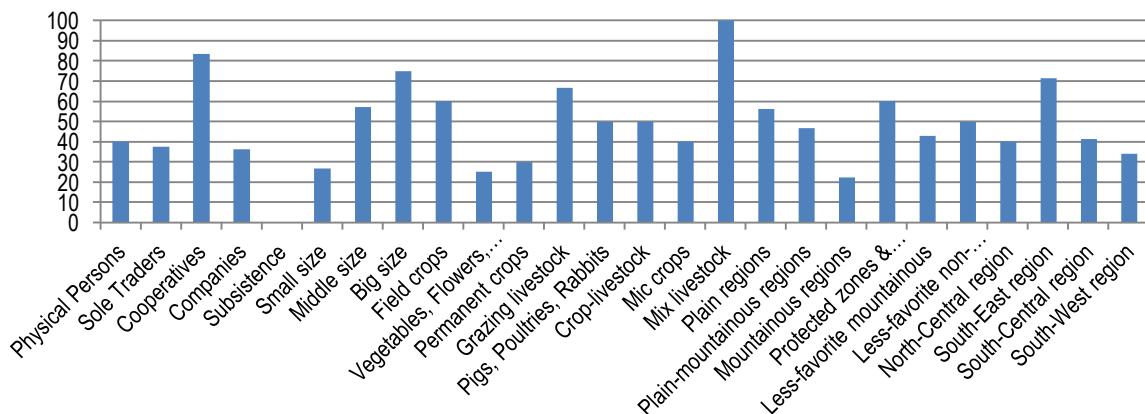
Source: interviews with managers of farms, 2017

Sometimes in agriculture are also applied more-complex forms for governing of relations between market agents like interlinking the contracts for inputs supply and/or marketing of farm produce with parallel reception of additional services (*e.g.* crediting, lending, consultations, information, assistance, purchase by a supplier, supply by a buyer, *etc.*).

According to the majority of surveyed farms (80%) they do not use "interlinked contract for marketing with reception of services from the buyer" and such a special mode have no importance for agrarian sustainability and its aspects (Figure 2). At the same time, a considerable portion of surveyed managers (17,5%) evaluates as positive the impact of employed interlinked contracts for marketing with services from a buyer. Those are mostly smaller producers in different subsectors and regions, for which obtained complementary services from the buyers "in package" with the marketing (interest free loan, consultations, inputs supply, laboratory tests, cooling containers, transportation, etc.) are essential. These type of farms do not have own internal capability for organization of such activities and/or easy access, or necessary means for procurement of needed services from the market or other suppliers. The package of received "free" services with marketing of farm produces most frequently includes advance financing, preferential interest and credit, transportation from the farm, agronomic and veterinary consultations, quality and safety laboratory tests, training of personnel, market information, storage and cooling facilities, assistance in finding suppliers or supply of critical inputs (medicaments, forage, *etc.*), and so forth. Only a tiny portion of the managers' asses as negative in regards to agrarian sustainability the utilization of interlinked contract for marketing with additional services from the buyer.

Similarly, to the interlinked marketing, a segment of farms (15%) also applies "interlinked contracts for inputs supply with reception of services from the supplier", and evaluate that mode as positive for agrarian sustainability

(Figure 2). Usually those are producers of different type, subsectors and regions, for which obtained additional services "in package" with the supply are very important. The package of services most often includes: crediting, transportation, consultation, finding a buyer or purchasing of farm produce, *etc*. The majority of surveyed holdings (85%) do not practice such form of interlinked supply not believing the latter is important for agrarian sustainability. Also no manager thinks that such mode of governance of supply negatively affects agrarian sustainability or some of its aspects.

Setting up and/or participation in various collective organizations outside the farms gates (cooperatives, associations, professional initiatives, etc.) considerably facilitates overcoming disadvantages of pure private or market forms for governing of agrarian sustainability. Our survey has found out that the great majority of surveyed farms (85%) do not take "part in cooperatives" of any type (joint supply, marketing, crediting, logistics, lobbying, etc.) and assess such membership as essential for agrarian sustainability and its individual aspects (Figure 2). Most holdings do not consider as effective the cooperatives membership since they see no significant private benefits but only costs for membership fee, participation in activity, *etc*. For instance, surveyed cooperative in the South-East region of the country, which used to be a member of the National Union of Agricultural Cooperatives, terminated membership because "there is no benefits and a high cost for membership" (10 stotinki per dka) as well as experienced financial difficulties. Another big producer (and processor) of grape in the same region is a member of a professional association but has "no voice" for protection of its interests.

In the last years the number of traditional cooperatives in Bulgaria substantially decreased and their activity restricted due to the low efficiency, bad management, and losing the comparative advantages in relations to other forms such as own farm, contract, market, firm mode, *etc*. Many of existing cooperatives started to function as market oriented production cooperatives, and/or in "private" interests of the managers and small groups around them. At the same time, very few coops managed to orient its activity toward better servicing the needs of members and rural communities, as well as for realization of collective projects for socio-economic development, ecology, risk sharing, lobbying, etc. Subsequently, the number of cooperatives, the number of cooperatives members, and the size of cooperative farms considerable decreased in recent years. Therefore, many farmers' asses as neutral the impact of cooperatives in achieving the socio-economic and environmental sustainability in the sector. What is more, a small proportion of the managers (2,5%) even think that such membership in a cooperative is a negative factor for governing of agrarian sustainability at the contemporary stage. Merely an insignificant portion of farms (12,5%) participates in some cooperative and evaluate that membership as positive for agrarian sustainability or some of its aspects. Those are mainly smaller holdings belonging to farmers in advanced age. For the latter participation in a cooperative give possibility for (full or part-time) employment and/or cheap and secured supply of essential services and products (*e.g.* cultivation of farmland, provision of food for household, feed for domestic livestock, mechanization and other services *etc*.).

In recent years there are also examples for formation of successful "new generation" cooperatives for effective servicing the real needs of members such as collective marketing, processing, negotiating, contracting, lobbying for public support, etc. Such instances are not many as membership in that type of cooperatives is small, while participants' small producers. The latter further hinders exploring the potential of cooperative form for improving agrarian sustainability even in cases the collective mode outside of the farm gates is strongly needed (collecting negotiation and marketing of output). Many vegetable producers pointed out that the lack of an effective nationwide producers' organization is a significant problem. However, such an organization is difficult to establish at the current stage due to the big numbers and conflicting interests of producers, tendency for waiting and "free riding" by nonmember farmers, *etc*. A big buffalo producer also underlines that the existence of two associations in the country in a situation of small overall number of holdings and animals (total 9000) is a significant problem – inefficiency of activity, division of producers, *etc*.

The "failure" of collective modes in Bulgarian conditions is also a reason for the low participation of farms in joint initiatives with other agrarian and non-agrarian agents. According to the majority of interviewed managers (72,5%) "participation in collective actions with other farmers and non-farmers" do not have significant importance for agrarian sustainability, and practicing by them (Figure 2). For the remaining good portion of holdings however (27,5%) participation in diverse collective actions with other farmers and non-farmers is a positive factors contributing for improvement of agrarian sustainability or some of its aspects.

In recent years there have emerged and becoming more and more popular various farmers and non-farmers informal and formal initiatives ("collective actions") for innovation and quality, revival of rural regions and traditional productions, protection of natural environment, "codes of behaviour", protection of intellectual agrarian property (traditional livestock breeds and crops varieties, special products, specific origins and protected names) etc. Such collective forms are initiated by entrepreneurial farmers, professional organizations, related (processing, trade)

industries, non-governmental and civic organizations, *etc*. These forms are increasingly supported by younger farmers of different type, professional and non-governmental organizations, state and local authorities, and other interested parties. The great potential of and the farmers needs from such "collective" actions however has not been completely explored and the positive effect(s) on agrarian sustainability realized. There are also a few examples of successful collective initiatives for sustainable exploration of natural resources (lands, waters, ecosystem services, *etc*.) when a great common interests and benefits are present. Good examples are the joint actions of one of the surveyed cooperative with other cooperatives and farmers in the South-East region for consolidation of the agricultural lands in managed by them areas.

A partial or complete integration of farms in the vertical (food, supply, *etc*.) chain is a popular form for improving governance efficiency and the activity of related agents for sustainable development. When market prices and standard ("classical") contracts do not work well the agrarian agents design integrated modes for governing of their relations. Our investigations have found out that only a tiny proportion of surveyed farms (2,5%) are involved in some "integration with a supplier of the farm" and evaluate that form as positive in relation to agrarian sustainability (Figure 2). For instance, one of the interviewed livestock operator uses the veterinary and medical services of his retired parents. Such services are critical for successful development of his holding and therefore their supply is internalized ("fully integrated") in the family farm. The predominant part of the surveyed managers (97,5%) does not believe that integration with a supplier to the farm is important for amelioration of socio-economic and environmental aspects of agrarian sustainability at the current stage of development.

"Integration with a buyer of product" is more widely used form for governing the vertical links in the sector. According to every forth of the interviewed managers they apply some form of integration with a buyer of output and that governance mode favours agrarian sustainability (Figure 2). The partial or complete integration with a buyer (processor, retailer, exporter, *etc*.) allows a better coordination and control of transactions between partners, guarantee the sale, avoid risk of market prices fluctuation and opportunistic behaviour, and induces strong incentives for joint initiatives, cooperation, and rapid "internal" resolution of emerging disputes in a mutual interest. Such integration mostly is required by the existing strong bilateral or multilateral assets dependency (processing capability, geographical proximity, volumes and timing of delivery, products quality specification, varieties, origin and certification, *etc*.) of the individual agents in the supply chain. That necessitates (strong incentives, needs, justify additional costs for) elaboration of a special form with designed mechanisms for coordination, stimulation and dispute resolution for facilitation of relations of symmetrically dependent agents.

In certain cases, the integration with a buyer of farm produce is partial as farms preserve their autonomy, while vertical relations are governed though long-term provision contracts, interlinking purchase with crediting and service supply by buyer, *etc*. (as it is the case in marketing of raw milk, fresh fruits and vegetables, *etc*.). In other cases, however, there is a complete integration and control based on a joint (co)ownership or organizational form (firm, holding) as it is the case for most part of the grape for industrial wine production. In such cases, farms either entirely lose their autonomy, or become an internal division of a bigger organizational form, or are registered as separate organizational entities. The latter minimize the risk of joint failure (bankruptcy) of different divisions, tax reduction, increasing public subsidies, and meeting formal requirements for participation in public support programs (restrictions for farm size, ceiling for amount of subsidies, maximum number of project applications, *etc*.), profiting from established reputation of trademarks and origins and/or keeping "competition" between relatively separated units of the integral form (co-ownership). Our study has also found out a "new" tendency in the evolution of governing structures in certain subsectors of agriculture. The survey proved that a great part of vine-wine complexes in the country are additionally integrated on the base of common ownership in large financial and organizational conglomerates (holdings, groups) in agrarian, and related and unrelated with agriculture sectors.

According to the three quarters of Bulgarian farms they are not vertically integrated with other agents nor they believe that form is essential for agrarian sustainability and any of its aspects. In most cases, there is a situation of competitive markets (many suppliers and many buyers), high standardization and "mass character" of produce, as well as lack of dependencies of partners' assets in the supply chain. In other cases, effective integration of farming with processing, marketing etc. requites certain minimum quantities of product which are difficult to reach. Such example is a surveyed big buffalo grazer whose calculations indicate that it is not profitable to produce in-house (own) buffalo yogurt (selling row milk to another processor without realizing value added). In other instances, specific quality (variety structure, standardization of product) is requited difficult to achieve by smaller producers. In all these cases relationships seller-buyer are more effectively governed through ("faceless") market forms and market price movements (competition), standards contracts for marketing (supply) of product, and/or personal relations (high trust, gentlemen agreements, other sanctioning mechanisms) between counterparts.

To a greatest extent there is a forward vertical integration with buyers of farm produce for Companies (45,45%) and Sole Traders (37,5%) which assess its positive importance for the governance of agrarian sustainability (Figure 9). Physical Persons are integrated to a lesser degree (13,33%) while none of the Cooperatives practice that mode. The lack of vertical integration in cooperatives is determined by: "high" specialization in certain "mass" productions (grain and industrial crops) which do not require vertical integration; existence of own processing and/or marketing channels for realization of farm produce; and better (symmetrical) negotiating positions and "power". Degree of vertical integration of agricultural producers increases along with the enlargement of farm size, as the greatest share of integrated with buyers are among the Big holdings (37,5%), to a lesser extent among Middle size farms (28,57%), a little portion among Small producers (20%), while among Predominately for subsistence holdings there is not such an integration. Greater scales of the agricultural production impose a bigger integration since the market and contractual risk ("failure") is bigger. At the same time, larger buyers (processors, retail chains, *etc*.) prefer trading with bigger agricultural producers in order to secure needed volumes and decrease transaction costs.

Figure 9. Positive impact of integration with a buyer of produce on agrarian sustainability in Bulgaria (%)
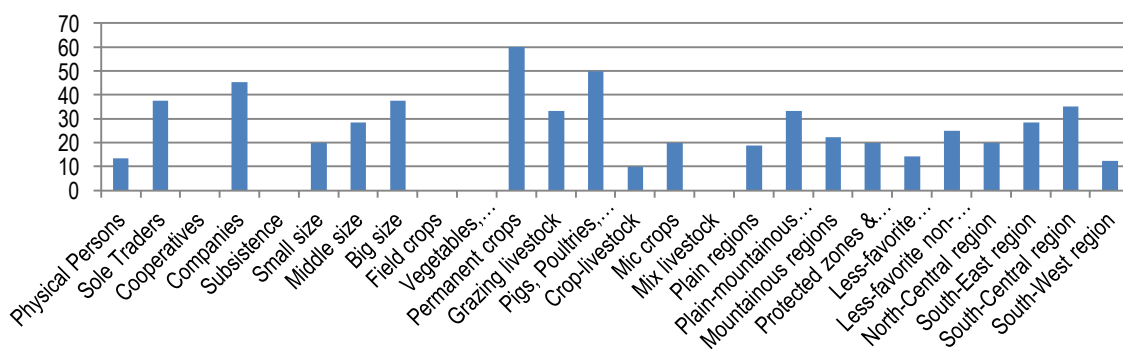
Source: interviews with managers of farms, 2017

The greatest extent of foreword vertical integration exists in subsectors Permanent crops (60%), and particularly in grapes for wine production, Pigs, Poultries and Rabbits (50%), and Grazing livestock (33,33%), particularly in milk production. Simultaneously, no holdings specialized in Field crops, Vegetables, Flowers and Mushrooms, and Mix livestock practices integration with buyers and consider it as favourable for agrarian sustainability. Also a relatively small share of farms with Crop-livestock specialization (10%) and Mix-crops (20%) develop integration with a buyer and believe it is important for agrarian sustainability. There is a considerable variation in the degree of vertical integration of farms with buyers in different ecological and geographical regions of the country. Comparatively biggest segment of the holdings located in Plain-mountainous regions (every third one) and in South-Central region of the country (35,29%) appreciate the positive impact and integrates in marketing of the output. To a least extent are vertically integrated with a buyer the farms located in the Less-favourite mountainous regions (14,29%) and South-West region (12,5%).

Various initiatives and pressure of farms suppliers, buyers of farm produce, interests' groups and public and large are all important factors for governing of agrarian sustainability in all its aspects. Our study has found out that for all surveyed farms the "initiatives and pressure of suppliers" have no or negative importance in governing of agrarian sustainability and some of its aspects (Figure 2). At the same time, for a relatively good fraction of the surveyed managers (32,5%), the "initiatives and pressure of the buyers" of farm produce (processors, traders, exporters, final consumers, etc.) is an essential positive factor for improving agrarian sustainability in all its aspects. The activity of commercial holdings of different type and location is governed by the latter initiatives and pressure. In recent years increasingly are introduced and popularized (advertised) diverse initiatives of retail chains, processors etc. aiming at improving efficiency of Bulgarian farms ("Made in Bulgaria" initiatives), and social and environmental contribution of agricultural production ("green" and "eco" initiatives, corporate "social" responsibility, sustainability movements, organic production, *etc*.). They all assist, create incentives, and/or pressure on agricultural producers for modernization of activity and increasing different aspects of agrarian sustainability.

Only a tiny proportion of holdings (2,5%) evaluates as negative the impact of various initiatives and pressure of buyers on agrarian sustainability. Such external initiatives and pressure for progressive change often augment the costs of farms, diminish competitiveness, and restrict markets for effective marketing of agricultural produce. At the same time, for the majority of Bulgarian farms (65%) the initiatives and pressure of buyers do not have

significant importance and lead to change in agrarian sustainability. At the contemporary stage of development, the main part of the activity of most farms are governed by other important mechanisms and factors ("movements" of market prices, innovations, entrepreneurs' initiatives, resource capability, *etc.*) rather than by the specific initiatives and pressure of the buyers of agricultural produce.

For a comparatively small section of the surveyed farms (15%) the "initiatives and pressure of the investors" are essential positive factors for improving agrarian sustainability and its different dimensions (Figure 2). That type of (external, hybrid) governance is typical for the bigger and more (vertically) integrated farms, with a significant or entire share of the "external" investors in the ownership of agricultural holding. For instance, when a vine (and wine) complex is integrated in a Holding, they lose (governance, financial, price, *etc.*) "autonomy", and their relationships with other (internal and external) counterparts are regulated by the common goals of the conglomerate (the "profit" centre/s).

For the majority of farms (80%) however, the initiatives and pressure of investors have no importance for agrarian sustainability, since these holdings (most often) have no external investors or the outside investors intervene in the farm management. In Bulgaria still there are few agricultural farms with a partial or dominant (co)ownership of external investors. Most holdings are based on individual or family ownership, or a small-group or cooperative membership. Principally, evolution of the corporations with open or close external membership (shares) in agriculture is impeded due to the high uncertainty of production and the enormous costs for outside control on activity (and opportunism) of the managers and farmers. A minor portion of the managers (5%) evaluate the initiatives and pressure of external investors as negative for the agrarian sustainability. Often involved outside agents (investors) do not have a high competency and/or full information for the specificity of agrarian production and their "active" intervention in the management is considered as negative in regards to agrarian sustainability or some of its aspects.

The initiatives and pressure of different interests' groups and public at large are important factors which may direct the governance of agrarian sustainability and its individual aspects in one or another way. According to the half of the surveyed managers the "initiatives and pressure of interests groups and public at large" do not impact considerably agrarian sustainability and some of its dimensions (Figure 2). For every second farm other market, private and public mechanisms for governing of agrarian sustainability are more important than the various initiatives and/or direct pressure of interests groups, local community or large society.

For a relatively small portion of the farms (12,5%) the various economic, social, environmental, etc. initiatives of interests groups and public at large and/or certain „pressure "from their side on agricultural producers impact positively agrarian sustainability or some of its aspects. For instance, most often a strong pressure of specific interests groups and/or public at large leads to improvement of eco-management in particular regions, subsectors or type of holdings. According to the good part of the surveyed farms (37,5%) the character of existing initiatives and executed pressure of interests groups and society impact negatively agrarian sustainability and some of its aspects. There are numerous cases when requirements of strong groups of (business, environmental, *etc.*) interests or local community are in conflict with sustainable agrarian development on account of other sectors and activity (tourisms, housing construction, industry, natural parks, *etc.*). There are also reported frequent instances of powerful individuals or groups in or outside agrarian sphere striving to acquire ownership or management rights over significant agrarian resources in certain (high value) ecological and geographical regions. Usually smaller producers are under constant "pressure" to transfer the ownership and/or management of resources against their will and interests. The latter has great negative consequences for agrarian sustainability and some of its aspects. One a relatively big of the surveyed grape producer in order to save his firm from a strong externa take-over pressure (in a combination with a lawsuit for insolvency) leased-out farmland to a „placed person "while court procedures are going on, and simultaneously searching for other "more reliable" ways for salvation.

Generally, different types of farms are affected unequally by the negative influence of the initiatives and pressure of interests groups and community. To a greatest extent from that factor suffer Physical Persons and holdings with Small sizes, out of which 86,67% and 93,33% evaluate as negative the importance of initiatives and pressure of interests groups and community for agrarian sustainability (Figure 10). Relatively a smaller portion of the Cooperatives (16,67%) and farms with Middle sizes (7,14%) assess as negative for agrarian sustainability the existing initiatives and pressure of interests groups and society. That "external" factor is determined as negative to a minor extent by the Companies (9,09%) and none of the Sole Traders, farms with Big sizes, and Predominantly for subsistence.

Figure 10. Negative impact of initiatives and pressure of interests groups and community on agrarian sustainability in Bulgaria (%)
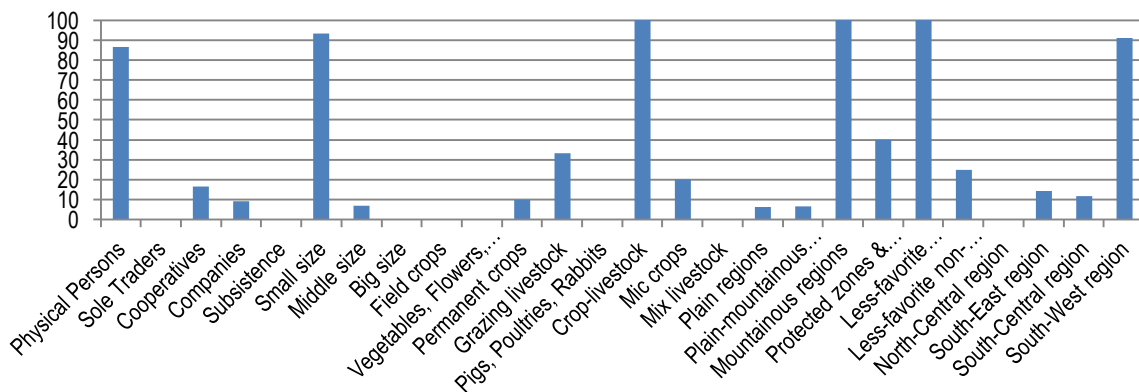
Source: interviews with managers of farms 2017

As a rule, firms and larger structures have stronger mechanisms for adaptation to external social pressure and/or confrontation to unacceptable pressure of certain interests groups and community. In some cases, certain firms and big farms represent interests of the "special" interests groups aiming at acquiring resources, activity and markets of other agricultural producers. On the other hand, having in mind their miniature size and unimportant resources, the semi-market holdings most often are not subject to external pressure of interests groups and/or community. There is a great variation on the negative impact of the external initiatives and pressure of interests groups and community on agrarian sustainability in different subsectors of agriculture and regions of the country. All farms with Mix crop-livestock specialization and every third in Grazing livestock feel the negative impact of the initiatives and pressure of interests groups and community. On the other hand, none of the holdings in Field crops, Vegetables, Flowers, and Mushrooms as well as Pigs, Poultries and Rabbits and Mix livestock assess as negative for agrarian sustainability the existing initiatives and pressure of interests groups and community.

The initiatives and pressure of interests groups and community is a negative factor for all farms located in the Mountainous regions and Less-favoured mountainous regions as well as for a considerable part (40%) of the holdings with Lands in protected zones and territories. Simultaneously, the majority of farms in Plain and Plain-mountainous regions evaluate as favourable or neutral for agrarian sustainability the impact of the initiatives and pressure of interests groups and community. The initiatives and pressure of interests groups and community adversely affect the most farms in the South-West region of the country (91,07%), and comparatively minor portion in the South-East (14,29%) and South-Central (11,76%) regions, and none in the North-Central region.

Cooperation with and an assistance of farms by a business organization or non-governmental organization may contribute to enhancement of agrarian sustainability or some of its aspects. Such an involvement of a "third" party in the governance of agrarian sustainability is necessitated when pure market and private forms do not work, while a state intervention is inefficient or untimely. However, not always such a complex mode of governance of agrarian sustainability produces good results. The majority of interviewed managers (90%) assess as neutral for agrarian sustainability the "partnership with a business organization", since the later usually does not exist or it is not essential for the aspects of agrarian sustainability. However, every tenth holding practices some form of partnership with a business organization and believe that such kind ("profit-oriented") partnership with an external organization have a positive impact on agrarian sustainability and some of its dimensions.

Similarly, a great majority of the surveyed farms (90%) report that "assistance by non-governmental organization" has no significant importance for agrarian sustainability since it either does not exist or the contribution of non-governmental organization toward agrarian sustainability is negligible. What is more, a tiny portion of the managers (2,5%) even suggest that "assistance" from the non-governmental organization hinders sustainable agrarian development. The latter is a consequence of the inefficient activity of existing non-governmental organizations, or of its content with directions distinct from sustainable development goals. A small proportion of farms (7,5%) however implements a beneficial collaboration with some non-governmental organization(s) and evaluates that type ("non-for-profit oriented") assistance as favourable for agrarian sustainability or some of its aspects. For instance, some of the interviewed managers are taken part in a beneficial long-term training in farm management in foreign (German) organizations, while others received (Swiss) support for transition to organic agriculture.

A public intervention in private and market sectors is a necessary and effective means for reaching the objectives of sustainable agrarian development. For example, state subsidizing is one of the main instruments for supporting agricultural producers in the European Union. Different type of subsidies to a various degree favour agrarian sustainability and its individual aspects in different type of farms, subsectors of agriculture, and ecological and geographical regions of the country.

"Farmland area-based state subsidy" is a major component of the Common Agricultural Policy for supporting the income of agricultural producers. According to the majority of surveyed managers (57,5%) that type of subsidies impact positively agrarian sustainability and all its dimensions (Figure 2). That mode of public assistance aims at increasing economic and social sustainability of agriculture and rural regions and overcoming disproportions with other sectors of economy. Along with this, reception of a single area-based payment is also related with an obligation for maintaining the land in a good agronomic condition by landowners and farmers, which improves environmental sustainability.

Nevertheless, a good portion of the farms (27,5%) evaluates as neutral the effect of state subsidies for utilized agricultural land in regards to agrarian sustainability and its individual aspects. Expected effect of this public instrument on agrarian sustainability for many leasing-in farmland holdings is minimized or annulled due to the fact that many owners of lands augment rent with a part (or the entire) amount of eligible subsidies. Some farms and landowners lease out "for free" to other farmers without registering the deal and receiving entire due subsidies for owned land. In all these cases the public subsidies for utilized agricultural land are actuary taken not by the farmers operating the land but external agents (farms, landlords, middlemen, *etc*.). Moreover, 15% of the managers believe that this type of subsidies is a negative factor for agrarian sustainability. The good part of the farmland area based payments in the country is received by a relatively small proportion of (large) agricultural holdings and in certain subsectors of agriculture (grain, oilseeds, *etc*.). The latter further contribute to income disparity of different type of farms, subsectors, and regions of the country.

Favourable impact of the state farmland area based subsidies to a various extent affects positively the farms of different juridical type, size, production specialization, and ecological and geographical location. Our study has found out that to a greatest degree the positive impact of area-based subsidizing is felt by the Cooperatives (100%), Companies (54,55%), and Physical Persons (53,33%) (Figure 11). Furthermore, with increasing the size of agricultural holdings also progressively grows the favourable impact of that type of public support. While in holdings Predominately for subsistence merely a third assess as positive that type of EU support, among the farms with big sizes their share is three quarter.

Figure 11. Positive impact of state land-based subsidizing on agrarian sustainability in Bulgaria (%)
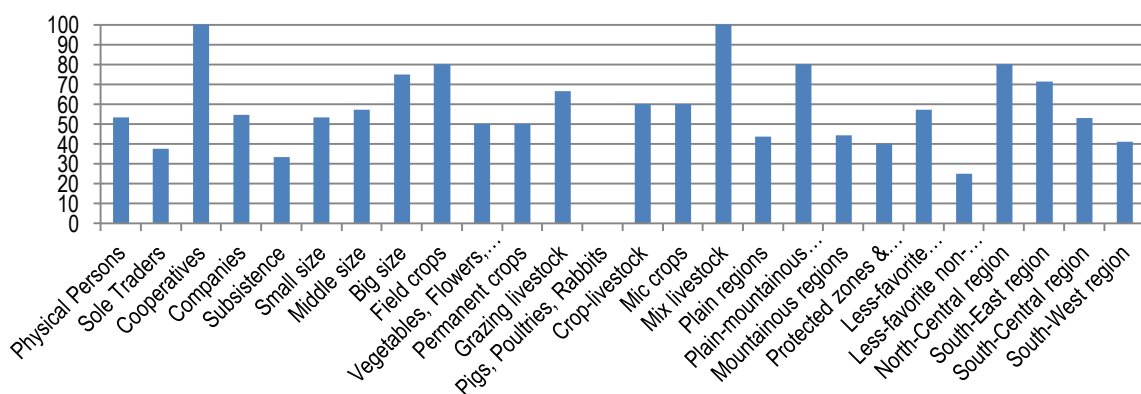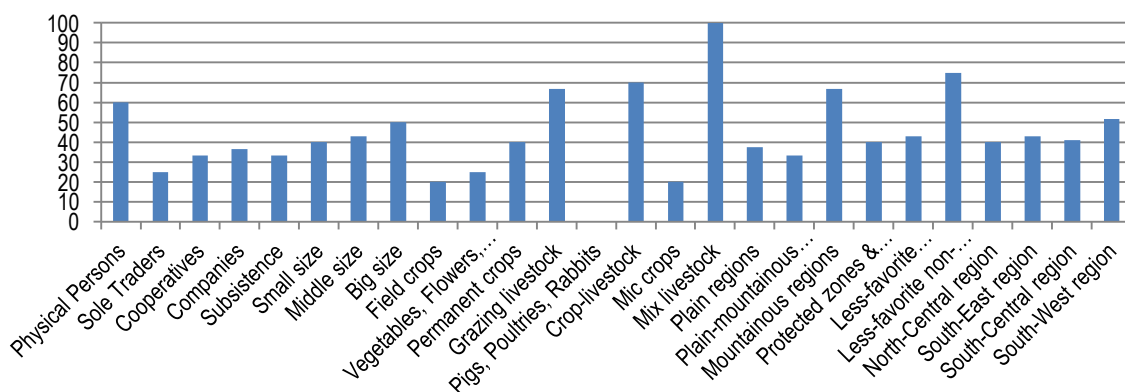

Source: interviews with managers of farms 2017

There are also variations in the positive impact of the state area-based subsidies in different subsectors of agriculture. From this instrument of public support to a greatest extent take advantage farms specialized in Mix-livestock (100%) and Field crops (80%). Among producers specialized in Permanent crops and Vegetables, Flowers, and Mushrooms every other assesses as positive the received area-based subsidies in relation to agrarian sustainability. In holdings specialized in Pigs, Poultries and Rabbits none of the surveyed managers indicates that this type of public support favours agrarian sustainability. There is also a considerable differentiation in the positive effect of the state land-based subsidies in different ecosystems and regions of the country. Comparatively the biggest proportion of farms in the Plain-mountainous regions (80%) and Less-favoured mountainous regions (57,14%) evaluate as favourable the impact of utilized farmland based subsidies on agrarian sustainability and its

individual aspects. At the same time, merely a quarter of the holdings in Less-favoured non-mountainous regions take advantage of that type of public support. To the greatest extent the positive impact of area-based subsidies is felt by the farms in North-Central region (80%) and South-East region (71,3%) of the country, while in the South-West region a smallest degree of holdings benefited (41,07%).

Another main form of public support is the national (top-ups) subsidizing for particular activities and products. Utilized agricultural land based subsidizing creates great differences in the incomes and effectiveness of individual subsectors and producers, which necessitates "correction" though direct subsidizing the production of certain products, grazing livestock, executed (restricted) activities, etc. According to the majority of interviewed managers (57,5%) "state subsidies for activities and products" does not affect significantly agrarian sustainability (Figure 2). Simultaneously, none of the surveyed believes that such type of direct support to production is a negative factor for agrarian sustainability and any of its aspects. For a good portion of the surveyed farms (42,5%) state subsidizing for activities and products is a positive factor for maintaining and improving agrarian sustainability or some of its elements.

There is a great variation in the degree of the public subsidizing of production among different type of farms. The biggest share of holding assessing as positive the impact of direct subsidies for products and activities is in the group of Physical Persons (60%) (Figure 12). On the other hand, only a quarter of the Sole Traders feel the favourable effect of that type public support. The extent of the subsidizing for products and activities augments along with the farm size. Among the biggest operators every other one take advantage from the positive effect of these subsidies, while among semi-market farms only a third. That form of public support to the greatest extent participate and take advantage farms in Mix-livestock (all), Mix crop-livestock specialization (70%), and in Grazing livestock (two-third). On the other hand, that mode of state support reaches none of the farms in Pigs, Poultries, and Rabbits, and only one-fifth of holdings in Field crops and Mix crops as it is evaluated as positive for agrarian sustainability.

Figure 12. Positive impact of state subsidizing for activities and products on agrarian sustainability in Bulgaria (%)

Source: interviews with managers of farms 2017

In different type of ecosystems that form of governing of sustainability to a greatest extent is implemented by the farms in Mountainous regions (two-third) and Less-favoured non-mountainous regions (three quarters) and relatedly lesser degree by the holdings in Plain-mountainous regions (a third). A relatively bigger faction of the farms in South-West region (51,78%) is benefited from that form of public support in comparison with the rest three regions where the schemes cover around 40-43% of the holdings.

The failure of effective market and private investments in agrarian sectors is a reason for the state intervention in supply of a preferential credit and subsidies for long-term ("capital") investments for improving sustainability. A half of the interviewed farms used "state subsidizing for new investments" and evaluate that form of public support as positive in relation to agrarian sustainability and its main aspects (Figure 2). The rest half of the holdings however, have not benefited from that mode of public support and asses it as neutral in regards to agrarian sustainability. Many instances are pointed out when public investment funds are utilized ineffectively due to the high amount of subsidies. For example, permanent crops (walnuts, rosehips, alfalfa, etc.) have been created without harvesting the yields or assets destroyed once the monitoring period (a "pay-back" business plan) by the authority is expired.

Firms of different type to the greatest extent participated in diverse schemes for state subsidizing of new investments – Companies (81,82%) and Sole Traders (50%) (Figure 13).

Figure 13. Positive impact of state subsidizing for new investments on agrarian sustainability in Bulgaria (%)
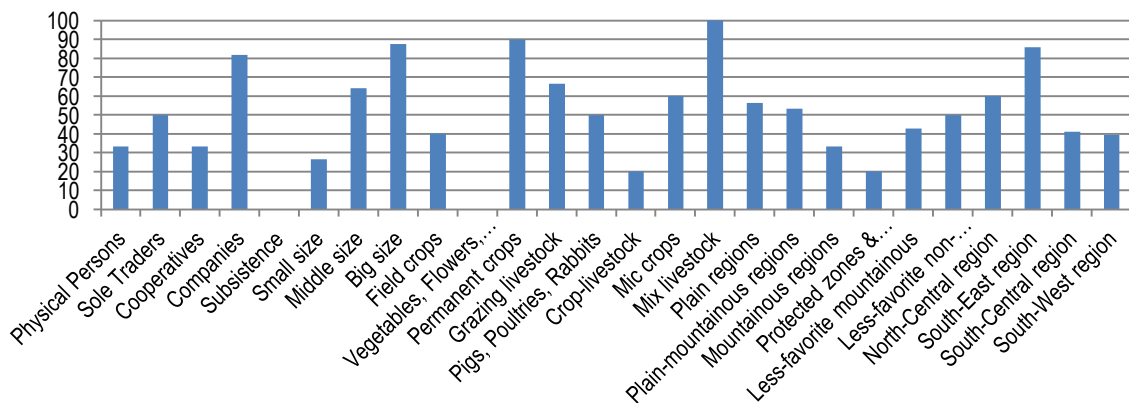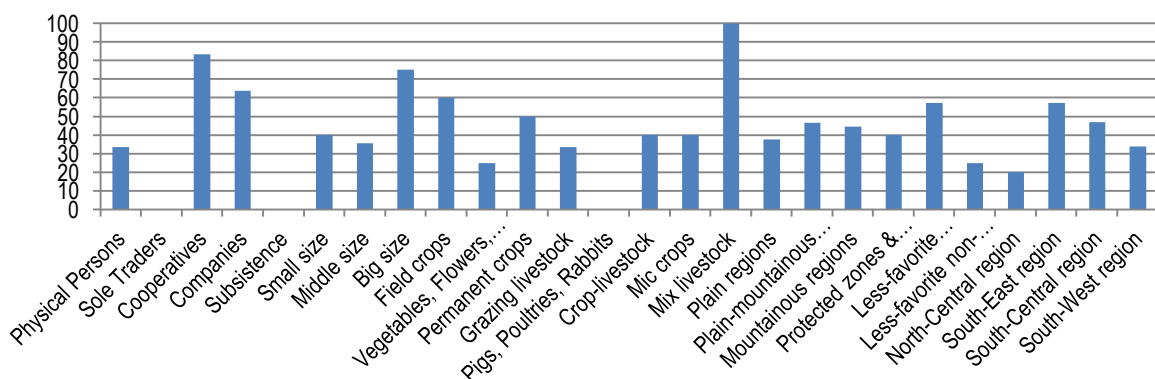

Source: interviews with managers of farms 2017

The largest portion of supported by that public support instrument farms are among the groups of the Big size (87,5%) and Middle size (64,29%), as well as specialized in the Permanent crops (90%), Mix livestock (100%), and Grazing livestock (66,67%). Simultaneously, none of the holdings Predominately for subsistence and from the sector Vegetables, Flowers and Mushrooms is favoured by that mode of governance of agrarian sustainability.

A greater proportion of holdings located in the Plain (56,25%) and Plain-mountainous (53,33%) regions are beneficiaries of the public investment subsidies in comparison with the farms with Lands in protected zones and territories (20%) and Mountainous regions (33,33%). A good share of the farms in South-East region (85%) and North-Central region (60%) benefit of the positive impact of that form of public intervention comparing to the holdings in the South-West (39,28%) and South-Central (41,18%) regions of the country.

The green payments and environmental measures of the Program for Rural Development (PRD) are another instrument for public support to sustainable agrarian development, particularly its environmental aspect. The greatest proportion of surveyed managers (42,5) assesses "green payments and eco-measures of the Program for Rural Development" as positive for agrarian sustainability (Figure 2). Public subsidies of that type are considered as mode of payment for services (public goods provision) and compensation of the costs of farmers for carrying out of an important social function – care for natural resources. For their part, the farms participating in that hybrid form of governance are obliged to implement certain ("good") practices for conservation and improvement pf lands, waters, landscape, natural biodiversity, etc. It is indicative that none of the interviewed farms thinks that type of public support has a negative impact on agrarian sustainability, and particularly on its environmental aspect. Nevertheless, according to the majority of holdings (57,5%) that form of public support has no significant importance for agrarian sustainability and any of its aspects. That is consequence of the fact that most farmers either do not receive such a support, or its form and amount affect anyway agrarian sustainability and its different aspects.

To the greatest extent the positive impact of green payments and other eco-measures of the PRD benefit the Cooperatives (83,33%) and Companies (63,64%), farms with Big sizes (75%), and those specialized in Mix livestock (100%), Field crops (60%), and Permanent crops (50%) (Figure 14).

Figure 14. Positive impact of green payments and eco-measures of Program for Rural Development on agrarian sustainability in Bulgaria (%)

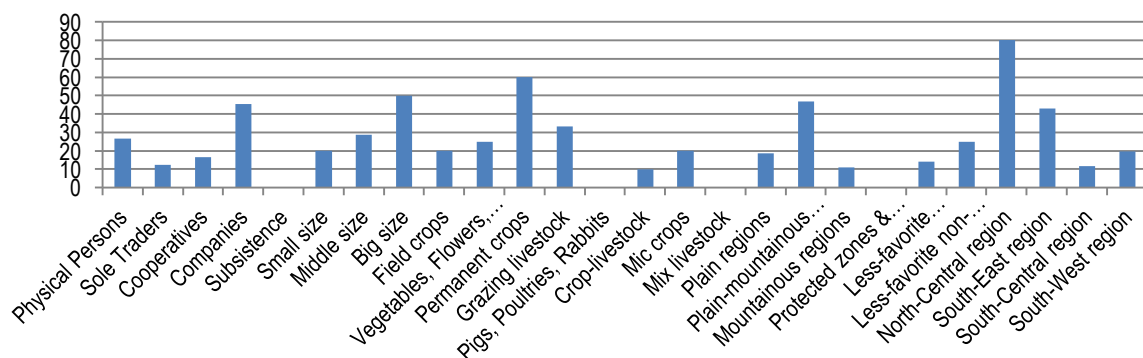*Source:* interviews with managers of farms 2017

The favourable impact of the public payments for environmentally friendly agriculture are mostly felt by the holdings in the Less-Favoured mountainous regions (57,14%) and Plain-mountainous regions (46,67`%), as well as those located in the South-East region of the country (57,14%). On the other hand, this instrument of public support is a positive factor for agrarian sustainability for a relatively small portion of the holdings in the Less-favoured non-mountainous regions (25%), North-Central (20%) and South-West (22,93%) regions of the country.

Various forms of public support to farmers' organizations of different type are a major component of the public intervention in agriculture and mode for increasing agrarian sustainability. That type of public support is extremely important for Bulgarian agriculture where evolution of the effective organizations of agricultural producers for correction of market and private failures considerably lag behind the needs of farmers. For predominant part of the interviewed managers (95%) existing at the contemporary stage of development in the country "state support to farmers' organizations" does not assist in any way agrarian sustainability (Figure 2). Apparently envisaged instruments of the state intervention in that exceptionally important area are not used by the farmers and/or lead to actual improvement of the governance of agrarian sustainability in the country. For the rest tiny portion of the holdings (5%) the state forms for supporting farmers' organizations are a positive factor for improving sustainability in the sector or some of its main aspects (social, economic, environmental).

In Bulgarian agriculture there are also applied some other measures of the Program for Agrarian and Rural Development aiming at supporting the actions of agrarian agents for improving different aspects of agrarian sustainability. According to the great part of the surveyed managers (72,5%) "other measures of the Program for Agrarian and Rural Development" do not impact significantly the level of agrarian sustainability (Figure 2). That is subsequent of the fact that considerable number of the Bulgarian farmers either does not have practically access to that form of public support or see that intervention as an essential factor for agrarian sustainability or some of its dimensions. The rest smaller portion of the farms (27,5%) have taken and/or are taking part in other measures of the PRD, and evaluate them as positive for agrarian sustainability or some of its aspects.

To a greatest extent the favourable impact of other measures of the PRD is pointed out by Companies (45,45%), holdings with Big size (50%), farms specializes in Permanent crops (60%), and located in Plain-mountainous regions (46,67%), and North-Central region of the country (80%) (Figure 15). For the best portion of the farms in the rest groups of juridical type, sizes, product specialization, ecological and geographical situation, the favourable impact of that form of public support is relatively small or absent.

Figure 15. Positive impact of other measures of Program for Agrarian and Rural Development on agrarian sustainability in Bulgaria (%)

As far as the remaining public programs are concerned, according to the greatest part of the interviewed managers (95%) they do not contribute in any way for agrarian sustainability (Figure 2). The rest mall portion of the holdings (5%) are taking or have taken part in some other type public (state, sectoral, social, environmental, regional, international, etc.) support and development program, and they believe that involvement favour agrarian sustainability or some of its main aspects.

Norms for good agricultural practices and cross compliance aim at directing actions of the agricultural producers toward achieving sustainable agriculture in its three aspects – social, economic and ecological. Most surveyed managers (65%) indicate that "requirements for cross compliance and good agricultural practices" do not have substantial importance for the governance of agrarian sustainability. Many agricultural producers do not comply fully (or at all) with compulsory norms and systems of good agricultural practices, or they appreciate that such official standards contribute to agrarian sustainability. What is more, one tenth of the farms points out that

mandatory requirements for cross compliance and good agricultural practice have a negative effect in regards to agrarian sustainability or some of its aspects. The latter is often due to the fact that superior "external" standards increase costs of producers (diminishing economic sustainability) without being associated with an expected positive impact on overall sustainability. In some cases, such norms do not correspond to the specific conditions of each holding and contribute to accomplishment of desired objectives for sustainable development of related farms, subsectors, ecosystems or geographical regions.

According to every forth of the surveyed managers the requirements for cross compliance and good agricultural practices are positive factor for improving agrarian sustainability and particularly its social and environmental aspects. The favourable impact of that mode of public intervention is reported in equal extent by farms of different juridical kind, sizes, production specialization, and ecological and geographical location. The formal norms for good agricultural practices and obligatory requirements for cross compliance assist agricultural producers and impose a "type of behaviour" leading to improvement of agrarian sustainability at farm, sectoral and regional levels.

Different forms of local support by the community and/or local authority are means for supporting market, private, collective and state modes, and for correction of market, private and/or state failure(s) and improvement of agrarian sustainability in the region. According to the predominant portion of the interviewed managers (95%) "existing public support in the region" has no significant importance for agrarian sustainability and its diverse aspects (Figure 2). In many cases such support practically is missing or it is insufficient, unsustainable, or not well designed in the interest of agrarian development in the region. An interviewed big agricultural producer describes public support in the region "only as moral". The remaining very small portion of the surveyed holdings (5%) evaluates as a positive the existing public support in the region in regards to sustainable agrarian development. There is tinny number of good examples where the local authority and/or public organization assist directly or indirectly farmers, farm households and organizations with appropriate policies, initiatives (festivals, product promotions, *etc*.), information, (co)financing, partnership and join forms, lobbying before superior authorities etc., and that intervention improves sustainability of agriculture at farm, (sub)sectoral, ecosystem and/or regional level.

Formal and informal voluntary standards, norms and rules, introduced and applied by the farmers and/or farmers' organizations are new developing form for governing of agrarian sustainability. They are expression of the willingness of individuals or a group of producers to impose voluntary quality, social, ecological etc. standards, norms, rules and/or restrictions for sustainable agriculture overpassing the official norms. According to the majority of surveyed holdings (72,5%) they do not apply any "voluntary standards, norms and rules" and consider that modes as important for agrarian sustainability and some of its aspects (Figure 2). A small portion of the managers (2,5%) however, indicates that "voluntary" standards, norms and rules, which are required ("imposed") by the professional organizations, big buyers, consumers' associations, interests groups, governmental agencies, etc. increase operational costs (for studying, introduction, implementation, controlling, disputing, etc.) and affect negatively agrarian sustainability. Every forth of surveyed managers assess as positive for agrarian sustainability implementation of (participation in initiatives for) voluntary standards, norms, and rules. Those are innovative farms from different juridical type, size, product specialization, ecological and geographical location, which implement such emerging private or collective mode for governing of agrarian sustainability (or some of its aspects).

Provision of free services like training, advices, etc. by the state is an important form for public support to agrarian sector. Every fifth of the interviewed managers reports of using in the past or presently some form of "provided by the state free services (training, advices, *etc*.)", and assess that mode of state assistance as a positive factor for agrarian sustainability and its dimensions (Figure 2). In recent years there have been carried out numerous trainings and consultations by the Agricultural Advisory Service and other government organizations, aiming at improving qualification and awareness of agricultural producers. In this mode smaller size holdings are mostly involved, which do not have or cannot afford to hire experts in management, finance, agronomy, etc. and rely on free state services in the area. At the same time however, the majority of the farms do not believe that provision of free services (training, advices, *etc*.) by the state is essential for agrarian sustainability. The latter confirms that the majority of Bulgarian farms have no access or use free state services, or evaluate the importance of (received) services as neutral in relation to agrarian sustainability and its individual aspects. What is more, a small fraction of the managers (7,5%) indicates that "assistance" of the farms by the state through free services as training, advices etc. is a negative factor for agrarian sustainability. According to a portion of the users of the state system of free farm services it does not work well and impedes achievement of agrarian sustainability due to inefficiency, high related costs for farmers, inadequate information, improper training, *etc*.

Another form for public (government) involvement in the private and collective sector for governing of agrarian sustainability is a public-private partnership. The majority of the surveyed managers (90%) do not report

participating in a "partnership with community, state, international etc. organization", nor evaluate that hybrid mode as important for agrarian sustainability (Figure 2). The latter is subsequence of the fact that in the country still there are not popular and widespread formal partnership forms of agricultural producers with a community, state and/or integrational organization. The rest small portion of the holdings (10%) however, applies some partnership with a community, state and/or international organization, and evaluates it as positive for agrarian sustainability and its main aspects. In the agrarian sector in the country there are few examples for successful partnerships of individual farmers or farmers' organizations with local, national or international public organizations, aiming at implementation of certain social, environmental, regional, etc. programs, introduction of new initiatives, standards, supporting and training young entrepreneurs and innovators, association of producers and interested parties, *etc*.

Tax preferences of different type are popular public form for supporting certain producers, subsectors, regions, etc. The majority of surveyed holdings (77,5%) does not use "tax preferences" and/or suggest that mode is important for agrarian sustainability and its dimensions (Figure 2). An insignificant proportion of the interviewed managers (2,5%) estimates that tax preferences for certain activities, productions, regions, etc. are even a negative factor for the agrarian sustainability. Every fifth of the managers however, assess as positive received by tax preferences in regards to agrarian sustainability, mostly for its economic aspect. The surveys farm most often underlines the favourable impact of returned excise for diesel fuel, the zero excise duty for wine etc. Beneficiaries of that type of public support are predominately bigger producers of different type in crop subsectors of agriculture (with enormous costs for purchasing fuel, mechanization, and transportation), and integrated farms in the vine-wine sector.

Mandatory social security payments are an important form for public intervention aiming at improving the social position of the workers in the sector and elevating agrarian sustainability. According to 15% of the surveyed managers they strictly implement "obligatory social security payments" and believe that instrument favour agrarian sustainability, particularly its social aspect (Figure 2). Those are mostly larger cooperative and other farms, for which the social security payment of workers is a priority and evaluated as a positive factor for improving of overall efficiency. The latter type of farms is also the mostly controlled by the authorities for complying with the social security payment norms, they often strictly implement formal regulations, and perceive that mode as a part of the normal farm practice.

At the same time, a good portion of the holdings (17,5%) assess as negative compulsory social security payment in relation to agrarian sustainability, and particularly for its economic aspect. These are larger farms, hiring many permanent and seasonal labours, for which the social payments take a big share in the total costs. The enhanced control and sanctions from the government agencies on big farms give less possibility to ignore regulatory requirements in the area. A good number of managers are also complaining that they are forced to hire many „unmotivated and unskilled workers ", for which they pay social securities without getting corresponding labour contribution (high costs for negotiation, training, unjustified absences from work, low working discipline, high job turnover, *etc*.). For the latter type of holdings, the mandatory social security payments are a significant additional cost which is not associated with relevant positive effects on agrarian sustainability.

The mandatory insurance is one of the forms of public intervention in the risk governance in agrarian sphere and for enhancement of agrarian sustainability. In agriculture, pure market forms for insuring against risk are not popular due to the lack of appropriate insurance coverages (products), high costs (premiums), frequent disputes over claims for compensation for damages, lack of tradition, *etc*. In many instances, the market forms are not applied due to the employment of other more effective private modes of risk management. Usually, compulsory assurance is requited for participation in some of the public support measures as it is necessary to insure permanent crops and buildings, livestock, yields, labour, *etc*. in projects for modernization of agricultural holdings. One fifth of the surveyed farms point out the favourable impact of "mandatory assurance" on agrarian sustainability and its aspects. Those are mainly bigger farms, which take part in different forms of public support programs requiring obligatory insurance (Figure 2).

According to a good part of the managers (17,5%) however, the mandatory insurance has negative consequences for agrarian sustainability, because it increases the production costs and claims for damages are associated with multiple problems. Moreover, for a major part of the holdings (62,5%) the obligatory assurance has no importance in regards to agrarian sustainability or some of its aspects. The majority of Bulgarian farms either does not practice that mode of (market) assurance or see any benefits from that form for governing of agrarian sustainability.

Social recognition of the contribution of the farmer, the owner and/or the manager of the holding is an important factor for stimulating (improving) the actions for achieving agrarian sustainability. According to a large part of the interviewed managers (37,5%) "social recognition of their contribution" is an essential regulating

behaviour and directing activity positive factor for improving agrarian sustainability (Figure 2). The great importance of the "social image" of the farmer and the recognition by the community in the region and country is pointed out by the innovating entrepreneurs and farmers of different kind, size, production specialization, ecological and geographical regions. That informal form of social governance of the behaviour is particularly typical for agriculture, where farmers, their activities and "reputation" are well known by the professional community, related sectors and general community in a residential area, region or country. For the remaining larger portion of the holdings (62,5%) however, social recognition of the farmer's contribution has no importance for agrarian sustainability and its dimensions.

Informal contracts between agricultural producers, farmers and suppliers, farmers and buyers, etc. are widely used in agrarian sphere. Unlike written contracts, having a legitimate power and being able to be disputed though a court system, informal agreements are governed solely by the "good will" and trust between counterparts and unwillingness to lose cooperation with a partner and/or social reputation. The greatest part of surveyed managers (60%) indicates the positive importance of the "informal agreements" in relation to the governance of agrarian sustainability (Figure 2). A significant fraction of the relationships in the agrarian sphere in the country are still governed (more) effectively through that traditional mode between counterparts, knowing each other well and frequently trading. For a good proportion of the holdings (30%) informal agreements have no importance for agrarian sustainability. Increasingly the relationships between counterparts are governed though a formal contract since they cover rare deals, large volumes, unknown counterparts, big partners (retail chains, processors, electricity, water, etc. suppliers) and other organizations (banks, insurance companies, state agencies), for which "formal" written contracts are mandatory. Besides, existence of formal contracts (*e.g.* for marketing of output) very often is a precondition for application for a bank loan and some of public support programs.

Nevertheless, each tenth of the holdings believes that informal agreements in the sector impact negatively agrarian sustainability and its components. For that form is too expensive or impossible to resolve conflicts between parties in case negotiated obligations are not fulfilled or conditions of exchange change (sharp increase in prices of purchased by farm inputs or considerable decline in market prices of farm produce). Interviewed farmers have given many examples, in which they are cheated and realized huge damages due to nonfulfillment of certain informal agreements by the partners, without been able to enforce their rights in court (as a result of difficulties, failure, more favourable opportunities for deals, *etc.*). Moreover, widely used informal agreements in the country are associated with development of a huge informal (grey) sector in agriculture, with unenforced quality, safety and environmental standards, unpaid taxes and social securities, juridical consultations fees, costs for contracts preparation, writing and registration, etc. All these increase production costs in the "light" sector of agriculture, and inferior competitiveness and efficiency comparing to the informal sector. Therefore, farms complying with the formal rules assess as negative for agrarian sustainability widespread application of informal agreements.

Different type of holdings, subsectors and regions apply unevenly the informal agreements and evaluate as positive their role for agrarian sustainability. To the greatest extent informal agreements dominate among Physical Persons (73,33%) and firms of various kind – Sole Traders (62,5%) and Companies (63,64%) (Figure 16). Simultaneously, relatively a small portion of the cooperative farms (16,67%) applies that mode for governing relations with divers agents, and assess it as positive for agrarian sustainability.

Figure 16. Positive impact of informal agreements on agrarian sustainability in Bulgaria (%)
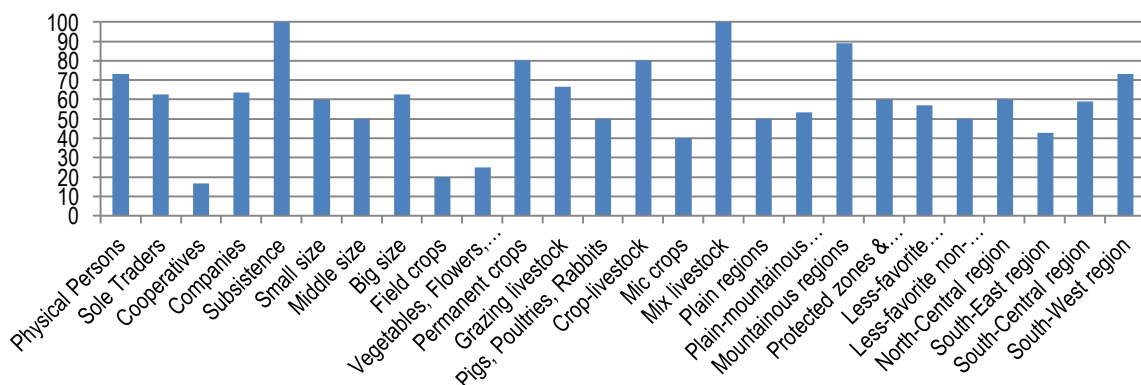
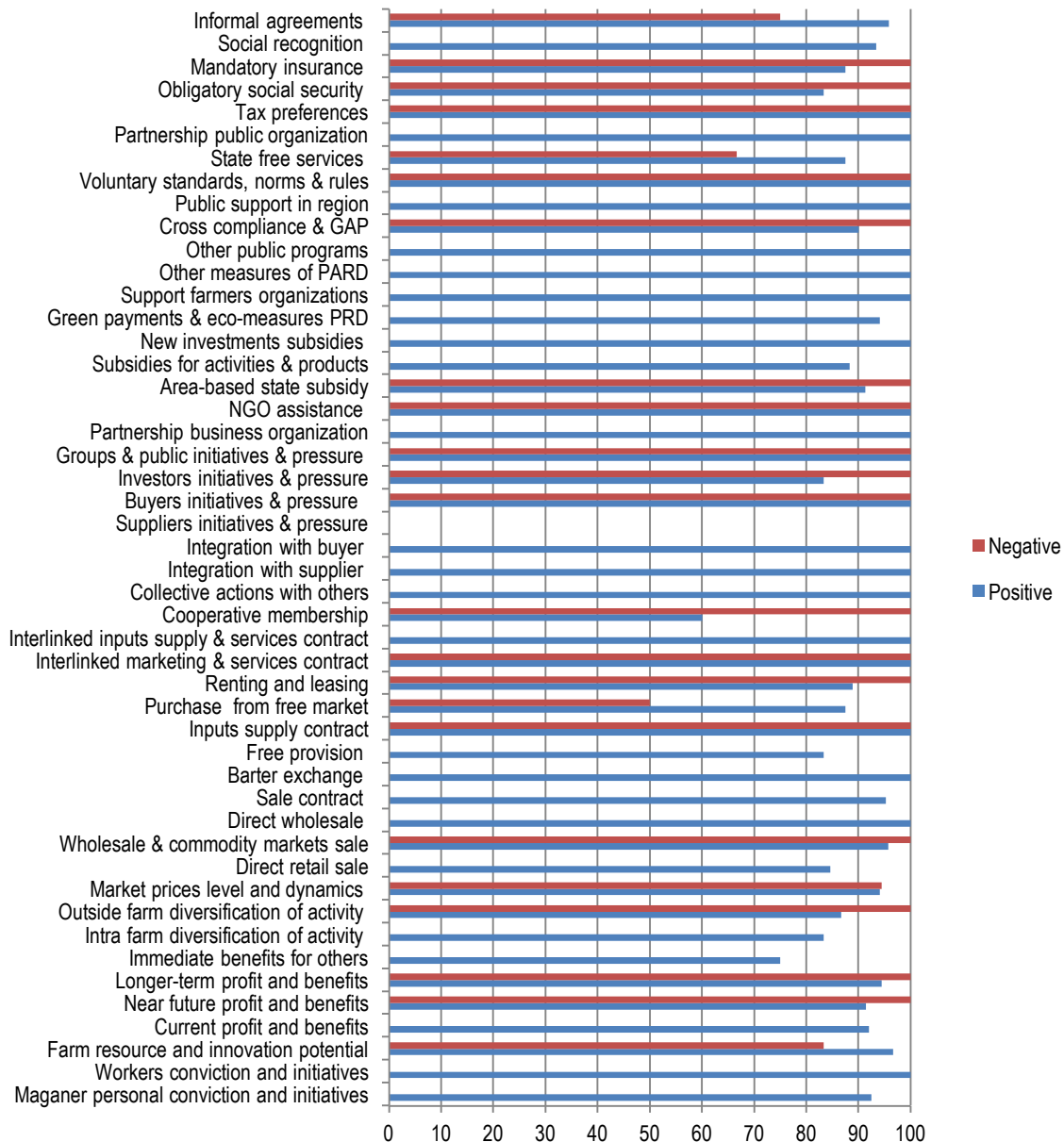*Source:* interviews with managers of farms 2017

The smallest semi-market holdings entirely govern their relationships with other agents through informal agreements. At the same time, farms with Middle sizes to the least extent (50%) use contract of the latter type. Informal agreements are most popular in subsectors Mix livestock (100%), Permanent crops and Mix crop-livestock (by 80%). Farms applying at least informal agreements and assessing them positively are among Field crops (20%) and in Vegetables, Flowers, and Mushrooms (25%). Informal contracts to the biggest degree are employed by the holdings in Mountainous regions (88,89%), while in the Plain regions to smallest extent. The South-West region of the country is the leader in terms of the proportion of farms (73,21%) practicing informal agreements, while fewer number of farms in the South-East region (42,86%) evaluate as positive that type of governance of relations. The structure and the scope of informal agreements in different type of farms, subsectors of agriculture, type of ecosystems and regions of the country give also some tentative insight for the evolution of the informal sector in agrarian sphere at the present time.

Identification of the links (correlation) between the level of agrarian sustainability in individual farms and the importance (efficient, "positive" impact) of diverse private, contractual, collective and hybrid modes of governance for these holdings, allows to determine the real efficiency of the specific governing modes for improving agrarian sustainability in the country. For most of implemented governing forms there exist a strong correlation between the positive estimates of the managers for the impacts on agrarian sustainability, and the archived good (and high) level of agrarian sustainability in the corresponding farms (Figure 17).

Thus, preferred and employed by the farms governing forms are critical and (most likely) their choice by the managers to a certain extent actually contribute to achievement of a higher agrarian sustainability in surveyed holdings. Effectiveness of individual governing modes is as following: personal conviction and initiatives of the farmer (92,5%), personal conviction and initiatives of workers (100%), profit and benefits in the present time (92%), immediate benefits for other persons and groups (75%), diversification of activity in the farm (83,33%), direct retail sells of products and services (84,62%), sale on wholesale and commodity markets (100%), marketing contract for products and services (95,24%), barter exchange of products and services (100%), free provision of resources, products, services and activities (83,33%), interlinked supply contract with services by the supplier (100%), participation in joint actions with other farmers and non-farmers (100%), integration with the buyer of produce (100%), partnership with a business organization (100%), state subsidies for activities and products (88,24%), state subsidies for new investments (100%), green payments and eco-measures of the PRD (94,12%), state support to farmers organizations (100%), other measure of the PARD (100%), participation in other public programs (100%), existing public support in the region (100%), partnership with community, state, and integrational organization (100%), and social recognition of the contribution (93,33%).

For the rest of analysed governing forms used by the surveyed farms there is no clear relation between the superior levels of agrarian sustainability and the managers' assessments on sustainability impact of a particular mode. In all these cases, preferred by the managers governing forms do not lead to expected results (due to novelty, a short period of implementation, inefficiency in terms of sustainability), or manifested "joint (cumulative, complementary, contradictory) effect" with other employed governing modes. It is also likely that the managers' estimates are not precise and represent the impact of a particular governance form on farm private efficiency rather than the real impact on agrarian sustainability (overall social efficiency).

Figure 17. Share of farms with good and high sustainability evaluating as positive or negative the impact of individual governing forms on agrarian sustainability in Bulgaria (%)

Source: interviews with managers of farms 2017, authors calculation

Conclusion

Our empirical study has just been a first attempt to identify the complex links between the governing forms employed by the Bulgarian farms and the level of agrarian sustainability in the country. It made it possible to identify the mechanisms and modes of governance mostly used by the agricultural producers, and assess their impact on agrarian sustainability as a whole, and in different subsectors, geographical and administrative regions, (agro) ecosystems, and type of farming enterprises. We have found out that in the specific socio-economic, institutional and natural environment agricultural producers of different juridical type, size, specialization, and location use quite unlike mixture of effective market, private, collective and hybrid modes for governance or their activities and relations. Individual factors and modes which most contribute to improvement of agrarian sustainability at the current stage of development in the country are: managers' personal convictions and initiatives, farms resources and innovation potential, near future profit and benefits strategies, market prices levels and dynamics, area-based EU subsidies, and informal agreements.

Nevertheless, evolution of the system of agrarian governance and the level of agrarian sustainability depends on various economic, political, behavioural, demographic, technological, international, natural etc. factors. Individual, joint and spill over effects of all these factors are to be accounted for and assessed in further research in that new area. Particularly, it is important to incorporate into analysis and assess the impact of the formal and informal components of institutional environment which are critical and eventually determine agents' behaviour and level of agrarian sustainability. Besides, always there is a certain "time lag" between the "improvement" of the system of governance, and the positive, negative or neutral impact on agrarian sustainability, and its economic, social and environmental aspects. All these factors are to be studied in such assessments as estimates also made on the "dynamics" of the impact over a longer time horizon.

Research on the relations between the governing structure and the (level and dynamics of) agrarian sustainability is to continue though expansion of the number and representation of surveyed holdings, and the spectrum of the specific governing modes used by the farms of different type as well as assessments of the impact of institutions on agrarian sustainability. What is more, applied methods are to be enriched in order to specify better the complex relations between the agrarian governance and sustainability. Furthermore, modes of governance at higher hierarchical levels (sector, national, transnational) have to be specified and their separate and/or complementary impact on agrarian sustainability evaluated.

Having in mind the importance of comprehensive assessments of the impacts of governing system on agrarian sustainability, and the enormous benefits for farm management and agrarian policies, this type of studies are to be expended and their precision and representation increased. The latter however, requires a close cooperation between all interested parties, and participation of farmers, agrarian organizations, local and central authorities, interest groups, research institutes and experts, etc. Moreover, the precision of estimates has to be improved, and besides on the estimates of farm managers to incorporate other relevant information – experts and stakeholders' assessments, monitoring, report, statistical, etc. data, studies on "actual" (rather than declared) behaviour of various agrarian and non-agrarian agents, and associated "effects" on agrarian sustainability, *etc*.

Acknowledgement

References

[1] Bachev, H. 2010. *Governance of Agrarian Sustainability*. Nova Science Publishers, ISBN: 1608768880, 9781608768882, 116 pp.

[2] Bachev, H. 2010. *Management of Farm Contracts and Competitiveness*. VDM Verlag Dr. Muller. ISBN-10: 3639301552, 176 pp.

[3] Bachev, H. 2016. Defining and Assessing the Governance of Agrarian Sustainability. *Journal of Advanced Research in Law and Economics*, Volume VII, 4(18): 797-816. DOI: 10.14505/jarle.v7.4(18).12

[4] Bachev, H., Ivanov, B., Toteva, D., Sokolova, E. 2016. Agrarian Sustainability and its Governance – Understanding, Evaluation, Improvement. *Journal of Environmental Management and Tourism*, Volume VII, 4(16): 639-663. DOI: https://doi.org/10.14505//jemt.v7.4(16).11

[5] Furuboth, E.G., and Richter, R. 1998. *Institutions and Economic Theory: The Contribution of the New Institutional Economics.* Ann Arbor: The University of Michigan Press, ISBN-10: 0472108174, 576 pp.

[6] Georgiev, M. 2010. "Rent Seeking" in Agricultural Contracts in the Country. *Trakia Journal of Sciences*. 8(3): 230-233.

[7] North, D.C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press, ISBN: 0521397340, 9780521397346, 152 pp.

[8] Raman, S. 2006. *Agricultural Sustainability. Principles, Processes and Prospect*. The Haworth Press Inc. New York, ISBN-13: 978-1-56022-310-8, 475 pp.

[9] Sauvenier, X., Valekx, J., Van Cauwenbergh, N., Bachev, H. *et al.* 2005. *Framework for Assessing Sustainability Levels in Belgium Agricultural Systems – SAFE.* Belgium Science Policy, Brussels, 23 pp., Available at: https://www.belspo.be/belspo/organisation/Publ/pub_ostc/CPgen/rappCP28leaflet_en.pdf

[10] Terziev, D., Radeva, D. 2016. *Studying the New Agriculture*. 2nd International Conference on Development and Economics (I.CO.D. ECON). Thessaloniki, Greece, Conference Proceedings, 175-179 pp. Available at: https://icodecon.com/images/docs/proceedings_2017_3_18.pdf

[11] Williamson, O.E. 1996. *The Mechanisms of Governance*. Oxford University Press. ISBN: 0199879567, 9780199879564, 448 pp.

*** EC. 2017. *Sustainable agriculture and rural development policy - agricultural development*. European Commission.

*** UN. 1992. *Report of the United Nations Conference on Environment and Development*. United Nation.

*** UN. 2015. *Paris Climate Change Conference*. United Nation.

Corporate Tax Incidence and its Implications for the Labor Market

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Abstract:

The paper investigates the relationship between corporate taxation and labor market indicators. This research supports the idea that the increase in corporate income tax rates in the open economy will lead to the capital outflow to the low-tax jurisdictions, resulting in tax incidence on labor with consequent decrease in labor productivity. An empirical analysis demonstrated the negative relationship between labor freedom index and corporate tax rate. In countries with higher GDP per capita the strength of such relationship differs from countries where GDP per capita is relatively low. In terms of corporate tax incidence, this means that in developed countries the corporate tax burden is shifted onto workers in lesser extent compared with developing and emerging economies. The estimation of specific elements of labor freedom index allowed to identify main tendencies of impact of change of the corporate income tax rate on certain labor market indicators in countries with different GDP per capita. We suggested that corporate tax incidence diversely affects the labor productivity in countries with different GDP per capita, and the direction of such impact is determined by composition of labor force and openness of economy.

Keywords: corporate income tax; labor; tax burden; tax incidence; comparative analysis; labor productivity

JEL Classification: C10; E20; E24; H22; H25; O57

Introduction

Musgrave and Musgrave (1989) in their «Public finance in theory and practice» classified the tax incidence as statutory incidence, determining the statutory obligation for economic agents to pay taxes, and effective incidence, which refers to the tax bearer – a person who really bears this tax burden (Musgrave and Musgrave 1989, 237).

The obligation to pay taxes far from always means that such tax agent bears an appropriate tax burden. Therefore, the question of tax incidence arises. Corporate income tax (CIT) incidence can have either direct or indirect impact on workers. The direct impact relates to the change of employment income, while the implicit effect concerns changes of employment conditions arising when a company does not cut wages. This can result to the decrease in labor productivity and average value added per worker, which in turn can lead to the slowdown in economic growth. Therefore, the paper aims to investigate the relationship between level of corporate taxation (in terms of corporate income tax rate) and labor market indicators in countries worldwide to identify the suggested corporate tax incidence and its potential causes.

The paper is structured as follows. Section II provides research background on incidence of the corporate tax on labor for both the open and closed economy cases. Section III describes methodology, and Section IV provides results of empirical analysis of relationship between corporate taxation and labor market indicators in countries. Section V concludes.

1. Research Background

After introducing the capital income tax in 1909, which differed from existing indirect and property taxes, the issues of its incidence arose. The popular opinion was that in the short-term there was no incidence of such tax on workers. The partial equilibrium models were the main instrument of estimation of incidence. The first attempt to use the general equilibrium model in order to analyze the incidence of capital income tax was done by Harberger (1962).

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He provided both a theoretical analysis of the effects of the corporation income tax and estimation of its probable incidence in the United States. He developed a general-equilibrium model with corporate and non-corporate industries (sectors), each employing two factors of production, labor and capital. The realization of model with an example of the United States allowed him to conclude that capital bears close to the full burden of the tax.

The Harberger's conclusions related to the incidence of capital income tax on labor remained generally acknowledged until the growth of globalization and the increased number of international economic agreements had put the issue of openness of the economy in the forefront in the analysis of macroeconomic processes (Melvin 1982 and Grubert and Mutti 1985 *etc*.)

In theory, any source-based capital tax in the small open economy is inefficient (Diamond and Mirrlees 1971), and the share of the corporate tax burden falling on domestic immobile factors increases (compared to closed economy case). Thus, if the country has no market power on the world markets, the after-tax rate of return to capital is fixed. Moreover, if such a country raises the corporate income tax, this results in decrease in domestic investment and the increase of pre-tax rate of return to investment. The latest will rise until the domestic after-tax rate of return will equal the international after-tax rate of return. This means that the corporate income tax burden is fully shifted to domestic immobile factors of production, which include immobile labor or land. In the open economy, the tax distorts both the domestic and the international allocation of capital. In the long-run the marginal productivity of labor and, consequently, the wages (according to the theoretical assumptions) will decrease. This lead to the decrease in labor demand, and the corporate tax burden born by labor, will rise.

Harberger itself (1995, 2008) revised the incidence of corporate income tax in an open economy having been stated that the openness of a state should be regarded as a crucial factor in analyzing the incidence of corporate taxation. He found that domestic labor often bears the full burden of the corporate tax and that a larger burden on capital reduces both the degree of international capital mobility and the degree of substitutability between domestic and importing goods.

Further research providing empirical estimation of corporate tax incidence on labor used mainly the general equilibrium models. And the obtained results varied widely. Some of them confirmed Harberger's findings as Randolph (2006), Felix (2009), McKenzie and Ferede (2017), others as Fuest (2011) or Fuest, Peichl, and Siegloch (2016) demonstrated that the labor bears an essential share of the corporate tax burden, but reject an assumption that the corporate tax falls primarily on business owners). Finally, Gravelle and Smetters (2006), Gravelle (2013), Agarwal and Chakraborty (2017) *etc*. argued that the corporate tax falls largely on capital income, which is similar to the closed economy case.

When the small open economy faces the perfectly elastic supply of capital, the corporate income tax burden is shifted to factors other than capital. The latter will continue to move abroad until its domestic after-tax return would equal the world return. Such decrease of capital will lead to the lower marginal productivity of labor, and, in turn, if the capital is perfectly mobile, the corporate income tax burden will be fully shifted into the labor.

In contrast, when the economy is large, the high corporate income tax could reduce an international after-tax rate of return. As a result, the immobile factors of production again bear a part of corporate tax burden, but in such a case, the capital owners will also lose, while immobile factors owners in other countries with capital inflow will benefit. Workers on the domestic labor market will bear the burden since the most part of them cannot move freely between countries and domestic wages will fall. At the same time, in the foreign labor market the foreign workforce benefits from the increase of foreign capital.

Thus, in general, according to Fuest (2015), the open economy models predict that "the smaller is the country imposing the tax relative to the world or domestic economy the larger is the burden on immobile factors" (Fuest 2015, 8).

Another set of papers use wage bargaining models (Brenzel, Gartner, and Schnabel 2013), Arulampalam *et al*. 2012), Fuest 2015) in order to analyze the impact of corporate income tax changes on wages. In general, their results indicate that the enhancing of bargaining power of companies weakens the incidence of corporate income tax; however, these models do not consider both an open economy and capital mobility. However, when the economy is open, a company has the possibility to shift both production, and capital abroad; this could improve its bargaining position. This means, according to Exbrayat *et al*. (2016) the direct tax incidence, which increases with the level of economic integration. In competitive labor markets, the indirect incidence of corporate income tax arises from variations in the capital-to-labor ratio (invested in each country), when the capital outflow from a high tax country reduces the marginal productivity of labor in smaller tax country and strengthen thereby such corporate tax incidence. Nevertheless, when the labor cost is taken into account the tax cuts could not lead to the expected results, notably to prevent capital outflow. The question is that countries raise corporate income tax rates in order to lower domestic labor cost. *i.e*., when the government is concerned with lower wages one of the ways to achieve

it is to maintain corporate income tax rates on the relatively high level (compared with other countries) (Lockwood and Makris 2006, Exbrayat *et al.* 2016).

Therefore, according to the existing studies, in the open economy the corporate tax burden is partially (or entirely) shifted onto labor. The level of incidence depends on the size of the country, on the degree of substitution between imported and domestic products, on the degree of factor substitution and the intensity of their use. The theory suggests that the increase in CIT rate means for companies the necessity of cutting wages for maintaining commodity prices at the same level. However, at the same time there is a strong possibility that to maintain the certain level of wages, companies will manipulate the number of hired employees, terms and conditions of employment and dismissal, amounts of severance pay, number of working hours *etc.*, which can lead to the decrease in average value added per worker. In other words, companies can shift the corporate tax burden onto labor by changing conditions of employment.

Hereafter, we investigate the relationship between change of CIT rate and labor market indicators to identify the suggested corporate tax incidence and its potential causes.

2. Methodology

Our analysis includes two stages:
- identification as a whole the suggested tax incidence through worsening working conditions by companies. The latter can be expressed numerically by labor freedom index, which is the integral quantitative indicator considering the impact of six factors: ratio of minimum wage to the average value added per worker; hindrance to hiring additional workers; rigidity of hours; difficulty of firing redundant employees; legally mandated notice period, and mandatory severance pay (The Labor Freedom Index 2017);
- analysis of each of these factors in order to identify overarching factor(s), and the nature of its(their) relationship with CIT rates in countries.

Our estimations based on the data on 145 countries for 2009-2017 retrieved from KPMG, Deloitte and Ernst and Young, The Heritage Foundation, The International Labor Organization, and The World Bank databases, including Doing Business database. The methodology includes statistical and factor analysis, as well as comparative analysis.

3. Case Studies

First, we divided all countries according their level of economic development expressed as GDP per capita (Figure1).

Figure 1. Corporate tax rates, GDP per capita and labor freedom index in countries, 2016.
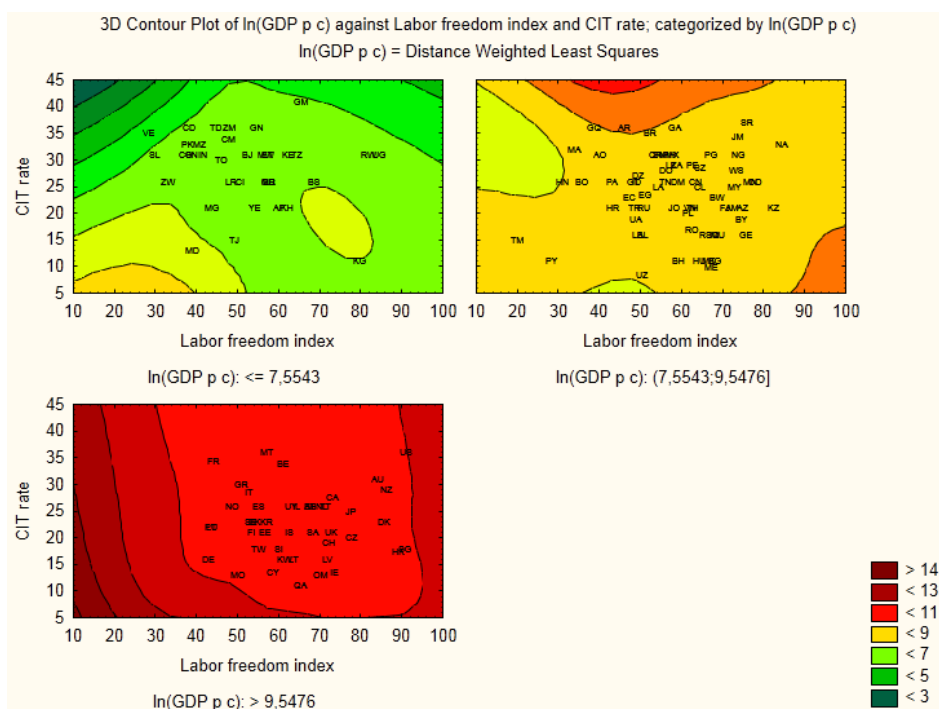
Source: author   *Note*: the natural logarithm of GDP per capita, $\ln(GDPpc)$ used to simplify visual comprehension

To provide further analysis and to simplify visual comprehension of findings we calculated the ratio of labor freedom index and CIT rate (LC_n) as:

$$LC_n = \frac{\sum_{i=1}^{n} LF_i / CIT_i}{n}, n = 1,2, \dots, N \qquad (1)$$

where: N is the number of countries; LF_i is the labor freedom index of the i-th country; CIT_i is the corporate income tax rate of the i-*th* country.

Figure 2 presents the results of correlation analysis between labor freedom indices and CIT rates (as LC_n ratio) and GDP per capita ($\ln(GDPpc)$) in countries worldwide.

Figure 2. The results of correlation analysis between labor freedom indices and CIT rates, 2016.
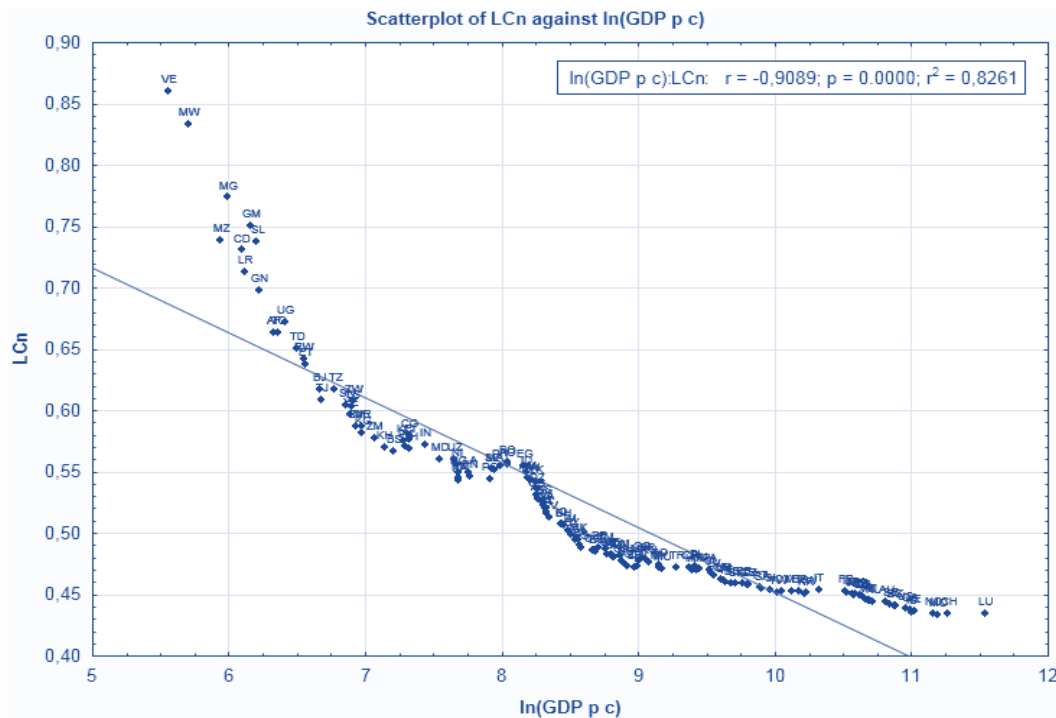
Source: author

Figure 2 demonstrates the inverse correlation between analyzed variables. Such statistically significant dependence is visible even for the linear approximation – $R^2 > 0,8$; for other approximation types – exponential, power and logarithmic, the value of R^2 is even larger.

This means that increase of corporate tax rate leads to the reduction of labor freedom index. In other words, when companies for whatever reason do not want to reduce wages in response to increase of CIT rate they shift the CIT burden onto workers by worsening their employment conditions.

However, such relationship varies depending on the level of GDP per capita. This means that for low-income and low-middle-income countries such relationship will differ from both upper-middle-income countries and high-income countries. Said otherwise, the richer and more developed countries have indicators, which determine the labor freedom index and which are not aligned with the tax rate.

Accordingly, they reach the same value of labor freedom index with larger tax rate, which, in turn, gives lower ratio of these two variables compared to other countries. In countries with high GDP per capita, the corporate tax burden is shifted onto workers (due to worsening their employment conditions) in lesser extent than in countries where GDP per capita is relatively low.

II. At this stage we analyze specific elements of labor freedom index in order to identify the nature of their relationship with CIT rates in countries, and potential tax incidence. We found 62 countries worldwide with different levels of GDP per capita, in which the CIT rates have been changed during 2009-2017. For each country, we provide a factor analysis, starting with exclusion of factors of labor freedom index, which have no variance (data reduction method).

After we analyzed the descriptive statistics (Table 1 as an example for Angola, where we excluded three variables with no variance) and built correlation matrices (Table 2, where three variables have significant correlation with CIT rate).

Table 1. Descriptive statistics

	Valid N	Mean	Min	Max	Variance	Std.Dev.	Coef.Var.	Std.Error
Standard CIT rate	8	12,5000	10,0000	15,0000	7,14286	2,672612	21,38090	0,944911
Minimum wage for a full-time worker	8	198,2255	182,3044	209,8582	70,75396	8,411537	4,24342	2,973928
Ratio of minimum wage to value added per worker	8	0,3855	0,3545	0,4100	0,00040	0,020048	5,20000	0,007088
Maximum working days per week	8	5,6250	5,0000	6,0000	0,12500	0,353553	6,28539	0,125000
Paid annual leave	8	20,2500	20,0000	22,0000	0,50000	0,707107	3,49189	0,250000
Severance pay for redundancy dismissal	8	10,2944	10,1000	11,6000	0,27831	0,527548	5,12459	0,186516

Source: author

Table 2. Correlation matrix

	N	Mean	Std.Dv.	r(X,Y)	r²	t	p
Standard CIT rate		12,5000	2,672612				
Paid annual leave	8	20,2500	0,707107	-0,377964	0,142857	-1,00000	0,355918
Severance pay for redundancy dismissal	8	10,2944	0,527548	-0,371514	0,138023	-0,98017	0,364854
Minimum wage for a full-time worker	8	204,1190	7,673855	-0,747955	0,559436	-2,76024	0,032844
Ratio of minimum wage to value added per worker	8	0,3855	0,020048	-0,925239	0,856067	-5,97378	0,000987
Maximum working days per week	8	5,6250	0,353553	-0,755929	0,571429	-2,82843	0,030020

Source: author

The results for 62 countries showed the following tendencies (Table 3)

Table 3. Results of statistical and factor analysis for countries with change in CIT rates

	Factor	Number of countries with significant correlation
1	Minimum wage for a full-time worker	Angola, Belarus, Brazil, Cameroon, Chile, Columbia, Congo, Rep., Cyprus, Ecuador, El Salvador, Estonia, Guatemala, Jordan, Laos, Madagascar, New Zealand, Pakistan, Senegal, Slovenia, Thailand, Taiwan, Tunisia, UK, Uzbekistan, Vietnam
2	Ratio of minimum wage to value added per worker	
3	Maximum working days per week	Albania, Angola, Bangladesh, Cyprus, Greece, Namibia
4	Premium for night work	Chile, Finland, Iceland, Slovenia, Switzerland
5	Premium for work on weekly rest day	Congo, Cyprus, Fiji, Ireland, Portugal, Slovenia, Switzerland, Vietnam
6	Paid annual leave	Slovenia, Tunisia
7	Severance pay for redundancy dismissal	Brazil, Congo, Dominica, Ecuador, Madagascar, Senegal, Slovenia, Taiwan
8	Notice period for redundancy dismissal	Congo, Panama, Portugal, Slovenia, Tajikistan, Tunisia, UK, Uzbekistan

Source: author

Note: for factors 1 and 2 the signs of correlation coefficients are identical.

The value added per worker as well as the labor productivity can increase due to investment and R&D, and some research argued that lower CIT rates have either a positive effect on these factors. (HM Treasury 2013, Gravelle and Marples 2014 etc) or any significant effect (Hungerford 2014). Moreover, in the open economy the labor productivity declines due to capital outflow occurred as a result of increase in CIT rates (Diamond *et al.* 2013, Boghean and State 2015), and according to Ogawa *et al.* (2016) in the unionized country such capital outflow reduces labor productivity (compared to the non-unionized country case).

To provide comparative analysis of obtained results for 25 countries, in which the significant correlation between CIT rate change and minimum wage for a full-time worker/ ratio of minimum wage to value added per worker is observed, we used both labor force participation rate and labor productivity indicators.

The results of analysis are presented on Figure 3. Figure 3 demonstrates that countries with lowest GDP per capita have upper middle levels of labor force participation rate while the labor productivity is rather low. It can be explained, ultimately, by a large number of low-skilled and unskilled jobs with simultaneous low value added per worker. In contrast, countries with highest GDP per capita with large share of R&D and highly skilled work have high labor productivity rates with labor force below average.

Consequently, in countries with lower GDP per capita the negative significant correlation means that the increase in CIT rate leads to the decrease in ratio of minimum wage to value added per worker due to weak unions/labor protections, and because of large share of low-skilled jobs. Therefore, the increase in CIT rate affects labor productivity (that is contrary to Hungerford (2014).

In contrast, the decrease in CIT rate leads to the increase in labor productivity resulting from capital inflow from unionized countries. The latter ties up with suggestions of Ogawa *et al.* (2016). In the non-unionized country, labor is paid according to its marginal product, while in the unionized state the labor is overpaid. In the open economy case, implying the integration of capital markets, the labor market of non-unionized country benefits from capital inflow.

Figure 3. Results of comparative analysis of countries with the significant correlation between CIT rate and minimum wage/ratio of minimum wage to value added per worker
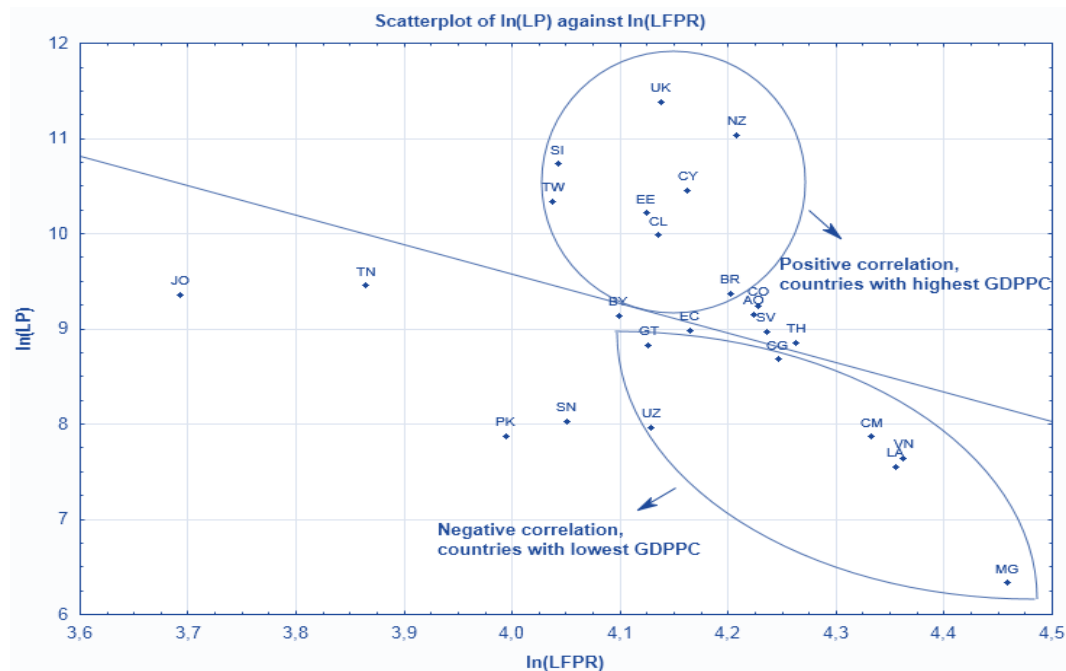
Source: author
Note: ln (LFPR), ln (LP) are natural logarithms of labor force participation rate and labor productivity respectively

Countries with higher GDP per capita demonstrate the positive significant correlation between CIT rate and the ratio of minimum wage to value added per worker, which can be explained by a large share of tax-favored activity, which is mostly related to the R&D (for these countries Figure 3 demonstrates high rates of labor productivity with average labor force participation rate); government incentive to take part in international tax competition to prevent capital outflow, notably from R&D sector (Sokolovska 2016) and consequently to prevent the decrease of labor productivity (the higher is the tax rate, the higher is the labor productivity – as a result of tax incentives).

Conclusion

The tax theory suggests that in the open economy the corporate tax burden is partially (or entirely) shifted onto labor. This burden can be shifted either by cutting wages or by worsening employment conditions – in case when companies do not cut wages.

The conditions of employment in countries worldwide generally can be determined by labor freedom index: the higher is its value the better are terms of employment in country (conditions for hiring and dismissals, rigidity of hours, amount of mandatory severance *etc.*).

An empirical analysis for 145 countries demonstrated the negative and statistically significant relationship between labor freedom index and corporate tax rate, which varies depending on the level of GDP per capita. This could be evidence that corporate tax rate increase leads to the worsening employment of conditions since companies do not want or cannot to cut wages. Moreover, in countries with higher GDP per capita the strength of such relationship differs from countries where GDP per capita is relatively low.

In terms of corporate tax incidence this means that in developed countries with higher GDP per capita the corporate tax burden is shifted onto workers (particularly, by worsening their employment conditions) in lesser extent compared with countries with relatively low GDP per capita.

Further analysis for 62 countries with changes of CIT rates allowed to suggest that such change in countries with low GDP per capita affects labor productivity, identifying the potential tax incidence, due to a large share of labor force employed in low-skilled and unskilled jobs, and also due to capital inflow as a result of capital market integration, that affects labor market.

For countries with higher GDP per capita is the suggested corporate tax incidence is determined by a significant part of tax-favored activity, notably R&D with high value added per worker, and also by government incentive participate in international tax competition.

Consequently, the corporate tax incidence diversely affects the labor productivity in countries with different GDP per capita, and the direction of such impact is determined by composition of labor force and openness of economy.

References

[1] Agarwal, S, Chakraborty, L.S. 2017. *Corporate Tax Incidence in India.* Levy Economics Institute. Working Paper No. 898, 35 pp. Available at: http://www.levyinstitute.org/pubs/wp_898.pdf

[2] Arulampalam, W., Devereux, M.P., Maffini, G. 2012. The direct incidence of corporate income tax on wages. *European Economic Review*, 56 (3): 1038-1054.

[3] Boghean, C., State, M. 2015. The relation between foreign direct investments (FDI) and labour productivity in the European Union countries. *Procedia Economics and Finance*, 32: 278-285.

[4] Brenzel, H., Hermann G., and Schnabel, C. 2013. *Wage Posting or Wage Bargaining? Evidence from the Employers' Side.* IZA DP no. 7624. Available at: http://ftp.iza.org/dp7624.pdf (accessed December 12, 2017)

[5] Diamond, J., Zodrow, G., Carroll, R. 2013. *Macroeconomic Effects of Lower Corporate Income Tax Rates Recently Enacted Abroad.* Ernst & Young. Available at: http://ratecoalition.com/wp-content/uploads/2013/04/EY_TPA_RATE_Coalition_Macroanalysis_2013_03_04_FINAL.pdf

[6] Diamond, P., Mirrlees, J.A. 1971. Optimal Taxation and Public Production I: Production Efficiency. *The American Economic Review*, 61(1): 8-27.

[7] Exbrayat, N., Geys, B. 2016. Economic Integration, Corporate Tax Incidence and Fiscal Compensation. *The World Economy*, 39 (11): 1792-1811.

[8] Felix, A. 2009. *Do state corporate income taxes reduce wages?* Federal Reserve Bank of Kansas City. Available at: https://www.kansascityfed.org/Publicat/EconRev/PDF/09q2felix.pdf (accessed November 27, 2017).

[9] Fuest, C., Peichl, A., Siegloch, S. 2016. *Do Higher Corporate Taxes Reduce Wages? Micro Evidence from Germany.* ZEW Discussion Paper 16-003. Available at: https://ssrn.com/abstract=2739611 (accessed December 12, 2017).

[10] Fuest, C. 2015. *Who bears the burden of corporate income taxation?* ETPF Policy Paper, no.1. Centre for European Economic Research (ZEW). Available at: http://www.etpf.org/papers/PP001CorpTax.pdf (accessed December 12, 2017).

[11] Gravelle, J. 2013. Corporate Tax Incidence: Review of General Equilibrium Estimates and Analysis. *National Tax Journal*, 66 (1): 185-214.

[12] Gravelle, J., Smetters, K.A. 2006. Does the Open Economy Assumption Really Mean That Labor Bears the Burden of a Capital Income Tax? *The B.E. Journal of Economic Analysis & Policy,* 6(1): 1-44. DOI: https://doi.org/10.2202/1538-0637.1548

[13] Gravelle, J., Marples, D. 2014. *Tax Rates and Economic Growth*. Congressional Research Service. CRS Report for Congress R42111. Available at: https://www.pacificresearch.org/wp-content/uploads/2017/06/R42111.pdf

[14] Grubert, H., Mutti, J. 1985. The Taxation of Capital Income in an Open Economy: The Importance of Resident-Nonresident Tax Treatment. *Journal of Public Economics*, 27 (3): 231-309.

[15] Harberger, A.C. 2008. *Corporation Tax Incidence: Reflections on What Is Known, Unknown, and Unknowable.* In: Fundamental Tax Reform, The MIT Press, Cambridge. ISBN: 9780262042475, DOI:10.7551/mitpress/9780262042475.003.0017

[16] Harberger, A.C. 1995. *The ABCs of Corporation Tax Incidence: Insights into the Open-Economy Case*. In: Tax Policy and Economic Growth, *edited by* American Council for Capital Formation, 51-73 pp., Washington, D.C: ACCF Center for Policy Research

[17] Harberger, A.C. 1962. The Incidence of the Corporation Income Tax. *The Journal of Political Economy*, 70(3): 215-240.

[18] Hungerford, T. 2012. *Taxes and the Economy: An Economic Analysis of the Top Tax Rates Since 1945*. Congressional Research Service. R42729. Available at: https://graphics8.nytimes.com/news/business/0915taxesandeconomy.pdf

[19] Lockwood, B., Makris, M. 2006. Tax incidence, majority voting and capital market integration. *Journal of Public Economics*, 90 (6-7): 1007-1025. DOI:10.1016/j.jpubeco.2005.06.005

[20] McKenzie, K.J., Ferede. E. 2017. Who pays the corporate tax? Insights from the literature and evidence for Canadian provinces. *SpPP Research Papers*, 10(6): 1-26.

[21] Melvin, J.R. 1982. The Corporate Income Tax in an Open Economy. *Journal of Public Economics*, 17 (3): 393-403.

[22] Musgrave, R.A., Musgrave P.B. 1989. *Tax and Expenditure Incidence: An Overview*. In: Public Finance in Theory and Practice, McGraw-Hill Book Co., New York. ISBN-10: 0070441278, 664 pp.

[23] Ogawa, H., Sato Y., Tamai, T 2016. Who gains from capital market integration? Tax competition between unionized and non-unionized countries. *Canadian Journal of Economics*, 49(1): 76-110.

[24] Randolph, W.C. 2006. *International Burdens of the Corporate Income Tax*. Working Paper 2006-09. 18067, Congressional Budget Office. Washington, D.C. Available at: https://cbo.gov/sites/default/files/cbofiles/ftpdocs/75xx/doc7503/2006-09.pdf

[25] Sokolovska, O. 2016. Race to the bottom in international tax competition: some conceptual issues. *Journal of Tax Reform*, 2(2): 98-110.

*** The Labor Freedom Index 2017. *The Heritage Foundation*. Available at: http://www.heritage.org/index/labor-freedom (accessed December 12, 2017).

*** Analysis of the dynamic effects of Corporation Tax reductions. 2013. HM Treasury, HM Customs and Revenue 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263560/4069_CT_Dynam ic_effects_paper_20130312_IW_v2.pdf (accessed December 12, 2017)

Retail Price Endings and Consumers' Buying Behavior: Evidence from an Emerging Economy

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Abstract:

The practice of odd-even pricing is pervasive in Indian retail sector. This study empirically examined the impact of the pervasive use of the price-endings on consumers' perception and buying behavior. A structured questionnaire using a 5-point Likert scale was used to do a mall-intercept survey in the capital cities of Delhi, West Bengal, Maharashtra, Tamil Nadu, Orissa, Bihar, Uttar Pradesh, Punjab, Madhya Pradesh, Jharkhand, and Karnataka. The collected responses were analyzed using structural equation modeling (SEM). The findings show that Indian consumers perceive prices like 999, 99.95, 349.99 as low and discount prices. Also, the prices like 1000, 100, 350 which are a little bit higher than 999, 99.95, 349.99 are perceived as high-prices. This price perception partially mediates consumers' buying behavior. Most of the time, consumers purchase products priced with odd-ending because they think that the products are on sale or special offer also, the consumers who are brand conscious purchase the products priced with even-ending.

Keywords: odd pricing; even pricing; psychological pricing; consumers' perception; mall intercept; buying behavior

JEL Classification: M31

Introduction

The contemporary retail market is uncertain and very competitive. It is very challenging for a retailer to be sustainable and to grow with leveraged sales and profitability. For sustainability and continuous growth with augmented sales and profitability, the retailer needs capital, which is one of the forms of money, comes from the sales prices of products or services. Price is the amount of money charged from customers for the products or services, sold and rendered to them by the retailer. Coughlan and Mantrala (1994) have stated price as a competitive tool. Marketing management describes price as one of the elements of 4 Ps of the marketing mix, is the only revenue generating element or variable while other elements such as product, place, and promotion are expenses for a retail organization (Kotler *et al.* 2014). Therefore, it is very crucial for a retailer to price its products or services practicing the most appropriate pricing strategy. The retailers practice different pricing strategies based on the category of the products or services. The practice of psychological pricing or odd-ending pricing is the most common and widespread in the retail market (Holdershaw *et al.* 1997). The odd-ending pricing is used by the retailers as a rational way of dealing with the uncertainty of the market (Gedenk and Sattler 1999). "The psychological pricing is the practice of structuring and presenting prices to appeal to consumers' emotions and to influence their decision-making process" (Pride and Ferrell 1997). In literature, psychological pricing is referred to as odd pricing, just below pricing, charm pricing, magic pricing, intuitive pricing, irrational pricing, or rule-of-thumb pricing (Boyd and Massy 1972, Dalrymple and Thompson 1969, Gabor 1977, Kreul 1982, Monroe 1990, Rogers 1990, Sturdivant 1970, Holdershaw *et al.* 1997, Kumar and Pandy 2017).

Many retailers tend to set the prices of their products or services just below round numbers such as $99.49, $999.99, $599.95, or $199. This tendency of setting the retail prices is referred to as odd-pricing or psychological pricing (Kreul 1982, Schindler and Kirby 1995, Twedt 1965). The exact origin and time of initiation of practicing the psychological pricing are not certain (Dalrymple Thompson 1969). However, (Hower 1943) has stated that this pricing strategy could have been started in the middle of the 19th century. Though psychological pricing has been in practice for more than 100 years, this was first studied by the academic researchers only in the 1930s (Bader and Weinland 1932) and afterward. Though the history of the practice of psychological pricing is this much longer

in the academic field, however, there is still a little knowledge about the effect of psychological pricing on sales of the products or services (Holloway 1973). There is little evidence regarding the origin of psychological pricing, but the existence of its practice is assumed to be more than 100 years back (Schindler and Wiman 1989). According to a theory, the psychological pricing or the odd-pricing originated after fixed pricing became the norm in the USA, after the Civil War ended (Georgoff 1971) also, the standardization of currency is considered one of the reasons. Another commonly cited reason is that psychological pricing emerged as a measure to avoid combat theft by the employees (Hogl 1988, Sturdivant 1970, Twedt 1965). The psychological pricing was started by Melville Elijah Stone in 1875 first time in a newspaper pricing competition (as cited in Kumar and Pandey 2017). The practice of psychological pricing is now common especially in the USA (Rudolph 1954, Twedt 1965, Schindler and Wiman 1989), Germany (Hogl 1988), and New Zealand (Holdershaw 1995). However, in India, though the practice of odd-pricing or psychological pricing is pervasive in price advertisements of products or services in the daily newspapers, in off-line retailing and in online retailing as well, even then there is a dearth of study about the psychological pricing or odd-pricing and its impact on the buying behavior of Indian consumers.

The aim of this study is to examine whether there is any effect of psychological pricing on perception and buying behavior of the Indian customers. There are many studies done on the effect of odd-pricing or psychological pricing on consumers' buying behavior. However, they have got mixed results (Ginzberg 1936, Daryample and Haines 1970, Georgoff 1972, Blattberg and Wisniewski 1987, Gendall *et al.* 1997). The outcomes of these studies are not consisting. Two of the above studies found statistically insignificant effects of price-endings on the consumers' buying behavior; the other two studies found that the effect of price-endings is on some of the products whereas the last study has reported a positive impact of odd-ending pricing or psychological pricing on the consumers' buying behavior. On the basis of these mixed outcomes about the effects of odd-pricing or psychological pricing on the consumers' buying behavior, we have done this study to check if there are any effects of psychological pricing on the perception and purchasing behavior of the Indian customers.

The psychological prices are structured as odd-prices, a little less than an encircled number, such as $9.99, $8.95, $1.67, $2.98 or $199 (Dunne *et al.* 2015). The customers have a propensity to perceive "odd-prices" as being extensively lower than they actually are. Thus, prices such as $6.99 and $9.98 are considered to spend $6.00 and $9.00 instead of considering to spend $7.00 and $10.00. This is so because the customers read prices from left to right, therefore, they round off the prices near to the leftmost digit, and because of this $6.99 and $9.98 are perceived as $6.00 and $9.00. This technique of perceiving the prices is called left-digit-effects (Thomas and Morwitz 2005). Since, a 9-ending price conveys a low price image, called price-image-effects and also, the 9-ending price conveys an impression of the low-quality of the product, called quality-image-effects (Schindler and Kibarian 2001).

1. Consumers' Price Perception

Consumers' price perception is the ability to see, hear, feel, or become aware of prices of products or services. Pasricha (2007) states that perception is a psychological processing of information received by our senses and also, the result of the internal process of perception is awareness of attributes of the product. The perception is a procedure, people use to interpret and organize sensation to produce a meaningful experience of the world (Lindsay and Norman 2013). In other words, the way, a consumer perceives and responds to prices of the products and the advertising information in general, broadly relies on how he or she perceives them through the senses and how they are interpreted through the mind. A crucial matter upon which psychologists are divided is the extent upon which the perception depends directly is the information present in the stimulus (prices of the products or services). Some of the psychologists agree that perceptual procedures are direct, relies on the perceivers' expectation, previous knowledge and the information available in the stimulus (prices of the products or services). Linking perceptual procedure to pricing in this study, consumers' sensory experiences of the prices of products or services involve both the recognition and the effect they have upon them, and their willingness to purchase the products or the services. The consumers' expectations rely broadly on their previous experiences and the present perception of the prices. Therefore, it can be said that the perceptual procedure is a sequence of steps which starts with the environment and leads to the perception of the stimulus and an action in response to the stimulus. By the perceptual procedure, a consumer gets information about the properties and the prices of the products or the services.

Customers obtain information about prices of products from the external world through the senses, such a piece of information received is integrated and analyzed to make decisions. The decision is a result of mental procedure (cognitive procedure) leading to the selection of a course of action amongst several alternatives. When a customer gets into a retail outlet, he or she perceives the price tags of the products and determines what action should be taken and how to relate it to the perception. The price sensitive buyers would either perceive it as cheap

or expensive and that biased perception and interpretation would determine whether he/she would purchase the product or not. The customers' price perception is also a cause of impulse buying. Human behavior is such that the people strive to maximize the value while to minimize the cost. When a customer perceives that the utility derived from a product would exceed the price of the product, then there is a high probability that the customer would purchase that product even if it were not in his or her plan.

The economists who study customers' behavior are of the view that customers are price takers and accept prices at their face value or as given by the producers. Marketers often acknowledge that customers assess price information vigorously. They decode prices according to their previous buying experiences, formal communication (advertising and sales promotions), informal communication (friends, colleagues and family members), and point-of-purchase or the online resources (Kotler and Keller 2005).

Also, the consumers' price perception depends on their social groups (Kurtuluş and Okumuş 2010). Theories of the consumers' behavior suggest that consumers' understanding of the rightmost digit of the prices influences the demand curves and this is what prompting the retail organizations to practice odd-ending pricing or psychological pricing strategy for pricing their products and services. The price cognizant consumers think that if they purchase products and avail the services priced at odd-ending prices, they will save some money (Gaston-Breton 2011).

2. Review of Literature

According to Allaway *et al*. (2006), one of the biggest paradigm shifts in marketing over past twenty years has been the change in marketer objectives from a business focus to a relationship focus. Vazifedoost *et al.* (2013) state that consumers' behavior is the study of human responses to products or services and their marketing activities. The psychological impact of prices is extensively approved. However, some significant aspects have acknowledged relatively little attention. One of such aspects is the impact on the price displayed on the price tags on the consumers' perception and behavior. When multiple prices are presented in a list of products or services, both the order in which they are displayed (increasing or decreasing order) and the range of prices displayed (both the number of choices and also the magnitude of variation between the lowest and the highest price) may affect both the perception of a fair price and the consumers' buying behavior (Kreul 1982, Monroe 1990, Simonson 1993, Smith and Nagle 1995). Price perception is modified by scale transformation, *i.e*., expansion or compression. The practice of odd-pricing or psychological pricing could be less efficient to distinguish national brands from retailer brands. The Euro currency can be an opportunity to study the procedure by which consumers perceive prices and integrate product characteristics for a choice (Gaston-Breton and Desmet 1999). Measurement of price perception may be generalized across the cultures (Menge and Altobello 2009).

Numerous research studies have explained that more positive effects occur when prices are listed in decreasing as opposed to increasing order (Example., $999; $899; $799.99 and so on). These effects comprise a willingness to pay higher prices (Monroe 1990), higher perceptions of value (Garbarino and Slonim 1995); and higher buying probability (Brennan 1995). It is said that when prices are displayed in decreasing order, the first higher price serves as an anchor (or reference) point that widens the perception of the other prices, and as an outcome, the customers are eager to pay is higher than if the list was displayed in an increasing array (Kreul 1982, Monroe 1990, Smith and Nagle 1995). According to Bennett *et al.,* (2003) customers, on an average, would choose higher-priced products and services when prices in a list are displayed in decreasing array and when the range of prices in the list is wider rather than narrower. According to Janiszewski and Lichtenstein (1999) price perception research has relied upon Adaptation-Level-Theory to account for the dynamics by which consumers translate market prices into subjective price perceptions. The adaptation-level hypothesis predicts that prices are evaluated according to their deviation from a single anchor *i.e*., the internal reference price. The price perception depends both on products and consumers (Sirvanci 2011). Zhou *et al*. (2002) found that market efficiency positively affects the formation of price-quality schemas.

In an inefficient market, consumers believe that positive relationship between price and quality exists to a smaller extent, but paradoxically, risk-adverse consumers have to rely more on price to infer product quality. Therefore, customers' retention is significantly less expensive than finding new ones (Kyriazopoulos and Rounti, 2007). Price is one of the most important marketplace cues that consumers use in their decision-making process. It is widely known that consumers react differently to the prices of the products or the services. According to Lichtenstein *et al*., (1993), there are multidimensional aspects of price cues. According to Geçti (2014), the price is a very important driver for consumers to make buying decisions. It will be helpful for businesses to know consumers' price perceptions for realizing their pricing strategies. For very low estimate prestige sensitivity, 9-ending prices are used and for the price-quality association and for high prestige sensitivity, 0-ending or even-ending prices are

practiced, known as positive aspects of price perception. Kleinsasser and Wagner (2011) state that consumers, purchase high-priced goods might be influenced by price endings, just as consumers, purchased low-priced goods are. Second, personal involvement and price interest have a moderating effect on perceptions of such price endings. Third, odd prices also make sense for sellers of high-priced goods. The consumer price perception dimensions include price consciousness, value consciousness, price-quality association, and retailers' reputation (Chen and Sadeque 2007). The price-ending influences the consumers' perception through the cognitive process (Jakstiene *et al.* 2008).

According to Harris and Bray (2007), men and women do perceive price-endings differently. Women are more likely to purchase the products and the services priced using 9-ending or psychological pricing and men prefer to purchase the products or the services priced with '0-ending' or even-ending prices. According to Asamoah and Chovancova (2011), there are several moderating variables or factors such as branding, advertisement, sales promotions, personal involvement and purchasers' interest which impact on the customers' price perception. The personal involvement moderates customers' price perception, *i.e.*, highly involved customers are likely to respond more strongly to odd-ending priced products and services than the even-ending priced products and services. Another moderating effect comes from customers' price interest, which strengthens the price-image-effects, induced by price endings. The brand and its perceived value and position in a competitive field (price reduction of strong brands is perceived suspiciously; with robust and media supported brand advertising, a buyer may be eager to pay any price, regardless of price endings).

According to Hackl *et al.* (2014), customers reward the firms which set prices at zero cents, whereas they punish those who set prices at a price-ending in 90 or 50 cents. According to Basu (1997), 9-ending prices create a psychological illusion for the customers and because of this they sometimes purchase the products and avail the services priced with 9-endings. The number of price promotions is a significant determinant of the rigidity of food prices. An increasing number of price promotions reduce price rigidity the most in retailing firms. Moreover, psychological pricing of retailers does not affect food price rigidity too (Herrmann and Moeser 2006). According to Guéguen and Jacob (2005), the effect of the 9-ending prices can be generalized and this can cause more consumer sales than the use of zero-price ending *i.e.*, one cent higher. Further, nine-ending prices have no effect on the rate of the purchasers, but have a positive effect on the amount, the purchasers spent.

If prices of products or services fall just below and within (i) *5* cents of the nearest whole dollar (example. *95,* 96, 97, 98, 99), (ii) 1 cent to the nearest 10 cents (example. 19, 29, 39, 49, 69, 79...), (iii) *$5* of the nearest $100 or $1000 amount, or (iv) $1 of the nearest round dollar amount (example. 19, 29, 39, 49, 69, 79...) then, the prices are odd prices. Therefore, a price like $10.45, ending in an odd digit, not defined as the odd price (Holdershaw 1995) and the same has been cited in (Holdershaw *et al.* 1997). The importance of psychological pricing may be overestimated in pricing decisions in the marketplace (Wedel and Leeflang 1998). A study by Choi *et al.* (2012) demonstrates that an appropriate match for message and pricing type enhances advertisement efficacy. According to Twedt (1965) 57% of retail prices ended in the digit 9, 15% ended in the digit 5, 6% ended in the digit 7, 7% ended in the digit 5, 4% in the digit 0, 3% in the digit 8, 4% in the digit 4, 2% in the digit 1, 1% in the digit 2, and 1% in the digit 6. This approves the pervasive use of odd pricing in the retail sector. A study by Guenguen and Jacob (2005), a product with a price ending with 99, opposed to one ending in 00, generates more purchasers. According to Holdershaw *et al.* (1997) there is evidence to support the firm belief which exists among retailers that greater than expected demand occurs at odd price points. A study by Schindler and Kirby (1997), the overrepresentation of digit '9' in the advertisements of products' prices can, to some extent, be accounted for by the same psychological factors that account for the common occurrence of the other two overrepresented digits 0 and 5.

The 99-ending prices communicate price-image information that may be favorable to the advertisers of the products labeling prices like $999 or $149 (Schindler and Kibarian 2001). Also, when the prices in advertisements are expressed with 99-endings rather than 00-endings, the customers perceive these as the lowest and discounted prices. This finding is contradicted by (Fortin *et al.* 2008, Schindler 2001) stating that products priced with 99-ending are perceived as quality products rather than the products priced with 00-ending. The customers from the USA prefer to purchase products priced with 9-ending whereas, the Polish customers prefer 0-ending or even-ending pricing (Suri *et al.* 2004). The price-ending tactic also works in the retail service industry and influences the consumers' price perception (Hoffman *et al.* 2002). The price-ending is also practiced in hotels and restaurants to signal value and quality of the food-items (Collins and Parsa 2006). The consumers are less likely to notice an increase in an odd-price than in an even-price (Schindler 1984). That is if $689.95 is increased to $699.95 then the consumers rarely notice it, however, if $80 is increased to $85 then the consumers notice it as an increment of $5. When a brand reputation is high, a high price has a higher effect on perceived quality when the warranty is stronger (Akdeniz *et al.* 2013). Palazon and Delgado (2009) found that at high benefit levels, price discounts were more

effective than premiums, while the opposite occurred at low benefit levels. The consumers' perception of price, quality, and value are considered pivotal determinants of the consumers' shopping behavior and product choice (Zeithaml 1988). Bartsch and Paton (1999) have stated that because of the odd-pricing the sales of the lottery tickets increased in the USA. Allen and Dare (2004) found that houses listed at certain charm prices were sold for significantly greater transaction prices than those listed at round number prices. The use of odd pricing has become so common that it is nearly taken for granted (Boyes *et al.* 2007). The retailers converge their prices to 99-cent ending when observing the previous pricing decisions of others (Ruffle and Shtudiner 2006). Differences in perceptions were found in both high and medium price level products which were priced odd and even (Quigley and Notarantonio 2015). Physical bundles of products express an interesting deal because of the customers' psychological perception (Pechpeyrou 2013). The reference price perception is shaped by the pioneer, not by the follower (Lowe and Alpert 2010). The effect of a price increase on the consumer behavior is mediated by price perception and price effect (Peine *et al.* 2009). The most effective psychological price depends on the price level. For example, for low-priced and fast moving consumer products, 99-cent-ending prices are more effective than even-ending prices and 95-cent-ending prices. However, if prices are at $50 then, 95-cent-ending prices are more effective than 99-cent-ending prices (Gendal 1998). The 9-ending prices may be more effective for regular prices because 9-ending promotional prices do not show a relevant effect on the consumer buying behavior. This happens because of the discount in prices as the consumers are more interested in discount rather than 9-ending prices (Ruiz *et al.* 2006). The gasoline stations in the USA excessively practice psychological prices (Lewis 2015).

3. Conceptual framework and hypotheses development by a theoretical underpinning of the studies

3.1. Odd-Ending Pricing

The propensity of retailers to set prices of the products or services just below round numbers (such as $99, $40.49, $99.95) is called odd-ending pricing (Kreul 1982, Schindler and Kirby 1997, Twedt 1965, Dunne *et al.* 2015). A casual observation of retail advertisements in the newspapers or on the Internet reveals that many retailers practice odd-pricing strategy for their products or services. A causal observation of advertisements of products or services in daily newspapers or in online retailing hightlights the pervasive practice of odd-ending prices in India, *i.e.* the advertisements of the products or services bearing prices like 999, 199, 149 are quite common in the Indian retailing.

There are several anecdotal reports about the impact of just below pricing or psychological pricing on the consumers' buying behavior. However, only a few published reports have systematically examined the effects of psychological pricing on the consumers' buying behavior. Ginzberg (1936) conducted an experiment with the help of a large mail-order retailer. In the experiment, comparison of the sales reactions was recorded from the two versions of the retailer's catalog. In the first version, items were offered at $1.49, $.49, $.79, $.98, $1.98 and in the second version, the items were offered at $.80, $.50, $1.00, $2.00, $1.50. From the experiment, it was found that some of the consumers purchased items offered at just below pricing and others purchased the items offered at round endings. Therefore, no significant conclusion could be drawn from this study. Gendall *et al.* (1997) stated that odd-ending pricing has an influence on the consumers' buying behavior. Consumers' awareness of prices of products and services has a direct and significant relationship with customers' buying behavior (Schindler and Kibarian 1996, Mollahoseyni *et al.* 2012). The 9-ending pricing helps the retailers to augment their sales (Anderson and Simester 2003, Aalto-Setälä and Schindler 2006, Choi *et al.* 2014)

H1a: Odd-ending pricing significantly influences consumers' buying behavior.

H1b: Consumers' price perception mediates the impact of Odd-ending pricing on consumers' buying behavior.

3.2. Even-Ending Pricing

The retailers' tendency to set the prices of products and services with 0-ending is called even-ending pricing (Guéguen and Jacob 2005). The most commonly practiced even-ending pricing digit is zero '0' (Naipaul and Parsa 2001). The customers choose round prices or even-ending prices more often than expected (Lynn *et al.* 2013). The products priced with even-ending attract more customers when some products are priced with odd-endings and displayed all together (Carver and Padgett 2012).

H2a: Even-ending pricing significantly influences consumers' buying behavior

H2b: Consumers' price perception mediates the impact of even-ending pricing on consumers' buying behavior.

3.3. Left-Digit-Effects

The retailers deliberately set the prices of products and services with 9-ending or odd-ending because of its underestimation mechanism (Schindler and Wiman 1989, Bizer and Schindler 2005). This mechanism makes clear that the customers pay less attention to the end digit(s) of the prices (Schindler and Kibarian 1993). This phenomenon makes the customers perceive an odd-ending price or psychological price lower than a 0-ending price or even-ending price. Thus, a customer perceives 999 as 900 instead of perceiving it as 1000.

In other words, since the prices are in multiple digits (Alpert 1971, Brenner and Brenner 1982, Georgoff 1972, Lambert 1975, Nagle and Holden 1995, Schindler and Wiman 1989, Simon 1989) therefore, multi-digit numbers are processed from left to right (Hinrichs, Berie and Moselle 1982, Poltrock and Schwarz 1984) to minimize information processing effort and this tends to ignore a price's right most digits. Because of this left-digit-effects, a product labeling price 499.99 rather than 500.00 creates an illusion of lower price. Thus, the product seems much cheaper to the customers than what it really is. Brenner and Brenner (1982) have suggested that this illusion is the result of a biological constraint, known as customers' limited capacity to store directly accessible information. These effects also called "level effects" or left-digit- effects (Thomas and Morwitz 2005, Thomas and Morwitz 2009, Basu 2006, Mulky *et al.* 2014).

H3: Left-digit-effects of price-endings significantly influences consumers' price perception.

3.4. Image-Effects

The practice of digit '9' and '5' in odd-ending pricing and digit '0' in even-ending pricing is pervasive in retail pricing (Holdershaw *et al.* 1997). This practice of pricing has created a symbolic meaning in the minds of the customers and this is referred as image-effects (Stiving 1996, Velthuis 2003).

In other words, this symbolic meaning of the price endings creates customers' perception about the product/service, store or competition. The customers perceive products or services labeling prices, ending with the digit '9' or '5' available on sale or special offer. The customers think that products or services having odd-ending prices are discounted and are of low-quality products or services. The odd-ending prices display low quality and price discount (Schindler 2001, Schindler 2006). The odd-ending prices sometimes but not always perceived to be lower than a price one cent higher (Thomas and Morwitz 2005). According to Dodds *et al.* (1991) and Rao and Monroe (1989), even-ending prices display high quality. The customers purchase hedonic over utilitarian products when they have odd-ending prices (Choi *et al.* 2014). The price setters use odd-ending prices for the products on sale and even-ending prices for the products that are of high-quality (Stiving and winer 1997, Thomas and Morwitz 2009, Schindler 1991). The odd-ending prices are perceived as the lowest prices (Harper 1966). According to Stiving (2000), it is not necessary that price endings will always show the quality of the products. Comparing odd-ending pricing with round-ending pricing, the odd-ending pricing produces an impression of greater discount (Guéguen and Legoherel 2004). The psychological price creates an illusion for the customers and because of it, they make their purchase (Raaij and Rijen 2003).

H4: Image-effects of price-endings significantly influences consumers' price perception.

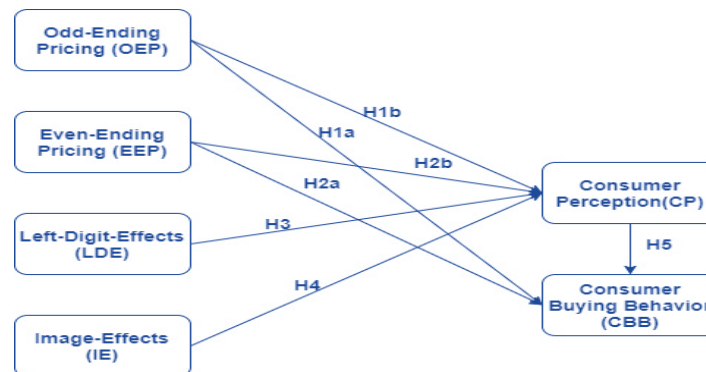### 3.5. Consumers' buying behavior

The advertisers of prices very often use the strategies, trigger emotions and feelings of consumers and because of this they purchase the products and avail the services (Vlasceanu 2013). In German grocery retailing the practice of psychological pricing is rigid (Herrmann and Moeser 2005). The retailers spend a huge amount of money on price promotions tending that such promotions change consumers' price perception and buying behavior (Grewal *et al.* 2011, Murthi and Rao 2012, Olavarrieta *et al.* 2012, Ahmetoglu *et al.* 2014).

Sometimes, consumers may think that they are being misled by the price presentations (Bambauer-Sachse and Grewal 2011). The retailers practice 99-ending and even-ending or round ending pricing based on the category of the products. They practice 99-ending prices for the products of high promotional category because there is a positive correlation between the use of 99-ending pricing and number of products promoted. Whereas, even-ending or round-ending pricing is practiced for the expensive product category (Ngobo *et al.* 2010). The favorable effect of 9-ending pricing on consumers' buying behavior was reported only when some of the products were priced with even-ending pricing (Guéguen *et al.* 2009). Baumgartner and Steiner (2007) have reported that consumers strongly prefer 9-ending prices than round-ending prices. There is an increase in demand because of the odd-ending pricing (Choi *et al.* 2011). The psychological pricing appears to consumers in different ways. This is because of the six phenomena (i) product choice is more frequent, (ii) sales level is high, (iii) low product-quality image (iv) perception

of more discount (v) perception of value of the product is favorable (vi) the consumers have less attention to the rightmost digit of prices and more attention on the leftmost digit of the prices (Freling *et al.* 2010).

H5: Consumers' price perception significantly influences consumers' buying behavior.

Figure 1. Hypothesized Research Model

Source: Author Compilation

4. Research Methodology

For the purpose of conducting this empirical research on retail price-ending and its impact on perception and buying behavior of the Indian consumers, a structured questionnaire was developed on the basis of variables identified by document analysis. The document analysis is a systematic procedure for reviewing or evaluating documents, both printed and electronic (*i.e.,* computer-based and internet transmitted) materials. Like the other analytical methods in qualitative research, the document analysis requires the data which are examined and interpreted in order to extract meaning, gain understanding and develop empirical knowledge (Bowen 2009, 27).

The questionnaire developed using 5-point Likert Scale, was shown to experts from the academic field and from the retail industry to examine its face validity and content validity. The suggestions of the experts were incorporated and finally, 19 statements or items were kept in the questionnaire along with eight demographic variables. Finally, the developed questionnaire was used to know the perception and buying behavior of the Indian consumers by conducting mall intercept survey in the capital cities of Delhi, West Bengal, Maharashtra, Tamil Nadu, Orissa, Bihar, Uttar Pradesh, Punjab, Madhya Pradesh, Jharkhand, and Karnataka. According to Bush and Hair (1985), "mall intercept is a face-to-face or personal interview method". Total 550 questionnaires were distributed amongst the shoppers, out of which 430 responses were received and after sorting, 410 fully filled up questionnaires were found. Data was fed into IBM-SPSS Version 22. After data screening (removing cases having missing values and outliers) and checking the normality of the data 400 responses were found appropriate that is shown in Table1 with frequencies of the demographic variables. The data collection took 5 months, which was from January to May 2017 and the total study was completed approximately in 9 months.

Table1. The demographic profile of the respondents

Variable	Category	Number	Percentage (%)
Gender	Male	183	45.75
	Female	217	54.25
Age	Up to 20 years	21	5.25
	21-30 years	200	50.00
	31-40 years	91	22.75
	41-50 years	80	20.00
	Above 50 years	8	2.00
Educational Qualification	Up to Matriculation (10th)	0	0.00
	Matriculation Pass (10th)	16	4.00
	Intermediate Pass (12th)	39	9.75
	Graduate	134	33.50
	Post Graduate	175	43.75
	Ph.D. and Above	36	9.00
	Others	0	0.00
Marital Status	Married	164	41.00

Variable	Category	Number	Percentage (%)
	Unmarried	160	40.00
	Divorced	37	9.25
	Separated	39	9.75
	Others	0	0.00
Family Income per Month in Rupees	Up to 20,000	11	2.75
	21,000-40,000	82	20.50
	41,000-60,000	62	15.50
	61,000-80,000	87	21.75
	81, 000-1,00,000	64	16.00
	Above 1,00,000	94	23.50
Family Size	1 Person	68	17.00
	2-3 Persons	115	28.75
	4-5 Persons	106	26.50
	6-7 Persons	50	12.50
	8 and Above	61	15.25
Occupation	Employed (Government/Private/PSU)	109	27.25
	Not Employed	40	10.00
	Student (School/College/Institution/University)	168	42.00
	Business	48	12.00
	Professional	34	8.50
	Agriculture/Farming	0	0.00
	Others	1	0.25
Residing in	City	283	70.75
	Village	111	27.75
	Others	6	1.50

Source: Author's Compilation

5. Analysis and Results

In this research, exploratory factor analysis (EFA) was applied using IBM-SPSS Version 22 for dimension reduction. Six factors such as Odd-Ending Pricing (OEP), Even-Ending Pricing (EEP), Left-Digit-Effects (LDE), Image-Effects (IE), Consumer Perception (CP) and Consumer Buying Behavior (CBB) were identified using Principal Component Analysis (PCA) as factor extraction method with eigenvalue greater than 1, and Varimax as factor rotation method. The overall Cronbach's α value was 0.737, which showed internal consistency among variables in a factor and reliability of the scale, which approved the acceptability of the scale. KMO and Bartlett's test result has been illustrated in table 2, approved the sample adequacy.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.716
Bartlett's Test of Sphericity	Approx. Chi-Square	4146.313
	df	171
	Sig.	.000

Source: Author compilation

The factor loadings for each of the factors and Cronbach's α value for each of the factors have been greater than 0.5 and 0.7 respectively, have been illustrated in Table 3, shows internal consistency among variables in the construct/factor. These extracted factors explained a total of 76.730% of the variations.

Table 3. Factor analysis results and model constructs

Factor	1	2	3	4	5	6
OEP1	0.856					
OEP2	0.795					
OEP3	0.819					
OEP4	0.817					
EEP1		0.866				
EEP2		0.836				
EEP3		0.818				
LDE1			0.858			

Factor	1	2	3	4	5	6
LDE2			0.809			
LDE3			0.860			
IE1				0.899		
IE2				0.873		
IE3				0.893		
CP1					0.891	
CP2					0.895	
CP3					0.885	
CBB1						0.947
CBB2						0.958
CBB3						0.951
Cronbach's α	0.840	0.789	0.804	0.875	0.873	0.954

Source: Author compilation

Confirmatory factor analysis (CFA) has been conducted through measurement model because it is a more appropriate statistical technique than alternative statistical techniques available for confirming convergent validity, discriminant validity and inter-construct correlations of the factors or constructs obtained after using the EFA (Bagozzi and Phillips 1982), used IBM-AMOS Version 21 for checking convergent validity and discriminant validity of the constructs. Table 4 illustrates the convergent validity, discriminant validity, and inter-construct correlations results.

Table 4. Convergent and discriminant validity and inter-construct correlations

	CR	AVE	MSV	MaxR(H)	LDE	CBB	OEP	IE	CP	EEP
LDE	0.808	0.584	0.050	0.818	**0.764**					
CBB	0.954	0.874	0.012	0.963	0.110	**0.935**				
OEP	0.811	0.533	0.005	0.979	0.068	-0.043	**0.730**			
IE	0.876	0.703	0.050	0.981	0.223	0.111	-0.006	**0.838**		
CP	0.873	0.696	0.012	0.984	-0.020	-0.082	-0.014	-0.110	**0.834**	
EEP	0.796	0.567	0.007	0.985	0.081	0.024	-0.012	-0.084	**-0.025**	**0.753**

Note*: Diagonal elements are square root of Average Variance Extracted (AVE)
Source: Author compilation

Mulaik and Millsap (2000) have recommended a four-step approach for structural equation modeling (SEM), has been used for this study. If the goodness-of-fit (GOF) measures are greater than or equal to 0.9 then the model is a good fit (Bentler and Bonett 1980). For the measurement model, the fit indices are as: χ2 =143.850; χ2/df=1.058; RMR=0.025; GFI=0.962; AGFI=0.947; PGFI=0.689; NFI=0.966; RFI=0.957; IFI=0.998; TLI=0.998; CFI=0.998; RMSEA=0.012; PCLOSE=1.000. The acceptable threshold and its reference for each of the fit indices are illustrated in Table 5. The obtained values of the fit indices approve that the measurement model is acceptable and the convergent validity, the discriminant validity, and the internal construct correlations are also acceptable. Therefore, the measurement model was retained. When doing CFA, it is necessary to establish convergent validity and discriminant validity as well as reliability (Hair *et al.* 2010). There are some measures to establish validity and reliability, which are composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), and average shared variance (ASV). The acceptable thresholds for these values are as reliability (CR)>0.7; convergent validity (AVE)>0.5; discriminant validity (MSV<AVE, ASV<AVE, and the square root of AVE should be greater than inter-construct correlations. The results are illustrated in Table 4.

5.1. Hypothesis testing

The fit of the structural model was examined by adding hypothesized relationships between the latent variables. The final structural model revealed overall acceptable good fit. The values of the fit indices are as: χ2=249.910; GFI= 0.940; AGFI=0.921; PGFI=0.712; RMR=0.069; CFI=960; RMSEA=0.043; PCLOSE=0.904; χ2/df=1.731. All the obtained values of the fit indices along with their thresholds are illustrated in table 5 with their references.

Table 5. Fit indices for the full structural model

Index	Value Obtained	Recommended values for good fit	Recommended values for very good fit	Sources
χ2	249.910	-	-	
RMSEA	0.043	<0.08	<0.05	Byrne (1998)
PCLOSE	0.904	-	>0.50	Byrne (2010), Joreskog & Sorbom (1996a)
RMR	0.069	≤0.09	<0.05	Byrne (2010)
GFI	0.940	-	>0.9	Byrne (2010), Joreskog & Sorbom, 1993)
AGFI	0.921	-	>0.9	Byrne (2010), Joreskog & Sorbom 1993)
PGFI	0.712	>0.50	<0.9	Byrne (2010), Mulaik *et al.* (1989, 105)
NFI	0.912	>0.8	>0.9	Byrne (1998), Zhang *et al.* (2002)
N-NFI or TLI	0.953	>0.8	>0.9	Byrne (1998), Zhang *et al.* (2002)
CFI	0.960	>0.8	>0.9	Byrne (1998), Zhang *et al.* (2002)
IFI	0.961	>0.8	>0.9	Byrne (1998), Zhang *et al.* (2002)
PNFI	0.768	-	>0.5	Byrne (1998) and Mulaik *et al.* (1989)
PCFI	0.809	-	>0.5	Byrne (1998) and Mulaik *et al.* (1989)
χ2/df	1.735	>1 and <5	>1 and <3	Bollen (1989), Carmines and McIver (1981), Hair *et al.* (1995), Joreskog (1969)

Source: Author compilation

This study meets the criteria of adequate sample size *i.e.,* n>200 (MacCallum *et al.* 1996). Since studies on retail pricing and consumers' buying behavior support the direct impact of price-endings on the consumers' buying behavior and a few studies also support the mediating role of consumers' perception between retail pricing and consumers' buying behavior. The overall results of the hypotheses testing are in Table 6.

Table 6. Path Analysis of Structural Model for 'Relationship Development Model for Consumer Buying Behavior'

Measurement Path	Hypotheses	Standard Regression Estimates	t-value (CR)	p-value	Assessments
CP ← OEP	H1a	0.179	3.554	***	Supported
CP ← EEP	H2a	0.309	4.898	***	Supported
CP ← LDE	H3	0.351	5.720	***	Supported
CP ← IE	H4	0.239	3.980	***	Supported
CBB ← OEP	H1b	0.141	2.596	0.009	Supported
CBB ← EEP	H2b	0.157	2.398	0.016	Supported
CBB ← CP	H5	0.192	3.152	0.002	Supported

Note:* significant Regression co-efficient (p<0.05)
Source: Author compilation

Now, the impact of price-endings *i.e.*, odd-ending pricing (OEP) and even-ending pricing (EEP) was examined on the consumers' behavior and also, mediating role of consumers' perception (CP) was examined between price-endings and consumer buying behavior using Baron and Kenny's (1986) three-step approach. The impact of left-digit-effects and image-effects were tested on the consumers' perception as well. Step 1 includes whether the explanatory variables (OEP), (EEP), (LDE) and (IE) are significant predictors of the mediator (CP). Step 2 includes whether the independent or explanatory variables (OEP) and (EEP) are significant predictors of criterion or dependent variable (CBB). And step 3 includes whether the mediator (CP) is a significant predictor of the dependent variable (CBB) while controlling the direct relationship between the independent variables (OEP) and (EEP) and the dependent variable (CBB).

As per step 1 of Baron and Kenny (1986), after removing the direct link of odd-ending pricing (OEP) and even-ending pricing (EEP) from consumers' buying behavior (CBB) and establishing the relationship of odd-ending pricing (OEP), even-ending pricing (EEP), left-digit-effects (LDE), and image-effects (IE) with the consumers' perception (CP). The fit indices for the model are as: χ2=286.548, CFI=0.948, RMSEA=0.049, and GFI=0.932. This advocate that the odd-ending pricing, even-ending pricing, left-digit effects, and image-effects have a significant impact on the consumers' perception, which supports the relationship of OEP, EEP, LDE, and IE with CP respectively. In other words, H1b is significantly acceptable with β=0.179, t-value=3.548, and p-value=0.001; H2b is significantly acceptable with β=0.299, t-value=4.827 and p-value=0.001; H3 is significantly acceptable with β=0.355, t-value=5.770 and p-value=0.001 and H4 is significantly acceptable with β=0.239, t-value=3.965 and p-

value=0.001. That is all the hypotheses H1b, H2b, H3 and H4 individually have a significant impact on consumers' price perception (CP), see Table 7.

Table 7. Test results: Path coefficients.

Measurement Path	Hypotheses	Standard Regression Estimates	t-value (CR)	p-value	Assessments
CP◀—OEP	H1b	0.179	3.548	***	Supported
CP◀—EEP	H2b	0.299	4.827	***	Supported
CP◀—LDE	H3	0.355	5.770	***	Supported
CP◀—IE	H4	0.239	3.965	***	Supported

Source: Author compilation

Hence, our study has produced supports for our hypotheses and provided additional results. The results of our study are consistent with the previous studies along with some additional results. According to (Wedel and Leeflang 1998), the consumers perceive odd-ending priced products as of low quality and non-odd-ending priced products as of high quality which contradicts (Mulky *et al.* 2014) that the Indian consumers perceive both the price-endings (*i.e*., odd-ending and even-ending) as an indicator of high quality. The reason for this may be respondents, who were not from all over India. However, in our research, the respondents are from all over India. The products labeling prices ending with just below round numbers are perceived as available on sale. The consumers perceive odd-ending prices as discounted prices which is consistent with (Schindler 2006) study. The consumers read prices from left to right and because of this, they ignore the rightmost digit (Baumgartner and Steiner 2007). The prices ending with the digit '9' communicate price-image impression and the consumers perceive such prices as the lowest and the discounted prices. This study also provides information that 9-ending prices communicate a quality-image information *i.e*., the products priced with 9-ending prices are of low quality and on special offer (Schindler and Kibarian 2001). The prices ending in '9' may sometimes but not always are perceived as low prices (Thomas and Morwitz 2005).

As per the second step of Baron and Kenny (1986), after removing the direct link of the odd-ending pricing (OEP), even-ending pricing (EEP), left-digit-effects (LDE), and image-effects (IE) from consumer perception (CP), and keeping the direct relationships between odd-ending pricing (OEP), even-ending pricing (EEP) and the consumers' buying behavior (CBB) respectively, the obtained fit indices of the model are acceptable: $\chi^2=359.162$, CFI=0.921, RMSEA=0.059, and GFI=0.916. This advocates that odd-ending pricing and even-ending pricing have a direct impact on the consumers buying behavior. Further, the results significantly support the relationship between odd-ending pricing and consumers' buying behavior and also the relationship between the even-ending pricing and the consumers' buying behavior. In other words, the proposed study accepts H1a with $\beta=0.170$, t-value=3.122 and p-value=0.002 and H2a with $\beta= 0.185$, t-value=3.162 and p-value=0.002**, see Table 8.

Table 8. Path Analysis of Structural Model for 'Relationship Development Model for Consumer Buying Behavior' for mediation effect

Measurement Path	Hypotheses	Direct effect without a mediator			The direct effect of a mediator			Mediation Results
		Standard estimates	t-values (CR)	p-values	Standard estimates	t-values (CR)	p-values	
CBB◀—OEP	H1a	0.170	3.122	0.002	0.162	3.032	0.002	Partial
CBB◀—EEP	H2a	0.185	3.163	0.002	0.344	5.074	***	Partial
CBB◀—CP	H5	-	-	-	0.281	4.879	***	Supported

Source: Author compilation

Hence, the findings of this study are consistent with the previous studies of (Anderson and Simester 2003), the 9-ending prices increase demand but it is contextual *i.e.,* the 9-ending pricing works for new items, the consumers have not seen before. However, this is exactly not the same for the Indian consumers *i.e*., the Indian consumers purchase the items vigorously whether they are seeing the items the first time or if they have seen the items earlier. The consumers prefer to purchase the products and prefer to avail the services priced with the odd-endings, especially 9-ending (Schindler and Kibarian 1996). The reframed (*i.e*., time-based reframing of prices, the marketer describes prices of products for a short period of time, *e.g*., 'a particular product is for only 10 for today', for general days it costs 20.) prices are better for even-ending priced products whereas aggregate (or normal) prices are better for the odd-ending priced products (Bambauer-Sachse and Grewal 2011). The odd-ending prices create an illusion of much cheaper products, increases the customers' purchase. However, the customers prefer to purchase the even-ending priced products to distinguish expensive and high-quality products from cheap and low-quality products (Holdershaw *et al.* 1997). The customers are likely to pay round prices or even-ending prices because of the subjective preference (*i.e*., easy in calculation and indication of high quality) (Lynn *et al.* 2013). The

price and quality cognizant customers purchase the products priced with even-ending and the others purchase the products priced with odd-endings (Mollahoseyni *et al.* 2012). When the consumers have a belief that there is some gain in shopping then they prefer the odd-ending priced products, because of loss if they purchase even-ending priced products (Choi *et al.* 2012). The practice of odd-ending prices can bring sales losses for premium brands/products but it can augment sales if practiced for small brands (*e.g.*, new items and low price products, belonging to the weaker category of the products) (Macé 2012). The sales of products are augmented at odd prices while the sales of the products are reduced at the even prices (Guéguen and Jacob 2005). The odd-ending prices influence consumers to purchase the products indirectly because of the past fault (Choi *et al.* 2011). The consumers prefer hedonic or high-quality products over utilitarian when the prices are in odd-endings (Choi *et al.* 2014). The consumers ignore the rightmost digit in a price because of limited processing capacity and thus they purchase odd-ending priced products vigorously (Hackl *et al.* 2014). The odd-ending prices influence the customers to purchase fast moving consumer products and the even-ending pricing influences the consumers to purchase expensive consumer products (Asamoah and Chovancova 2011).

And now, Step 3 of Baron and Kenny (1986) measures the mediation effect of consumer perception (CP) between the relationships of odd-ending pricing (OEP) and even-ending pricing (EEP)) with the consumer buying behavior (CBB) respectively. The fit indices for the model are as: χ2=316.548, CFI=0.937, RMSEA=0.053, and GFI=0.925. The obtained results are shown in Table 8. Thus, from Table 8, it is seen that the proposed hypothesis H5 is acceptable with β=0.281, t-value=4.879, p-value=0.001 *i.e.*, consumer perception (CP) partially mediates the relationships of odd-ending pricing and even-ending pricing with the consumers' buying behavior (CBB). Hence, the findings of this study are consistent with the previous studies of (Gaston-Breton 2011, Ahmetoglu *et al.* 2014, Choi *et al.* 2012).

Discussion and Conclusion

The retailers practice odd-even pricing to influence the consumers' price perception and buying behavior, is crucial in this competitive business world. The consumers' price perception and the psychology behind it have a greater influence on the consumers' buying behavior. The review of previous research studies, books, journals, articles, newspapers, and working papers on price endings and consumers' buying behavior concludes that price-endings *i.e.,* odd-ending prices are pervasive in the retail sector and do lay an impact on consumers' price perception and buying behavior, which is contextual. That is odd-ending pricing generally works on new products. In other words, if the consumers have not seen the product before which is presented with odd-price, then purchasing probability of that product by the consumer's increases.

However, in India, price endings are not context dependent *i.e.,* the Indian consumers purchase the products or avail the services priced with odd-endings whether the products or services are new or not (*i.e.*, whether they have seen the products or experienced the services previously or not). The consumers read prices of products and services from left to right, and because of this, they perceive that the products priced with odd-ending pricing are on sale or special offer. The consumers perceive an odd-ending price as a discount price because they round down an odd price near to the leftmost digit (*e.g.*, a price of 999 is round down to the leftmost digit 9 and therefore 999 is perceived as 900 instead of perceiving it as 1000). This phenomenon creates an illusion of low price.

Therefore, consumers perceive 999 as a discounted price. This happens because the consumers have very limited capacity to process price information. This price perception of consumers makes them think that this price is associated with a low-quality product or service. A price ending with '0' is perceived as associated with a good quality product or service. The customers who are brand conscious prefer to purchase even-ending priced products or services. This study tried to unveil the mystery why the customers buy products or services priced using odd prices and even prices, which could have implications for retail-organizations, pricing managers, researchers and our understanding of how the customers make inferences from the given price information.

The present study made the concept of psychological pricing understandable which can help the organizations increase their sales and profitability and at the same time, the consumers can know why do they purchase the products or avail the services priced using psychological pricing. This study empirically investigated retail price endings impact on the consumers' perception and buying behavior and found that the consumers' price perception partially mediates the consumers' buying behavior of odd-even ending priced products or services. Also, price endings directly influence consumers' shopping behavior.

There is a dearth of study on price-endings and consumers' buying behavior in India. The advertisements of odd-pricing are pervasive in newspapers, home drop advertisements and at the point of purchase and so a further study may be conducted on the impact of advertisements of price-endings on the consumers' price perception and buying behavior. Further studies may use demographic variables as moderators as well.

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References

[1] Asamoah, E.S., and Chovancová, M. 2011. The influence of price endings on consumer behavior: An application of the psychology of perception. *Acta Universitatis Agriculturae ET Silviculturae Mendelianae Brunensis*, 59(7): 29-38. DOI: https://doi.org/10.11118/actaun201159070029

[2] Ahmetoglu, G., Furnham, A., and Fagan, P. 2014. Pricing practices: A critical review of their effects on consumers' perceptions and behavior. *Journal of Retailing and Consumer Services*, 21(5): 696-707. DOI: https://doi.org/10.1016/j.jretconser.2014.04.013

[3] Akdeniz, B., Calantone, R.J., and Voorhees, C.M. 2013. The effectiveness of marketing cues on consumer perceptions of quality: The moderating roles of brand reputation and third-party information. *Psychology & Marketing*, 30 (1): 76-89. DOI: 10.1002/mar.20590

[4] Allaway, A.W., Gooner, R.M., Berkowitz, D., Davis, L. 2006. Deriving and exploring behavior segments within a retail loyalty card program. *European Journal of Marketing*, *40*(11/12): 1317-1339. DOI: https://doi.org/10.1108/03090560610702830

[5] Anderson, E.T., Simester, D.I. 2003. Effects of $9 price endings on retail sales: Evidence from field experiments. *Quantitative Marketing and Economics*, 1 (1): 93-110. DOI: http://dx.doi.org/10.1023/A:1023581927405

[6] Aalto-Setälä, V., and Schindler, R.M. 2006. *The Importance of Attractive Prices in Pricing Dynamics*. Bank of Finland Research Discussion Paper, 30/2006, 1-32 pp., DOI: http://dx.doi.org/10.2139/ssrn.1018324

[7] Allen, M.T., and Dare, W.H. 2004. The effects of charm listing prices on house transaction prices. *Real Estate Economics*, 32 (4): 695-713. DOI: 10.1111/j.1080-8620.2004.00108.x

[8] Alpert, M.I. 1971. *Pricing Decisions*, Glenview, IL: Scott, Foresman, and Company. 145 pp.

[9] Byrne, B. M. 2009. *Structural equation modeling with AMOS, basic concepts, applications, and programming (2nd Edition).* New York, NY: Routledge. ISBN-10: 0805863737, 416 pp

[10] Bartsch, R.A., and Paton, V.I. 1999. The Presence of Odd Pricing in the Texas State Lottery1. *Journal of Applied Social Psychology*, *29* (11): 2394-2409. DOI: 10.1111/j.1559-1816.1999.tb00117.x

[11] Basu, K. 2006. Consumer cognition and pricing in the nines in oligopolistic markets. *Journal of Economics & Management Strategy*, 15 (1): 125-141. DOI:10.1111/j.1530-9134.2006.00094.x

[12] Bentler, P.M. and Bonett, D.G. 1980. Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3): 588-606. DOI: http://dx.doi.org/10.1037/0033-2909.88.3.588

[13] Bollen, K.A. 1989. *Structural Equations with Latent Variables*, Wiley New York. ISBN: 978-0-471-01171-2, 528 pp.

[14] Bush, A.J., and Hair Jr, J.F. 1985. An assessment of the mall intercept as a data collection method. *Journal of Marketing Research*, 22(2): 158-167. DOI: 10.2307/3151361

[15] Blattberg, R., and Wisniewski, K. 1987. *How Retail Price Promotions Work: Empirical Results,* Documento de Trabajo 42. Universidad de Chicago.

[16] Bader, L., and Weinland, J.D. 1932. Do odd prices earn money? *Journal of Retailing*, 8(1): 102-104.

[17] Boyd, H.W. and Massy, W.F. 1972. *Marketing Management*. USA: Harcourt Brace Jovanovich. ISBN: 0155551124 9780155551121, 618 pp.

[18] Byrne, B.M. 1998. *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS: Basic Concepts, Applications, and Programming,* Psychology Press, ISBN: 0805829245, 9780805829242, 412 pp.

[19] Baron, R.M., and Kenny, D.A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6): 1173.

[20] Bowen, G.A. 2009. Document analysis as a qualitative research method. *Qualitative Research Journal*, *9*(2): 27-40. DOI: https://doi.org/10.3316/QRJ0902027

[21] Boyes, W.J., Lynch, A.K., and Mounts, W. 2007. Why Odd Pricing? *Journal of Applied Social Psychology*, 37 (5): 1130-1140. DOI: 10.1111/j.1559-1816.2007.00203.x

[22] Bagozzi, R.P., and Phillips, L.W. 1982. Representing and testing organizational theories: A holistic construal. *Administrative Science Quarterly*, 27(3): 459-489. DOI: 10.2307/2392322

[23] Basu, K. 1997. Why are so many goods priced to end at nine? And why this practice hurts the producers. *Economics Letters*, *54* (1): 41-44. DOI: https://doi.org/10.1016/S0165-1765(97)00009-8

[24] Brennan, M. 1995. Constructing demand curves from purchase probability data: An application of the Juster Scale. *Marketing Bulletin*, 6: 51-58, Research Note 2.

[25] Bennett, P., Brennan, M., and Kearns, Z. 2003. Psychological aspects of price: An empirical test of order and range effects. *Marketing Bulletin*, 14 (1): 1-8.

[26] Baumgartner, B., and Steiner, W.J. 2007. Are consumers heterogeneous in their preferences for odd and even prices? Findings from a choice-based conjoint study: *International Journal of Research in Marketing*, 24 (4): 312-323. DOI: https://doi.org/10.1016/j.ijresmar.2007.05.003

[27] Bambauer-Sachse, S., and Grewal, D. 2011. Temporal Reframing of Prices: When Is It Beneficial? *Journal of Retailing*, 87 (2): 156-165. DOI: https://doi.org/10.1016/j.jretai.2011.02.002

[28] Bizer, G.Y., and Schindler, R.M. 2005. Direct evidence of an ending-digit drop-off in price information processing. *Psychology and Marketing*, 22 (10): 771-783. DOI: 10.1002/mar.20084

[29] Brenner, G.A., and Brenner, R. 1982. Memory and markets, or why are you paying $2.99 for a widget? *Journal of Business*, 55(1): 147-158.

[30] Coughlan, A.T., and Mantrala, M.K. 1994. Dynamic competitive retail pricing behavior with uncertainty and learning. *Managerial and Decision Economics*, 15 (1): 3-20. DOI: 10.1002/mde.4090150103

[31] Collins, M., and Parsa, H.G. 2006. Pricing strategies to maximize revenues in the lodging industry. *International Journal of Hospitality Management*, 25 (1): 91-107. DOI: https://doi.org/10.1016/j.ijhm.2004.12.009

[32] Choi, J., Singh, S., and Rangan, P. 2011. Odd-Ending Price: Justification for the Hedonic Purchase. in NA - *Advances in Consumer Research* 39: 624-625, eds. Rohini Ahluwalia, Tanya L. Chartrand, and Rebecca K. Ratner, Duluth, MN: Association for Consumer Research

[33] Carmines, E.G., and McIver, J.P. 1981. *Analyzing models with unobserved variables*, in Bohrnstedt, G.W., and Borgatta, E.F. (Eds.) Social measurement: Current issues, Sage, Beverly Hills, CA., 65-115 pp.

[34] Choi, J., Lee, K., and Ji, Y.Y. 2012. What type of framing message is more appropriate for nine-ending pricing? *Marketing Letters*, 23 (3): 603-614. DOI: http://dx.doi.org/10.1007/s11002-012-9164-7

[35] Chen, H., and Sadeque, S. 2007. *An Empirical Investigation of Consumer Price Perception and Reputation Dimensions' Effects on Attitude toward Private Label Brands*, 1-59 pp. Available at: https://www.diva-portal.org/smash/get/diva2:140487/FULLTEXT01.pdf

[36] Carver, J.R., and Padgett, D.T. 2012. Product Category Pricing and Future Price Attractiveness: 99-Ending Pricing in a Memory-Based Context. *Journal of Retailing*, *88* (4): 497-511. DOI: https://doi.org/10.1016/j.jretai.2012.05.001

[37] Choi, J., Li, Y.J., Rangan, P., Chatterjee, P., and Singh, S.N. 2014. The odd-ending price justification effect: the influence of price-endings on hedonic and utilitarian consumption. *Journal of the Academy of Marketing Science*, 42 (5): 545-557. DOI: http://dx.doi.org/10.1007/s11747-014-0369-6

[38] Dalrymple, D.J., Thompson, D. L. 1969. *Retailing: An economic view*. No. HF5429 D24. Free Press, 389 pp.

[39] Dalrymple, D.J., and Haines Jr, G.H. 1970. A study of the predictive ability of market period demand-supply relations for a firm selling fashion products. *Applied Economics*, 1(4): 277-285. DOI: https://doi.org/10.1080/00036847000000003

[40] Dodds, W.B., Monroe, K.B., and Grewal, D. 1991. Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, 28(3): 307-319. DOI: 10.2307/3172866

[41] Dunne, P.M., and Lusch, R.F. and Carver, J.M. 2015. *Retailing*, 8th ed., National Retailing Federation, USA, Cengage Learning India Private Limited, Delhi, India, ISBN: 9781285091136, 1285091132, 720 pp.

[42] Freling, T., Vincent, L., Schindler, R., Hardesty, D.M., Rowe, J. 2010. A Meta-Analytic Review of Just-Below Pricing Effects. *Advances in Consumer Research*, 37: 618-620.

[43] Fortin, D., Cleland, S., Jenkins, A. 2008. *Effects of advertised pricing on brand image for an online retailer.* Business and Law: Conference Contributions 222. Available at: https://ir.canterbury.ac.nz/bitstream/handle/10092/3817/12613198_a_proceedings2008.pdf?sequence=1&isAllowed=y

[44] Gendall, P., Holdershaw, J., and Garland, R. 1997. The effect of odd pricing on demand. *European Journal of Marketing*, 31 (11/12): 799-813. DOI: https://doi.org/10.1108/03090569710190541

[45] Geçti, F. 2014. Examining price perception and the relationships among its dimensions via structural equation modeling: A research on Turkish consumers. *British Journal of Marketing Studies*, 2 (1): 1-11.

[46] Gedenk, K., and Sattler, H. 1999. The impact of price thresholds on profit contribution - should retailers set 9-ending prices. *Journal of Retailing*, 75 (1): 33-57. DOI: https://doi.org/10.1016/S0022-4359(99)80003-7.

[47] Guéguen, N., and Legoherel, P. 2004. Numerical encoding and odd-ending prices: The effect of a contrast in discount perception. *European Journal of Marketing*, *38* (1/2): 194-208. DOI: https://doi.org/10.1108/03090560410511186

[48] Gaston-Breton, C., and Desmet, P. 1999. *Perceived Effects of Psychological Price Thresholds according to the Monetary Unit.* In Second Annual Conference of Pricing Research, Fordham University, New York.

[49] Gaston-Breton, C. 2011. *Consumer Preferences for 99-ending prices: the mediating role of price consciousness.* Working Paper 5, Business Economic Series 03, Departamento de Economía de la Empresa Universidad Carlos III de Madrid, Available at: https://e-archivo.uc3m.es/bitstream/handle/10016/10707/wb110503.pdf?sequence=1

[50] Gabor, A. 1977. *Pricing: Principles and Practices*. London: Heinemann Educational Books Ltd. ISBN-10: 0435843656, 288 pp.

[51] Georgoff, D.M. 1972. *Odd-Even retail price endings: Their effects on value determination, product perception, and buying propensities.* Bureau of Business and Economic Research, Division of Research, Graduate School of Business Administration, Michigan State University.

[52] Guéguen, N., Jacob, C., Legoherel, P., & NGobo, P. 2009. Nine-ending prices and consumer's behavior: A field study in a restaurant. *International Journal of Hospitality Management*, 28 (1): 170-172. DOI: https://doi.org/10.1016/j.ijhm.2008.03.009

[53] Grewal, D., Ailawadi, K.L., Gauri, D., Hall, K., Kopalle, P., and Robertson, J.R. 2011. Innovations in retail pricing and promotions. *Journal of Retailing*, 87S (1): S43-S52. DOI: https://doi.org/10.1016/j.jretai.2011.04.008

[54] Garbarino, E. and Slonim, R. 1995. E*ffects of Price History and price change awareness on Sales and Perceptions.* In Behavioral Perspectives on Pricing Conference, Marketing Science Institute, Cambridge Massachusetts, 11-12 pp.

[55] Gendall, P. 1998. Estimating the effect of odd pricing. *Journal of Product & Brand Management*, 7 (5): 421-432. DOI: https://doi.org/10.1108/10610429810237754

[56] Guéguen, N., and Jacob, C. 2005. Price and Consumer Behavior: An Evaluation in a New Context. *Journal of Applied Sciences*, 5(2): 383-384. DOI 10.3923/jas.2005.383.384

[57] Guéguen, N., Jacob, C. (2005). Odd versus even prices and consumers' behavior. *Psychological Reports,* 96 (3), pp.1121-1122. DOI: https://doi.org/10.2466/pr0.96.3c.1121-1122

[58] Ginzberg, E. 1936. Customary Prices, *American Economic Review*, 26: 296.

[59] Hoffman, K.D., Turley, L.W., and Kelley, S.W. 2002. Pricing retail services. *Journal of Business Research*, *55* (12): 1015-1023. DOI: https://doi.org/10.1016/S0148-2963(00)00227-7

[60] Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C. 1995. *Multivariate Data Analysis*, 4rd Edition, Prentice Hall, ISBN: 0139133100, 9780139133107, 757 pp.

[61] Hinrichs, J.V., Berie, J.L., and Molaan, K., Moselle, M.K. 1982. Place Information in Multidigit Number Comparision*, Memory and Cognition*, 10(5): 487-495. DOI: http://dx.doi.org/10.3758/BF03197652

[62] Hair, J.F., Jr., Black, W.C., Bobin, B.J., Anderson, R.E., and Tatham, R.I. 2010. *SEM: An introduction. Multivariate data analysis: A global perspective,* 629-686 pp.

[63] Hower, R.M. 1943. *History of Macy's of New York*: 1858-1919. Cambridge, MA: Harvard University Press, 500 pp.

[64] Hackl, F., Kummer, M.E., and Winter-Ember, R. 2014. 99 cent: Price Points in E-Commerce. *Information Economics and Policy,* 26: 12-27

[65] Harper, L.H. 1966. Optimal numberings and isoperimetric problems on graphs. *Journal of Combinatorial Theory*, 1(3): 385-393. DOI: https://doi.org/10.1016/S0021-9800(66)80059-5

[66] Hogl, S. 1988. *The effects of simulated price changes on consumers in a retail environment-price thresholds and price policy*. In Lisbon: Esomar Congress Proceedings.

[67] Holloway, R.J. 1973. Odd-Even Price Endings, *Journal of Retailing*, 49: 77-78.

[68] Holdershaw, J., Gendall, P., and Garland, R. 1997. The widespread use of odd pricing in the retail sector. *Marketing Bulletin*, 8 (1): 53-58.

[69] Herrmann, R., and Moeser, A. 2005. *Psychological Prices and Price Rigidity in Grocery Retailing: Analysis of German Scanner Data.* In 2005 annual meeting, July 24-27, Providence, RI (No. 19471). American Agricultural Economics Association (New Name 2008: Agricultural and Applied Economics Association).

[70] Holdershaw, J.1995. *The validity of odd pricing,* Doctoral dissertation, Thesis, Doctor-Department of Marketing, Massey University.

[71] Harris, C., and Bray, J. 2007. Price endings and consumer segmentation. *Journal of Product & Brand Management*, 16 (3): 200-205. DOI: https://doi.org/10.1108/10610420710751573

[72] Herrmann, R., and Moeser, A. 2006. Do psychological prices contribute to price rigidity? Evidence from German scanner data on food brands. *Agribusiness,* 22 (1): 51-67. DOI: 10.1002/agr.20075

[73] Joreslog, K.G., and Sorbom, D. 1998. *LISREL 8: Structural equation modeling with the SIMPLIS command language.* Chicago: Scientific Software International. ISBN-10: 0894980335, 226 pp.

[74] Janiszewski, C., Lichtenstein, D.R. 1999. A range theory account of price perception. *Journal of Consumer Research*, *25* (4): 353-368. DOI: https://doi.org/10.1086/209544

[75] Joreskog, K.G. 1969. A general approach to confirmatory maximum likelihood factor analyses, *Psychometrika,* 34 (2): 183-202.

[76] Joreslog, K.G., and Sorbom, D. 1996. *LISREL 8: User's reference guide*. Chicago: Scientific Software International. ISBN: 0894980408, 9780894980404, 378 pp.

[77] Jakstiene, S., Susniene, D., and Narbutas, V. 2008. The psychological impact of advertising on the consumer behavior. *Communications of the IBIMA* 3: 50-55.

[78] Kleinsasser, S., and Wagner, U. 2011. Price endings and tourism consumers' price perceptions. *Journal of Retailing and Consumer Services*, 18 (1): 58-63. DOI: https://doi.org/10.1016/j.jretconser.2010.09.011

[79] Kreul, L.M. 1982. Magic numbers: psychological aspects of menu pricing. *Cornell Hotel and Restaurant Administration Quarterly*, *23* (2): 70-75. DOI: https://doi.org/10.1177/001088048202300223

[80] Kurtuluş, K., and Okumus, A. 2010. Consumers' price perceptions as segmentation criteria: An emerging market case. *Journal of the School of Business Administration 39* (1): 21-34.

[81] Kyriazopoulos, P., and Rounti, I.S. 2007. Can price perceptions influence customer satisfaction? *Revista de Administração FACES Journal*, *6* (1): 11-22.

[82] Kotler, P., and Keller, K.L. 2005. *Marketing Management*, 12th Edition, Prentice Hall, ISBN-10: 8120327993, 816 pp.

[83] Kotler, P., Keller, K.L., Koshy, A., Jha, M. 2014. *Marketing Management.* 14th Edition, A South Indian Perspective, Pearson, Delhi, and Chennai, ISBN-10: 0132102927, 816 pp.

[84] Kumar, S., and Pandey, M. 2017. The impact of psychological pricing strategy on consumers' buying behavior: a qualitative study. *International Journal of Business and Systems Research*, 11(1/2): 101-117. DOI: https://doi.org/10.1504/IJBSR.2017.080843

[85] Lichtenstein, D.R., Ridgway, N.M., and Netemeyer, R.G. 1993. Price perceptions and consumer shopping behavior: a field study. *Journal of Marketing Research*, 30(2): 234-245. DOI: 10.2307/3172830

[86] Lewis, M.S. 2015. Odd prices at retail gasoline stations: focal point pricing and tacit collusion. *Journal of Economics and Management Strategy*, 24(3): 664-685. DOI: 10.1111/jems.12103

[87] Lynn, M., Flynn, S.M., and Helion, C. 2013. Do consumers prefer round prices? Evidence from pay-what-you-want decisions and self-pumped gasoline purchases. *Journal of Economic Psychology*, 36: 96-102. DOI: https://doi.org/10.1016/j.joep.2013.01.010

[88] Lindsay, P.H., and Norman, D.A. 2013. *Human information processing: An introduction to psychology.* Academic Press, ISBN: 1483258238, 9781483258232, 802 pp.

[89] Lowe, B., and Alpert, F. 2010. Pricing strategy and the formation and evolution of reference price perceptions in new product categories. *Psychology & Marketing*, 27 (9): 846-873. DOI: 10.1002/mar.20361

[90] Lambert, Z.V. 1975. Perceived prices as related to odd and even price endings. *Journal of Retailing*, 51(3): 13.

[91] Murthi, B.P.S., and Rao, R.C. 2012. Price awareness and consumers' use of deals in brand choice. *Journal of Retailing*, 88 (1): 34-46. DOI: https://doi.org/10.1016/j.jretai.2011.07.001

[92] Mulaik, S.A., James, L.R., Van Alstine, J., Bennett, N., Lind, S., and Stilwell, C.D. 1989. Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, 105(3): 430-445.

[93] MacCallum, R.C., Browne, M.W., and Sugawara, H.M. 1996. Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2): 130-149.

[94] Mollahoseyni, A., Esfahani, A.N., Jafarzadeh, M. 2012. Studying impacts of psychological factors on consumer's buying behavior at Iranian chair stores. *Interdisciplinary Journal of Contemporary Research in Business,* 3 (10): 257-263**.**

[95] Mulaik, S.A., and Millsap, R.E. 2000. Doing the four-step right. *Structural Equation Modeling*, 7(1): 36-73.

[96] Martínez-Ruiz, M.P., Mollá-Descals, A., Gómez-Borja, M.A., and Rojo-Álvarez, J.L. 2006. Using daily store-level data to understand price promotion effects in a semiparametric regression model. *Journal of Retailing and Consumer Services*, 13 (3): 193-204. DOI: https://doi.org/10.1016/j.jretconser.2005.08.017

[97] Macé, S. 2012. The impact and determinants of nine-ending pricing in grocery retailing. *Journal of Retailing*, 88 (1): 115-130. DOI: https://doi.org/10.1016/j.jretai.2011.07.002

[98]] Monroe, K.B. 1990. *Pricing: Making Profitable Decisions*, McGraw Hill. *New York*. ISBN: 0070427828, 9780070427822, 502 pp.

[99] Meng, J., and Altobello, N.S. 2009. Cross-cultural equivalence of price perceptions across American, Chinese, and Japanese consumers. *Journal of Product & Brand Management*, 18 (7): 506-516. DOI: https://doi.org/10.1108/10610420910998235

[100] Mulky, A., Prahalad, M., and Venkateswaran, K.N. 2014. *Price Endings and Consumer Perception.* Available at: http://tejas.iimb.ac.in/articles/08.php (accessed 20 August 2017).

[101] Naipaul, S., and Parsa, H.G. 2001. Menu price endings that communicate value and quality. *Cornell Hotel and Restaurant Administration Quarterly*, 42(1): 26-37. DOI: https://doi.org/10.1177/0010880401421003

[102] Ngobo, P.V., Legohérel, P., and Guéguen, N. 2010. A cross-category investigation into the effects of nine-ending pricing on brand choice. *Journal of Retailing and Consumer Services*, 17 (5): 374-385. DOI: https://doi.org/10.1016/j.jretconser.2010.03.018

[103] Nagle T.T., and Holden, R.K. 1995. *The Strategy and Tactics of Pricing: A Guide to Profitable Decision Making,* (2nd Ed.). Englewood Cliffs, NJ, Prentice Hall, ISBN: 0136693768, 9780136693765, 409 pp.

[104] Olavarrieta, S., Hidalgo, P., Manzur, E., and Farías, P. 2012. Determinants of in-store price knowledge for packaged products: An empirical study in a Chilean hypermarket. *Journal of Business Research*, 65 (12): 1759-1766. DOI: https://doi.org/10.1016/j.jbusres.2011.10.035

[105] Peine, K., Heitmann, M., and Herrmann, A. 2009. Getting a feel for price effect: a conceptual framework and empirical investigation of consumers' emotional responses to price information. *Psychology & Marketing*, 26(1): 39-66. DOI: 10.1002/mar.20261

[106] Pechpeyrou, P. 2013. Virtual Bundling with Quantity Discounts: When Low Purchase Price Does Not Lead to Smart-Shopper Feelings. *Psychology & Marketing*, 30 (8): 707-723. DOI: 10.1002/mar.20639

[107] Poltrock, S.E., and Schwartz, D.R. 1984. Comparative judgments of multidigit numbers. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 10(1): 32-45. DOI: http://dx.doi.org/10.1037/0278-7393.10.1.32

[108] Pride, W.M., and Ferrell, O.C. 1997. *Marketing Concept and Strategies,* 10th Edition, New Your, Houghton Mifflin Co. ISBN-10: 0395836840, 768 pp.

[109] Pasricha, S. 2007. *Consumer Psychology.* Deep & Deep Publications Pvt. Ltd. F-159, Rajouri Garden, New Delhi-110027, 13 pp.

[110] Palazon, M., and Delgado-Ballester, E. 2009. The effectiveness of price discounts and premium promotions. *Psychology and Marketing*, 26(12): 1108-1129. DOI: https://doi.org/10.1108/10610420910972837

[111] Quigley, Jr, C.J., and Notarantonio, E.M. 2015. *An exploratory investigation of perceptions of odd and even pricing*. In Proceedings of the 1992 Academy of Marketing Science (AMS) Annual Conference, 306-309 pp. Springer International Publishing.

[112] Ruffle, B.J., and Shtudiner, Z.E. 2006. 99: Are retailers best responding to rational consumers? Experimental evidence. *Managerial and Decision Economics*, 27 (6): 459-475. DOI: 10.1002/mde.1282

[113] Rogers, L. 1990. *Pricing for Profit*. USA: Basil Blackwell. ISBN: 0631169946 9780631169949, 328 pp.

[114] Rao, A.R., and Monroe, K.B. 1989. The effect of price, brand name, and store name on buyers' perceptions of product quality: An integrative review. *Journal of Marketing Research*, 26(3): 351-357. DOI: 10.2307/3172907

[115] Rudolph, H.J. 1954. Pricing for today's market. *Printers' Ink*, 247: .22-24.

[116] Sturdivant, F.D. 1970. *The managerial analysis in marketing*, USA: Scott, Foresman, and Company, ISBN-10: 0673059383, 756 pp.

[117] Stiving, M., and Winer, R.S. 1997. An empirical analysis of price endings with scanner data. *Journal of Consumer Research*, 24(1): 57-67. DOI: https://doi.org/10.1086/209493

[118] Simon, H. 1989. *Price Management.* Amsterdam, the Netherlands: Elsevier. ISBN: 0444873279 9780444873279, 319 pp.

[119] Schindler, R.M. and Wiman, A.R. 1989. Effects of odd pricing on price recall. *Journal of Business Research* 19: 165-177. DOI: https://doi.org/10.1016/0148-2963(89)90017-9.

[120] Simonson, I. 1993. Get closer to your customers by understanding how they make. *California Management Review*, 35 (4): 68-84. DOI: https://doi.org/10.2307/41166755

[121] Smith, G.E., and Nagle, T.T. 1995. Frames of reference and buyers' perception of price and value, *California Management Review*, 38 (1): 98-116. DOI: https://doi.org/10.2307/41165823

[122] Sirvanci, M.B. 2011. An empirical study of price thresholds and price sensitivity. *Journal of Applied Business Research*, 9 (2): 43-49.

[123] Schindler, R.M., and Kirby, P.N. 1997. Patterns of rightmost digits used in advertised prices: implications for nine-ending effects. *Journal of Consumer Research*, 24 (2): 192-201. DOI: https://doi.org/10.1086/209504

[124] Schindler, R.M., and Kibarian, T.M. 2001. Image communicated by the use of 99 endings in advertised prices. *Journal of Advertising*, 30 (4): 95-99. DOI: https://doi.org/10.1080/00913367.2001.10673654.

[125] Schindler, R.M., and Kibarian, T.M. 1993. Testing for perceptual underestimation of 9-ending prices. *Advances in Consumer Research*, 20 (1): 580-585.

[126] Schindler, R.M., and Kirby, P.N. 1997. Patterns of Rightmost Digits Used in Advertised Retail Prices: Implications for Nine-Ending Effect, *Journal of Consumer Research*, 24 (2): 192-201

[127] Schindler, R.M. 2001. The relative price level of 99-ending prices: Image versus reality. *Marketing Letters*, 12 (3): 239-247. DOI http://dx.doi.org/10.1023/A:1011116827790

[128] Suri, R., Anderson, R.E., and Kotlov, V. 2004. The use of 9-ending prices: contrasting the USA with Poland. *European Journal of Marketing*, 38 (1/2): 56-72. DOI: https://doi.org/10.1108/03090560410511122

[129] Schindler, R.M. 2006. The 99 price ending as a signal of a low-price appeal. *Journal of Retailing*, 82 (1): 71-77. DOI: https://doi.org/10.1016/j.jretai.2005.11.001

[130] Schindler, R.M., and Kibarian, T.M. 1996. Increased consumer sales response through the use of 99-ending prices. *Journal of Retailing*, 72(2): 187-199. DOI: https://doi.org/10.1016/S0022-4359(96)90013-5

[131] Stiving, M. 2000. Price-endings when prices signal quality. *Management Science*, 46 (12): 1617-1629.

[132] Schindler, R.M. 1991. Symbolic meanings of a price ending. *Advances in Consumer Research,* 18(1): 794-801.

[133] Stiving, M.A. 1997. *An economic theory of price endings,* 0338- Business Administration Marketing, Doctoral dissertation, University of California, Berkeley

[134] Schindler, R.M. 1984. Consumer recognition of increases in odd and even prices. *Advances in Consumer Research*, 11(1): 459-62.

[135] Thomas, M., and Morwitz, V. 2005. Penny wise and pound foolish: the left-digit effect in price cognition. *Journal of Consumer Research*, 32 (1): 54-64. DOI: https://doi.org/10.1086/429600

[136] Thomas, M., and Morwitz, V. 2009. *Heuristics in Numerical Cognition: Implications for Pricing*. Handbook of Pricing Research in Marketing, 132-149 pp.

[137] Twedt, D.W. 1965. Does the" 9 Fixation" in retail pricing really promote sales? *Journal of Marketing (pre-1986)*, 29 (000004): 54-55.

[138] Velthuis, O. 2003. Symbolic meanings of prices: Constructing the value of contemporary art in Amsterdam and New York galleries. *Theory and Society*, 32 (2): 181-215. DOI: http://dx.doi.org/10.1023/A:1023995520369

[139] Van Raaij, W.F., and Van Rijen, C. 2003. *Money illusion and euro pricing*. In Presentation at the IAREP (International Association for Research in Economic Psychology) Euro-Workshop, Vienna, Austria, July.

[140] Vlasceanu, S. 2013. Psychology of the consumers and the advertising in terms of factors that leads to consumer's decision-making. *Romanian Journal of Experimental Applied Psychology*, 4(1): 23-28.

[141] Vazifedoost, H., Charsetad, P., Akbari, M., and Akbari, J.A. 2013. Studying the Effects of Negative and Positive Perceptions of Price on Price Mavenism. *Research Journal of Applied Sciences, Engineering, and Technology*, 5 (15): 3986-3991.

[142] Wedel, M., and Leeflang, P.S. 1998. A model for the effects of psychological pricing in Gabor–Granger price studies. *Journal of Economic Psychology*, 19 (2): 237-260. DOI: https://doi.org/10.1016/S0167-4870(98)00006-3

[143] Zeithaml, V.A. 1988. Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *The Journal of Marketing*, 52(3): 2-22. DOI: 10.2307/1251446

[144] Zhou, K.Z., Su, C., and Bao, Y. 2002. A paradox of price–quality and market efficiency: a comparative study of the US and China markets. *International Journal of Research in Marketing*, 19 (4): 349-365.

[145] Zhang, Q., Vonderembse, M.A. and Lim, J. 2002. Manufacturing flexibility: Defining and analyzing relations among competence, capability, and satisfaction, *Journal of Operations Management,* 40 (3): 1-19. DOI: https://doi.org/10.1016/S0272-6963(02)00067-0