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Economic Clusterization and Complexion: The Specificity of the Coastal Zones of the South of Russia

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Abstract:

The article considers the interaction of territorial-industrial complexes (TIC) and economic clusters (as paired, interdependent forms of economic organization) and their special role in the development of coastal areas facing the multilateral dependence on foreign economic, natural and other cycles. The authors propose the classification of coastal areas of Russia in accordance with the nature of their economic profile and external macrocycles of various origins. The analysis of the risk structure of economic activities within cluster and TIC results in proposed economic-mathematical model of formation and development of cluster. The authors give and prove hypothesis about the "transitions" economic clusters and clusterogen entities, on the one hand, and complexes, on the other, to be the important factor in advanced development of the coastal zones due to the accumulation of institutional framework and the experience of reorientation of economic actors from domestic to foreign market (and vice versa) in conditions of unstable external dynamics. The theoretical findings are proved by the empirical data that characterize the dynamics of coastal areas of Southern Russia.

Keywords: economic cluster, cross-border cluster, territorial-industrial complex, coastal area, South of Russia.

JEL Classification: F23, F55, F63, R12.

1. Introduction

The "territorial-industrial complex" (TIC) as well as the term "economic cluster" appeared in the last two decades both seem to be the conceptual keys and terminological constructs used in the analysis and understanding of the spatial organization of the Russian and world economy. The study of the nature of their interrelations is important not only for deepening the theoretical base of the regional economy and socio-economic geography (those that need to establish a more clear and adequate conceptual frameworks and research tools), but also for understanding the trends and processes which occur today in the economic space of the Russian regions. The dynamics of economic clusters and territorial-industrial complexes seems to be one of the main factors of the regional economic development, as well as coastal zones are to become one of the main areas where its bilateral interrelations lead to advanced development of the territories.

The objective of the research is the mechanism of interrelation of economic clusters and territorial-industrial complexes which is embodied in the trends of regional economic development of the South of Russia. Particularly the special attention should be paid to areas in which the elements of industrial complexation are connected with the nature of economic activity. One of the main types of such regions is presented by coastal zones, the continuum-discrete stripes extending to a depth of from 50 to 200 km from the coast and being characterized not only by the "thickening" of economic and residential activity, but also by the stable presence of various sectors of maritime complex (Druzhinin 2016).

The review of companies (including major ones) within territorial-industrial complexes is traditional for the Russian research approaches (Alaev 1977) in which TICs are treated as "economically interdependent combination of enterprises in selected industrial point or area in general, which gives a certain economic effect due to the planned recruitment enterprises" (Kolosovsky 1958, 2). Market reality and de-industrialization of the 1990s cased the transformation and degradation of TICs (up to complete disappearance of some of their links). Self-organizing processes and globalization shot to the forefront, however, they only actualized the fundamental issues of geographical division of labor, territorial concentration and agglomerating, localized connections between various companies and enterprises (Pilyasov 2013). In this context, the concept of "cluster" (as the category akin to TIC, but not identical with it, introduced by Porter, 1990) argues in Russian science. On the one hand, it essentially "pushed" the concept of the TIC, on the other – it has revived the interest in the geographically interdependent development of elements of production, giving rise to numerous attempts of comparative studies

of the structure and bases of live ability of TIC and economic cluster (among them we would highlight the works by Larina and Makayev 2006a, 2006b, Larina 2007, 2008). Not aiming to review a full-scale tone and meaningful nuances of the spontaneously appearing discussion (*e.g.* Baklanov 2011, Pilyasov 2013), we note only that in the conditions of market economy both clusters and TICs, in fact, co-exist in complex, ambiguous system of relationships.

The current research involves such methods as comparative analysis, historical approach, logic and economic-mathematical modeling, risk analysis, the analysis of statistic data due to the research purpose to identify the specificity of economic cluster and TIC though the prism of their risk structure and the dependence on the dynamics of external macrocycles of various origins.

2. Methodological framework

2.1. Dialectics of territorial-industrial complex and economic cluster in coastal zones of modern Russia

While being both sectoral and cross-sectoral production complexes, modern TICs formed as the "highly integrated territorial production systems with sustainable technical and economic ties, the mutual dependence of the elements of production, significant territorial and economic integrity" (Agafonov 1983). The essential feature of the TICs' formation is the systematic, sustainable, recurring interactions (at the cross of which appear the "nodes of relationships"; Agafonov 1983). Generating the combination of objects, their properties and relationships, outlined though the category TIC, they are "characterized by the high-level mates in flows of substance, energy and information" (Alaev 1977). In this sense, the result is presented not only by the intensification of production relations and the enhance of integrity and interdependence of production elements, but also by other factors, acquiring great strength in the conditions of market relations (Agafonov 1983), TICs have been reproducing their forms of organization in the post-Soviet economic context. As for the economic cluster, it is based on self-organization processes occurring from the immediate interest of organizations in interaction with competitors, suppliers, contractors, representatives of various links of the value-added chain (Gorochnaya 2013). Thus, it should be pointed out that in the modern Russian reality cauterization has more complex and ambiguous character than in the countries of Europe, USA and Asia (Gorochnaya 2014).

With the growth and development of an increasing number of cluster formations (tending to perform the 'genetic inertia' of TICs) it becomes obvious that not only cluster may be the result of modification of TIC but also and the complexation process may be initiated by the clustering trends. Most clearly this trend is manifested in coastal areas, where the dynamics of economic clusters is directly correlated with the dynamics of foreign economic and political cycle, causing not only the change in the total volume of cargo turnover of port, but also the change of priorities in foreign economic cooperation, which is reflected in the composition of participants of cross-border clusters. This is especially true for areas with developed transportation and logistics functions (communication corridors).

There are the sea ports (and linked with them other intermodal transport logistics) to become the backbone of complex formation in the conditions of coastal areas. The market context produces, at the same time, deep and sustainable conjugation between complexation and clusterization: favor "maritime" cluster activities are not only to be localized and develop within the region, but are to become specific "cluster" itself, operating within the framework of a corporate economy of "mini-complexes" (private stevedoring companies) with their peculiar owners, logistics and specialisation" (Druzhinin 2016).

2.2. Typology of coastal zones by the influence of macro-cycle

Historically relevant specificity of the coastal zones is one of the main factors which cause the dynamics of the mutual modifications of TICs and cluster structures to be influenced by the particular external macro-cycle. The influence of natural and anthropogenic factors is usual in the case of coastal areas with the significant orientation towards maritime activities. The dynamics of the market of recreational services to a greater extent is not defined by its own internal factors of development of cluster members / recreational complex, and is fluctuating by the market demand (not behavioral and strategic risks but geopolitical, geoeconomic ones dominate, as well as their derivatives: transportation and logistic risk combining with instable dynamics of natural processes and the ecosystem). As a result, in this field the industry specificity contributes to relatively higher growth in the institutional and economic capacity in periods of active development of the market. Consequently, the volume of recreational areas and the possibilities of tourist accommodation, as well as the provision of additional services are to be substantially increased and retained after every growth phase. This feature is one of the reasons for the current situation in most regions of Russia with the developed recreational activity, where the quantitative indicators of the possibilities of tourist accommodation significantly exceeds the real demand (in

terms of reducing the living standards of the general population), while the high-quality sector of the market is poorly developed.

The coastal zones with offshore mining of energetic recourses are in direct correlation with the global energy market; in this regard, they are dominated by the development of the territory according to the principle of TIC (not by the principle of cluster). The same situation is true for the coastal areas of the military-industrial orientation, where (due to the nature of the sector) the significant role of the state and the limited opportunities for the development of competition contribute to the industry organization in the form of TIC without the active involvement of self-organization clustering trends. The position of territories of this type is in direct relationship with the foreign policy cycle, dynamics of international and regional conflicts, cycles of armament and disarmament.

As an example, the inventory of TICs, having the potential for cluster development of the "Maritime" type, localized on the territory of the Rostov region, is given (see Tabel 1)

Table 1 - The structure and features of TICs localized in Rostov region having potential for clustering

Maritime complex: sub-complexes	Clustering state	Cross-border factors of the macrocycle to influence the clustering	Organizational capacity
Transportation and logistics	Integrative clustering tendencies, large cluster capacity, the need for more infrastructural equipment, modernization and technologization as the basis for cluster development.	The relatively stable structure of exports and imports of transport services; attempts to expand the scope of cross-border collaboration through shared organizational and informational platforms, exhibitions and forums.	Ltd. "Gardarika – Rostov-on-Don", Rostov branch of LLC "Group of Companies Logistics and Transport", LLC "Southern Expedition", Rostov branch of CJSC "STS Logistics", Ltd. "South Logistics Company", JSC "Yutek", etc.
Fisheries	Preferential integration on the principle of the value chain. The institutionalization of a common interest presented by the Association "Fishing Industry of the Rostov Region". Partial integration into an integral link in the already established agro-clusters and the agricultural holdings (group of companies "Yug Rusi", JSC "Aston", LLC "Agrokom Group" and others).	Price disparity, unstable dynamics of prices for energy and feed that is directly reflected in the products price fluctuations; the inability to guaranty price stability, along with natural environmental factors affecting the natural development of aquaculture.	More than 400 enterprises and organizations of various forms, including 28 specialized enterprises of aquaculture. The most important producers: "Novocherkassk Fish Factory", LLC "Chkalov Fisheries Artel", federal state budget organisation "Azdon fishery", federal state scientific institution "Azov SRI Fishery", OJSC "Kuleshov fish farms"
Shipbuilding and ship repair	Lack of organizational mass for a full clustering (relatively high entry barriers in the sector); in the future, it may be met through the construction of shipyards in the Azov and the village of Belaya Kalitva. The perspective of clustering and the formation of subclusters through the development of high-tech sector (promising cluster of fish-finder technology in Taganrog).	At this stage, there is the tendency to "minimize" cross-border space of interaction; in terms of external economic sanctions the development of the complex could increase because of the the needs for import substitution.	CJSC "Azov Sudoverf", Taganrog shipyard, Ust-Donetsk Shiprepair-shipbuilding factory, Shipyard "Don-Kassens", Azov PKB for small shipbuilding, JSC shipbuilding and Shiprepair company "Midel", Shipyard "Obukhovskaya", JSC "Krasny Hydropress", JSC "Tsimlyanskiy Marine Engineering Plant", etc.
Tourism and recreation	Insufficient logistical and information potential for full clustering in conditions of relatively low potential for tourism development in the region. On the background of this trend take place attempts and projects of the organization of the tourism cluster in the region (in particular, the project "Rostov auto-tourism	The strong dependence on shifts in exchange rates and other external factors, the relatively low attractiveness of the region for foreign tourists.	Extensive network of small enterprises of tourist and recreational services and facilities, and logistics. The prospect of clusterization at the basis of Ltd. FPS Petro energo complex – South".

Maritime complex: sub-complexes	Clustering state	Cross-border factors of the macrocycle to influence the clustering	Organizational capacity
	cluster "Splash"), as well as integration with the tourism cluster in Krasnodar region and other neighbouring regions.		
The military-industrial sub-complex	Partial potential for cluster development trends in some links of the production chain (production of components, the high-tech sector).	There is no close correlation with external economic factors due to the nature of the industry; in terms of import the development of intra-organizational space takes place.	RITC-OJSC "Rostvertol", Taganrog machine-building plant, JSC "Taganrog aviation", etc.
Port industry	Deterrent factor of development is the low bandwidth of ports, port railway stations and airports. There is considerable potential for the development of port industry cluster, which is not fully used.	The dynamics of development of the port industry is determined by the cycle derived from the cycle of the external economic relations.	7 ports (JSC "Rostov port", JSC "Taganrog Commercial Sea Port", JSC "Azov Sea Port", JSC "River Port", JSC "Ust-Donetsk Port", LLC "Rostov Universal Port", JSC "Commercial Port"), about 130 shipping companies; ports adjacent to the logistics companies and elevator complexes: Azov Port Elevator Ltd., Portgrain LTD, Azov Grain Terminal Ltd, etc.

Source: compiled by the authors according to: Katansky (2010), Nikolaev (2007), The Official Website of the Ministry of Industry, The Resolution of the Government, The Rating of Transport and Logistics, Sports-Entertainment Complex, Socio-Economic Development Strategy, The Federal Agency for Fisheries; Federal Target Program.

2.3. Economic-mathematical model of clusterization/complexation risks

The presence of the port complex with a significant number of terminals in the region inevitably entails further processes of formation of industrial and logistics of complexes. In most cases, the emergence of a competitive component and the transition from TIC to any of the typological forms of cluster is to be initiated by the shifting of initial conditions, which takes place in the form of growth of the organizational mass of potential economic interaction participants in a potential cluster, or by increasing the total demand in contraction. The first condition arises when the participants of the existing TIC are joined by foreign and domestic partners and competitors (during the ascending trend of development of international economic dynamics of the region). The second condition occurs as a result of technological growth, renewal and the increase of domestic and external demand (which also occurs with greater probability in the case of positive dynamics of international economic interaction). On the contrary, in the conditions of negative dynamics of foreign economic trend an opposite trend occurs declining the cluster (either protocluster) space. However, the accumulated experience of technological and organizational collaboration and inter-organizational aggregation of interest anyway institutionalizes, promotes the growth and development of the tacit knowledge in the region; and the existing system of relationships embodies in the form of a territorial-industrial complex. Within this research we make the attempt to reveal the mechanism of this process more fully by means of economic-mathematical models.

Acting in conditions of high risk and uncertainty, typical for the coastal area, cluster is experiencing a number of risky factors which are of both general and specific nature. As a result, the likelihood of efficient interaction with a potential contractor is reduced. Expressing the magnitude of the risk (r) as the probability of non-occurrence of the event of inter-organizational interaction, we obtain the total probability of interaction (1 – r):

$$E = \frac{\frac{L_R C_F}{L_F C_R}(M_R - 1)}{\frac{L_F C_R}{L_R C_F} M_F + \frac{L_R C_F}{L_F C_R}(M_R - 1)} * Q * (1 - r_1) * \ldots * (1 - r_n) \quad (1)$$

where: C_F – average cost of interactions with the partner external to cluster / complex, C_R – the average cost of interaction with a regional (domestic to cluster) partner, L_R – average level of trust to regional organizations, L_F – average level of trust towards external organizations, Q – aggregate

need for interaction of regional organizations, E – rate of emergence of intracluster communication (Gorochnaya 2014), r_1, r_n – values of various types of internal and external risk.

In the case of clusterization and the formation of a TIC all types of risk will have different meanings. Moreover, the same risk category will be to express themselves in different ways and have different nature in market conditions and in the conditions of TIC with relatively stable number of participants. The brief comparative description of the main risks and their manifestations for the type of maritime TIC and maritime cross-border cluster is given below (see Tabel 2).

Table 2 - Comparison of major risks within a maritime TIC and a maritime cross-border cluster

Type of risk	The manifestation in the case of a maritime TIC	The manifestation in the case of a maritime cross-border cluster
Structural	Structural inertia as a negative parameter for the competitiveness	The instability of the structure, difficulty in forecasting
The risks are high barriers of entrance	Incomplete realization of local entrepreneurial initiatives	Possibility of monopolization of the primary oligopolistic cluster-market structure (or the structure of monopolistic competition)
Industrial-technological.	Relatively inert way of technological updates	The lack of coordination in asynchronous change of production technologies
Transport-technical	Relatively constant risk of use of transportations	Variable risk due to the capability of changing the method of transportation, the inclusion of new types of transport and their development
Logistic	Relatively constant risk of a breach of graphics in operation of transportation systems and movement of traffic	Variable risk, rising in the situation of unstable market dynamics and structural changes inside the cluster, or declining as a result of joint use of common logistics system by the actors of cluster
Behavioral-strategic	The risk of obsolescence of the strategy in relation to the external environment due to the lag effects	Significant risk of inter-organizational interactions due to the unpredictability of behavioral strategies of organizations at the market, the risk of asymmetric implementation of market strategy
The risk of fulfillment of obligations	Minimal risk in the conditions of stable functioning of inter-organizational relations	Gradation of risk value, depending on production features and the experience of interaction with the partner organization, its geographical location and belonging to a particular national legal system
Mediation contraction risk	The risk of an insufficient number of intermediaries and infrastructure with the rapid growth of production	The risk of sharing usage of the system of intermediaries, the need to protect confidential information, the risk of instability of intermediaries
Financial and credit	The risk of insufficiency of internal financial resources for growth within complex	The risk of interactions with competing financial and credit institutions, including those belonging to different national economic and legal systems
Customs tariff	The risk of price competitiveness of products at foreign markets and the profitability of cross-border collaboration	
Foreign economic	The risk of destructive factors associated with changes in foreign policy	
Foreign-political	The risk of direct administrative restrictions for cross-border cooperation between organizations	
Market	The risk of lack of product competitiveness in quality and technology	The risks of unstable market dynamics inside the cluster

Source: provided by the authors

Along with the differences given above one should note the correlation between some types of risk and the values of C and L indicators in the framework of cluster. In particular, the performance of intracluster communication costs is directly correlated with such types of risks as structural risk, high entry barriers, industrial technological, transportation and logistic risks, the risk of liability, etc., because they are associated with the rise in price of contraction due to the value of cargo and liability insurance which is implemented through both foreign insurance companies and internal funds of the enterprise aimed to cover the risks. The dependence between the parameters C and r can be characterized in the framework of the risk model of cluster as a function of the power function (see Figure 1):

$$C = r^k + C_{min}, \quad (2)$$

where: C – value of transaction costs, C_{min} – minimum threshold level of transaction costs, r – risk magnitude, k – the coefficient reflecting the sectoral and territorial specificities.

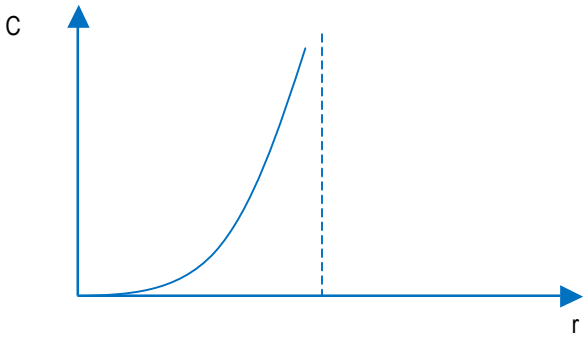

Figure 1 - Power dependence of transaction costs of inter-organizational interaction on the value of correlated risks

Upon r reaching a certain value, the indicator of transaction costs reaches the condition C→∞, which is the threshold value of risk for the implementation of economic cooperation. Similarly, as the result of the increase of risk value achieves the condition L→ 0, the dependence of indicators r and L can also be characterized by a power-law function (see Figure 2):

$$L = r^{-k} + L_{min}\ , \tag{3}$$

where: L – level of inter-organizational trust, r – risk magnitude, k – the coefficient reflecting the sectoral and territorial specificities, L_{min} – minimum basic level of trust characterizing the specific business environment in cross-border region.

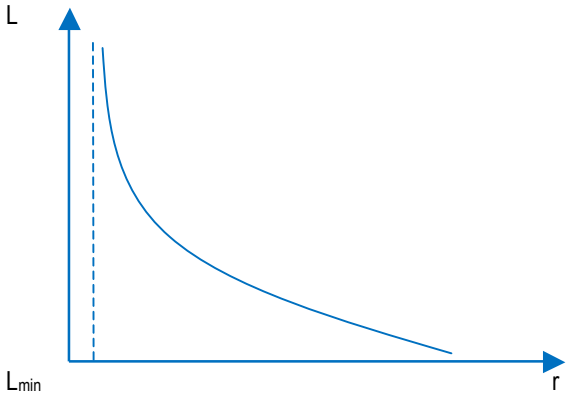

Figure 2 - Power dependence of the level of interorganizational trust on the magnitude correlated risks

Providing the comparative analysis of cross-border cluster and TIC, it is possible to identify the following main features of the correlation of the trust level and transaction costs between external and internal actors (see Table 3):

Table 3 - Comparative analysis of the ratio between trust level and transaction costs for internal and external actors within the framework of a TIC and a cross-border cluster

In the case of a maritime TIC	In the case of a maritime cross-border cluster
$L_R/L_F \rightarrow \infty$	$1 \leq L_R/L_F \leq \infty$
$C_F/C_R \rightarrow \infty$	$1 \leq C_F/C_R \leq \infty$

Source: provided by the authors

Thus, fluctuations in the external economic cycles, most acutely affecting the development of coastal regions as centers of international trade and technological cooperation, contributes to the dynamic and impulsive clusterization-complexation (this process can be considered in dialectical unity on the basis of reciprocity of clusterogenic and complexogenic processes: being institutionalized, the industrial and technological base of TIC becomes a solid basis for the formation of the cluster in terms of improving internal and external economic environment, as well as the experience accumulated in the framework of cluster cooperation enhances complex

communication). Based on this provision, it can be concluded that technological thalasso-attractiveness in coastal zones seems to be a direct result of multivariate logistic possibilities (including the cooperation with port systems), and the advanced dynamics of the coastal zones development is not only one of the effects of the active implementation of these features, but is also the result of increased sensitivity of coastal areas to the dynamics of the external economic cycle. The instability of economic trend, along with the relatively more rapid accumulation of experience in various manufacturing, logistics, technological cooperation and the development of new schemes, also contributes to a continued refocusing on certain foreign and domestic markets. Frequent changes of "game rules" at the international market, the imposition of economic sanctions, the change of custom tariffs and other conditions of foreign economic interaction contributes to a relatively rapid accumulation of precedentele experience, expansion of economic contacts, strengthening the possibility of reorientation from the external to the domestic market, representing an important competitive advantage of organizations operating in coastal zones.

3. Empirical evidence

Focusing on the dynamics of the main macroeconomic indicators in the regions of the South of Russia in comparison with the dynamics of internal and external trade, we can find following trend: against the background of unstable dynamics of foreign trade turnover (both from the CIS and far-abroad countries) all the key macroeconomic indicators has been in a steady growth, several declining in rate because of the partial collapse of foreign economic activity, however, maintained their trend (*see* Table 4). First of all, it suggests that further growth (even in the case of downturn of external economic interaction) is achieved due to the established institutional framework, infrastructure development, reorientation to domestic demand and the development of the internal market (in particular, this is evidenced by stable positive dynamics of the turnover domestic wholesale trade).

Table 4 - Dynamics of the main indicators of economic activity growth in coastal regions

Year	Rostov region	Krasnodar region	The Republic of Dagestan	Astrakhan region
Dynamics of wholesale trade, mln. RUR.				
2010	645,501	637,130	15,590	40,755
2012	987,315	900,292	33,257	56,136
2013	1,092,292	991,275	37,584	61,215
2014	1,177,444	1,138,016	32,779	70,413
Dynamics of foreign trade turnover with CIS countries, mln. USD				
2012	2,996.7	1,653.8	301.8	181.2
2013	2,978.6	1,454.7	276.8	587.7
2014	2,090.9	1,143.9	255.3	468.6
Dynamics of foreign trade turnover with the CIS countries, mln. USD				
2012	7,677	13,096.6	348.0	857.8
2013	7,409.3	12,230.5	488.9	821.8
2014	6,046.3	14,344.9	363.3	1,023.5
Gross regional product per capita of population, thousand RUR				
2010	154.1	196.9	94.9	143.4
2012	197.4	271.0	128.6	208.3
2013	215.9	309.8	153.3	269.8
2014	235.7	330.1	180.8	283.6

Source: Compiled by the authors based on data from official national and regional statistics

No less interesting trend is apparent when comparing these trends with the dynamics of the number of enterprises as the main component of clustering potential of the region. With the general increase of production and consumption there is some kind of "folding" of organizational space (see Tabel 5). Furthermore, the figures are differently performed in various regions. So, in the Rostov and Astrakhan regions, in general, changes in the number of enterprises are negative, in the Krasnodar region and the Republic of Dagestan along with the general negative trend there can be observed oscillations, which suggests that they increasingly respond to the dynamics of the external economic cycle. However, regardless of the specific regional practice, the fact of preservation of sustainable growth of the regional economy in conditions of unstable dynamics in the number of enterprises and

their foreign economic activity suggests that cross-border clusters (and protoclusters) are able to shift to domestic demand and to save their base, being transformed in the form of TIC.

Table 5 - Dynamics of the number of enterprises in the coastal regions of Southern Russia

Year	Rostov region	Krasnodar region	The Republic of Dagestan	Astrakhan region
2005	107 115	138 270	37 456	19 100
2010	90 703	130 889	28 034	18 204
2013	88 144	134 477	33 558	18 151
2014	89 473	141 784	34 115	18 736

Source: Compiled by the authors based on data from official national and regional statistics

Looking more closely at the dynamics of the cycle of major regional clusters involved in cross-border activities, it confirms the hypothesis of the cyclical fluctuations of the organizational mass to be in correlation with the economic dynamics of the macrocycle. In particular, this trend can be seen with the example of clusters in the agricultural sector of Rostov region, operating for over 10 years, which is sufficient time to obtain reliable information about the cyclic dynamics of their development (in particular, in this respect, the experience of agro-clusters "Zolotaya Semechka" and "Yug Rusi" is representative). While the major recessions of foreign economic activity and the rupture in relations with internal and external partners can be observed in 1999 and 2009 (it is important to note that there has not been any decline in international trade in agricultural products, such as sunflower and corn thanks to the cluster effect and stability of the existing relations), the main stages of "decline" of cluster space, combined with the purchase of production capacity of the retired cluster members (including cross-border ones) took place in 2001 and 2011 correspondingly, that allows to capture the two-year lag period associated with the inertia of institutional structures. In each case the vector of organizational form of the relationships between enterprises has shifted from the cluster to TIC, thus forming the potential for a new round of development of the cluster space in the conditions of positive dynamics of the future period associated with the involving of new cross-border partners.

Conclusion

Thus, the coastal area as the border region develops in the range of its "contact-barrier" properties, defined by both its internal factors of development and largely geopolitical and geo-economic situation. The contact-ability as one of the most important properties of coastal areas, on the one hand, gives the opportunity for the development of self-organization clustering trends, on the other hand, makes coastal area the objective of the special attention due to its high-risk level and the complex risk structure, which inevitably increases the role of state presence. We can conclude that coastal areas are not only the important sphere for the formation of the attractor of the modern economy, but also a crucial "node of connections" focused on port logistics (along with the major cities in which important logistic centers are localized).

Socio-economic (and, in particular, institutional) specificity of the coastal zones is in a special way conducive to concentration, and agglomeration and, consequently, it leads to the processes of clustering and complex formation. In this connection clustering and complexation not only support and provide the autocatalyses for each other, but also (in the situation of the coastal zone) are to become interdependent processes. In fact, in the coastal area we deal with a "cluster of complexes" and a "complex of clusters". The close contact of these sides of coastal areas' life contributes to the continual performance of the "cluster –TIC" dichotomy as the form of mutual transformational.

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Determinant of Exchange Rate with Hybrid Model: Empirical Evidence from Indonesia

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Abstract:

The purpose of this study is to examine the determinants of the exchange rate in Indonesia by using a hybrid model which is a combination of macroeconomic model with a model of the microstructure. Furthermore, hybrid models are estimated using an error correction model of Domowitz El-Badawi. The results show that five macro variables (money supply, interest rates, inflation, output growth, and capital flow) and a variable microstructures (inventory) has a significant influence on the determination of the exchange rate.

Keywords: exchange rate, hybrid model, microstructure model, macroeconomic model, error correction model.

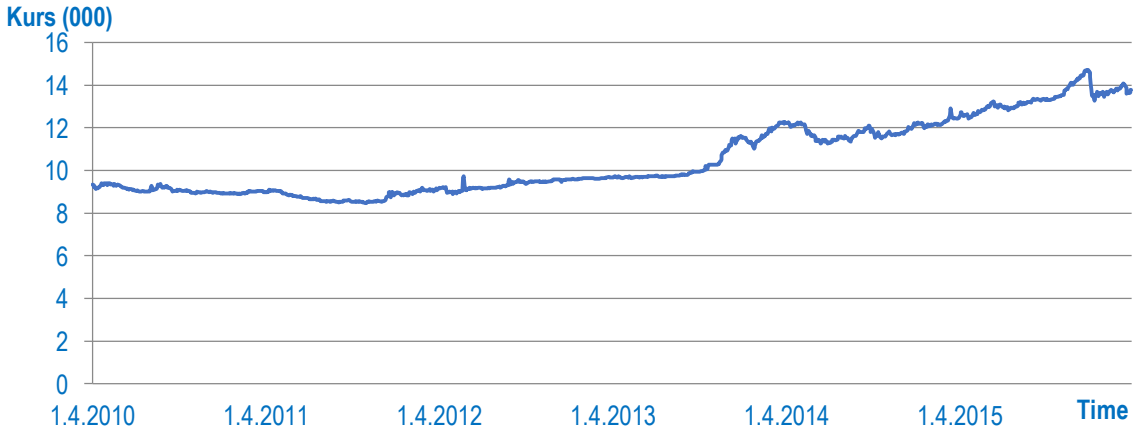
JEL Classification: E44, F31.

1. Introduction

Lately we have seen the value of the rupiah against the US dollar fluctuates with the trend of diminishing value. At the end of 2012 the value of the rupiah against the US dollar is still below 10,000 per dollar, but in October 2013 has been above 11,000 per dollar and in December 2014 reached 12,700 rupiahs. Even in August 2015 already over 14,000. Fluctuations in the exchange rate of rupiah per US dollar are reflected in Figure 1.

Given the impact of currency exchange rate fluctuations on the economy is huge, the efforts to maintain the stability of the rupiah exchange rate is very important. Parties are entrusted to keep the exchange rate in Indonesia is Bank Indonesia (BI), this is in accordance with the basic tasks of BI is to maintain the stability of the exchange rate good for the price of goods in general and against foreign currencies. Of course, to keep the stability of the currency exchange rate, previously had known beforehand the factors that affect the level of the rupiah.

Broadly speaking, the determination of the exchange rate can be grouped into three models, namely macroeconomic models, microstructure models and hybrid models. Meese and Rogoff (1983) asserted that unsatisfactory macroeconomic models are less satisfying to explain the determinants of the exchange rate. Frankel and Rose (1995) are same as Meese and Rogoff (1983), they showed the weak evidence that macroeconomic variables have an influence on the exchange rate, except in special conditions such as when hyperinflation. Bailliu and King (2005) also underline that models the determinants of the exchange rate based on the fundamental data of macroeconomic are less successful to explain or predict the exchange rate. The statement is very important because most of the research on the determinants of the exchange rate in Indonesia using macroeconomic models. Research on the exchange rate in Indonesia, including by Edwards and Sahminan (2008), Pratomo (2008), Cahyono (2008), Hsieh (2009), Abudalu and Elgazoli (2013), Heriqbaldi *et al.* (2014), Hsing (2015).



Source: http://pusatdata.kontan.co.id

Figure 1 - The Middle Rate of Rupiah per US Dollar

Cheung *et al.* (2005) and Abhyankar *et al.* (2006) explain that a failure in projecting the exchange rate is generally caused by the models used. Most researchers generally rely on one model or the basic concepts only. Macroeconomic models give better results when in the long term, while the microstructure gives better results when used in the short term. Macroeconomic models give better results when in the long term, while the microstructure gives better results when used in the short term. Analysis of the determinants of the exchange rate in order to cover, short-term and long-term it is necessary to use a hybrid model. Evans and Lyons (2000) became a pioneer in analyzing the determinants of the exchange rate using a hybrid model. The model combines fundamental macroeconomic models with microstructures models. Payne (2003), Killeen *et al.* (2006), and Rime *et al.* (2007) have also implemented Hybrid model empirically. Their empirical studies do show better results, viewing from the abilities in explaining variations in the exchange rate. Therefore, this study will use a hybrid model.

2. Research methodology

The hybrid model is a model that combines macroeconomic variables and microstructure as variables that determine the exchange rate. In general, the hybrid model can be expressed as follows (Lyon 2001):

$E_t = f(i, m, z) + g(X, I, Z) + e_t$

where f (i, m, z) is a component of macroeconomic models and g (X, I, Z) is component microstructures. Notation *E* shows the exchange rate, *i* is interest rate, m is the money supply, other macroeconomic variables *z*, *X* is order flow, *I* is net position or dealer inventory, *Z* are other micro variables, and e is the error.

Furthermore, to estimate the equation (1) it is done by using Error Correction Model Domowitz Elbadawi. The procedures are: 1) testing the data stationary by detecting the presence of unit root; 2) transforming the data into stationary; 3) conducting cointegration Dickey-Fuller test; 4) estimating by using the error correction model.

Explicitly, a hybrid model using the Error Correction Model Domowitz Elbadawi can be written as follows:

$$\Delta LnE_t = \alpha_0 + \alpha_1 \Delta LnM_t + \alpha_2 \Delta I_t + \alpha_3 \Delta P_t + \alpha_4 \Delta Y_t + \alpha_5 \Delta LnTB_t + \alpha_6 \Delta LNCF + \alpha_7 \Delta LnOF_t + \alpha_8 \Delta LnINV_t + \alpha_9 LnM_{t-1} + \alpha_{10} I_{t-1} + \alpha_{11} P_{t-1} + \alpha_{12} Y_{t-1} + \alpha_{13} LnTB_{t-1} + \alpha_{14} LnCF_{t-1} + \alpha_{15} LnOF_{t-1} + \alpha_{16} LnINV_{t-1} + \alpha_{17} EC_t + \varepsilon_t \quad (1)$$

$$EC_t = LnM_{t-1} + I_{t-1} + P_{t-1} + Y_{t-1} + LnTB_{t-1} + LnCF_{t-1} + LnInv_{t-1} + LnOF_{t-1} - LnE_{t-1} \quad (2)$$

$$LnE_t = \beta_0 + \beta_1 LnM_t + \beta_2 I_t + \beta_3 P_t + \beta_4 Y_t + \beta_5 LnTB_t + \beta_6 LnCF + \beta_7 LnOF_t + \beta_8 LnInv_t \quad (3)$$

Equation (1) is a short-term equation and the equation (3) is a long-term equation. Where α_0 and β_0 are constants; α_i,and β_i are the coefficient; E_t is the rupiah exchange rate against the US dollar; M_t is the difference between the money supply Indonesia with the United States; I_t is the difference of interest rate between Indonesia and the United States; P_t is Inflation differences between Indonesia and the United States; Y_t is output growth differentials between Indonesia and the United States; TB_t is the trade balance; CF_t is capital flow; OF_t is order flow; INV_t is inventory; EC_t is an error correction term.

The data used in this research are monthly data covering the period 2010:1 to 2015:6. The data source is published by Bank Indonesia and the various editions of the Federal Reserve Statistical Release.

3. Empirical results

Based on the results of the calculation of unit root test on the data level, visible LnE_t, LnM_t, I_t, P_t, $LnTB_t$, $LnINV_t$ probability value is greater than 5%, it means that the data are not stationary at level. While variable Y_t, $LnCF_t$, $LnOF_t$ probability value of less than 5%, it means the data are stationary at level. Data transformation is then performed using the first difference. The results of calculations on the data first difference stationary seen all these variables (Table 1).

Table 1 - The Result of Unit Root Test

No	Variable	Level			1st difference		
		ADF Stat	Prob	Information	ADF Stat	Prob	Information
1	LnE_t	1.0499	0.9967	Not stationary	-6.71075	0.0000	Stationary
2	LnM_t	-1.7439	0.4047	Not stationary	-9.0453	0.0000	Stationary
3	I_t	-1.3477	0.6022	Not stationary	-4.5307	0.0000	Stationary
4	P_t	-2.0942	0.2470	Not stationary	-5.2443	0.0000	Stationary
5	Y_t	-8.7583	0.0000	Stationary	-8.7267	0.0000	Stationary
6	$LnTB_t$	-1.8593	0.3491	Not stationary	-9.9926	0.0000	Stationary
7	$LnCF_t$	-7.9474	0.0000	Stationary	-15.856	0.0000	Stationary
8	$LnOF_t$	-12.887	0.0000	Stationary	-17.000	0.0000	Stationary
9	$LnINV_t$	-0.6293	0.8560	Not stationary	-10.643	0.0000	Stationary

Source: Own work

To perform cointegration tests with Eangle Granger (EG), it must be done from the regression equation models being tested. Then the residual is taken to be tested with Augmented Dickey-Fuller. If the value of the *t* statistic Augmented Dickey-Fuller (ADF) is greater than the critical value, the variables in the equation cointegrated each other or have a long-term correlation. Alternatively, it could be seen from the probability value (ρ-value). From Table 2 results that the value of the *t* statistic Augmented Dickey-Fuller (ADF) is greater than the critical value in all its α. The conclusion is variables in the equation cointegrated each other or have a long-term correlation.

Table 2 - The result of cointegration

ADF test statistic	Value
T- statistic	-3.9458
Critical Value Level 1%	-3.5349
Critical Value Level 5%	-2.9069
Critical Value Level 10%	-2.591
Prob.	0.003
Information	Cointegrated

Source: Own Work

Furthermore, the models estimate an error correction model (ECM) with the estimation results are presented in Table 3. From the table shows variable error correction (EC_t) demonstrated statistically significant results and is positive mark. This can be interpreted as a model specification Error correction model (ECM) Damowitz Elbadawi used in this study is valid and able to explain the dynamic variation. EC_t coefficient of 0.307504 means that the proportion of the determinant of the exchange rate in the previous period was adjusted in the current period is approximately 0.307504%.

The coefficient of determination to find out the percentage change in the variation of the independent variables could explain the change in the dependent variable. The coefficient of determination of 0.812968 (see

Table 3) meaningful 81.2968% of the independent variables in the model are able to explain the variation changes in the exchange rate, while the remaining 18.7032% set of variables outside of the model.

Changes in money supply in Indonesia are relative to the United States (D(LnM)) and changes in inventory dollars in commercial banks (D(LnINV)) showed significant and marked positive. While the variables were not significant were the relative change in interest rate of Indonesia to the United States (D(I)); changes in capital flows (D(LnCF)); changes in the trade balance (D(LnTB)); changes in Indonesia's inflation relative to the United States (D (P)); changes in the growth of Indonesia's output relative to the United States (D(Y)); and changes the order flow in Indonesia (D(LnOF)).

For variable lag is significant lag first of the interest rate relative (I_{t-1}), lag first of capital flow ($LnCF_{t-1}$), the lag first on the trade balance (LnTBt-1), lag first of inflation relative (P_{t-1}), lag first from the output growth of the manufacturing sector in Indonesia and the United States (Y_{t-1}), lag first of inventory dollars in commercial banks ($LnINV_{t-1}$), and lag first of order flow ($LnOF_{t-1}$). All variable lags have significant a negative sign or a negative direction. While the variable lag which is not significant is the lag of the money supply relative between Indonesia and the United States (LnM_{t-1}).

Table 3 - Hasil Estimasi Error Correction Model

Variable	Coefficient	t-Statistic	Prob.
C	0.881924	3.668235	0.0006
D(I)	-0.006506	-0.651995	0.5176
D(LnCF)	-0.004814	-0.761320	0.4503
D(LnM)	0.599784	7.835529	0.0000
D(LnTB)	-0.000313	-0.012277	0.9903
D(P)	0.002190	1.003959	0.3205
D(Y)	6.56E-05	0.143264	0.8867
D(LnINV)	0.093436	3.916014	0.0003
D(LnOF)	-0.000325	-0.104731	0.9170
I_{t-1}	-0.313714	-5.006040	0.0000
$LnCF_{t-1}$	-0.317710	-4.957612	0.0000
LnM_{t-1}	-0.046964	-1.251962	0.2168
$LnTB_{t-1}$	-0.314579	-4.217183	0.0001
P_{t-1}	-0.306949	-4.977543	0.0000
Y_{t-1}	-0.308147	-4.977031	0.0000
$LnINV_{t-1}$	-0.174891	-4.428775	0.0001
$LnOF_{t-1}$	-0.307324	-4.954952	0.0000
EC_t	0.307504	4.971161	0.0000
R square	0.812968		

Source: Own work

To determine the significance of long-term coefficients can be done by comparing the value of the *t* statistic with a value of *t* table (see Table 4). The table shows that the absolute value of the t statistic is greater than *t* table is C (constant), the difference money supply in Indonesia and the United States (LnM) with the positive direction, the difference in interest rates in Indonesia and the United States (I) with negative direction, the difference in inflation in Indonesia and the United States (P) with the positive direction, the difference in the growth of output of the manufacturing sector in Indonesia and the USA (Y) with a negative direction, capital flow (LnCF) with a negative direction, inventory dollars in commercial banks (LnINV) with a positive direction. While the variables that are not significant are the order flow (LnOF) and the trade balance (LnTB).

In the long-term effect of the money supply relative between Indonesia and the United States (LnM) exchange rates had a positive direction. Meaning the greater the money supply in Indonesia relative to the United States will respond with the rising value of the rupiah against the dollar (rupiah depreciated). In harmony with the long-term effects of changes in money supply in Indonesia relative to the United States on the exchange rate in the short term also has a positive direction. Means the greater the money supply in Indonesia relative to the United States will result in the weakening rupiah currency (rupiah depreciated) or the US dollar strengthened.

Impact of increase in the supply of a currency (when demand remaining) will have an impact on the money supply curve shifts to the right, the money supply curve shifts cause the balance of supply and demand for money decreases, so the value of money and the currency depreciated appreciated partner. Empirically many previous studies support these findings as Civcir (1998), Groen (2000), Atmadja (2002), Nucu (2011), Morley (2009), Saeed *et al.* (2012), and Uddin *et al.* (2013).

Table 4 - Long Term Coefficient and *t* Statistics

Variable	Coefficient	t-statistics	t-table
C (Constant)	2.868008	8.451E+00	1,96
I	-0.02019	-8.08E+00	1,96
LnCF	-0.03319	-5.72E+00	1,96
LnINV	0.431256	104.39316	1,96
LnM	0.847274	165. 1557	1,96
LnOF	0.000585	0.237936	1,96
LnTB	-0.02301	-1.099899	1,96
P	0.001805	2.1542618	1,96
Y	-0.00209	-3.031990	1,96

Source: Own work

Based on the estimation equation long term, interest rate relative (I) effect on the exchange rate of the rupiah. The direction of the effect of these two variables is negative. It means when the interest rate Indonesia increases relative to US interest rates causes the rupiah against the dollar down (the rupiah appreciated). These findings are consistent with previous studies, including Civcir (1998), MacDonald *et al.* (2003), Hacker *et al.* (2009) showed that there is a tendency of a negative correlation between the interest rate and the spot rate is relatively nominal (the domestic rate minus the foreign interest rate) and the spot exchange rate. In the short term, first variable lag of interest rates relative Indonesia compared to the US (I_{t-1}) had an influence on the currency exchange rate negative direction too. It means in the short term, if there is an increasing the interest rate relative Indonesia, it will respond with a decreasing rate (rupiah appreciated).

These findings are in accordance with the theory of asset demand. All investors will expect a high return of investment instruments including currency chosen. When capital can move flexibly between countries and when assets perfect substitutes, then the capital will lead to currency assets that have a greater return. In this case the rise in interest rates in Indonesia responded to the flow of funds to Indonesia so that ultimately have an impact on the strengthening of the rupiah against the dollar.

The impact of relative inflation between Indonesia and the United States (P) against the exchange rate of the rupiah is the positive effect. The higher the relative inflation in Indonesia with the United States will increase the rupiah exchange rate against the dollar (the rupiah depreciates). Similarly, in the short term, the lag of inflation relatively Indonesia with the United States (P_{t-1}) depreciated impact on the rupiah against the dollar. The research was supported by the results of the findings of the Civcir (1998) who discovered the existence of a positive influence between inflation with currency exchange rates. Canales-Kriljenko (2004) found the Consumer Price Inflation (CPI) effect significantly positive direction against the exchange rates of currencies in various countries (cross section). Hsing (2009) also declared positive influence between inflation with currency exchange rates in New Zealand.

These findings are consistent with the theory of Purchasing Power Parity. Commodities should have the same price either in Indonesia or United States when expressed in the currencies of the same one, so the purchasing power of both currencies (rupiah and United States dollars) is at parity. If there is a price difference will occur the arbitration will adjust the price in both countries, so that finally the price is the same.

In the long-term growth of the relative output between Indonesia and the United States (Y) has a negative influence against exchange rates. This means that the higher output growth would further strengthen the exchange rate of the rupiah against the dollar. In the short term, the lag from the relative output growth between Indonesia and the United States (Y_{t-1}) influential with negative direction. It means that in the short term the relative output growth in Indonesia and the Americas the previous period affects the rupiah exchange rate. If output continues to grow normally aligned with the accession opinions. Rising incomes will increase needs money so encouraged currency appreciate. In addition, increasing output Growth will increase optimism that it will have an impact on the appreciation of the rupiah. The empirical results are aligned with the results of this research include performing by Groen (2000) reveals that there are empirically influenced with negative direction between real income (Y) and currency exchange rates. The research of MacDonald *et al.* (2003) also found that the increase in real GDP relative to the amount of 1% of the trading partner will have an impact on the appreciation of the real effective exchange rate of 0.2%.

In the long term, the correlation capital flow in Indonesia with the exchange rate of the rupiah against the dollar has a negative direction. It means that more capital flow in Indonesia will strengthen the exchange rate of rupiah (dollars appreciate). Some of the studies that are same as these findings is Opoku-afari *et al*. (2004) did a study with the results of capital inflow has a tendency will encourage the appreciation of real exchange rates.

Macdonald *et al.* (2003) suggested that the increase in the net foreign asset 1 percent would apply to the appreciation of the real effective exchange rate by 1 percent. Similarly, in the short term, the lag of capital flow ($LnCF_{t-1}$) also has an impact on the exchange rate of rupiah with the negative direction.

According to Levi (2004) foreign investment in a country represents the demand for the country's currency when the investment is made. It means that an investment in Indonesia stock exchange from foreign parties represents the demand for the rupiah, so it will shift the demand curve against the rupiah currency to the right. The amount of investment flowing into the country, usually depends on the level of relative advantage compared to the level of benefits in other countries. Capital inflow indicates domestic asset purchases by foreigners. The purchase of domestic assets will raise the price of the domestic currency (Dua and Ranjan 2013).

In the long term, it is finding a positive correlation between inventory dollars in commercial Banks (LnINV) and exchange rates. It means, the larger the inventory, it will have an impact on the weakening of the exchange rate of the rupiah or dollar values rise. It is found also in the short term, where dollar inventory changes in commercial bank will be responded with an increase in the exchange rate of the rupiah against the dollar (rupiah depreciated).

Moulton (2008) stated *a market maker* would decrease the prices to decrease their *inventory* when considered it had exceeded the level of inventory that would be achieved and would raise the price when their inventory positions was low (below the level of the expected inventory). Activities adjust the inventory of foreign exchange could be linked to the opportunity cost of holding liquid assets. This opinion of Becker and Amadou (2005), stating the cost of holding liquid assets appears when it was compared with holding the assets instrument liquidness, so they need to manage liquid asset inventory (currency) to respond selling and buying orders by setting the *ask price* and the *bid price*.

Conclusions

The purpose of this research is to analyze a determinant of currency exchange rates Indonesia by using hybrid models. The hybrid model is combining a macroeconomic model and a microstructures model. The results of this research are valid with a high coefficient of determination.

Macroeconomic variables that affect the exchange rate is the money supply, interest rates, inflation, output growth is relative, and capital flow. The increase in Money supply relative between Indonesia and America will be responded with a rise in the exchange rate (rupiah depreciated). The increase in money supply will shift the money supply curve to the right, it causes the balance of the money market decreases, eventually the exchange rate of the rupiah depreciates. The increase in the relative interest rate in Indonesia is compared with the United States will decrease the exchange rate of the rupiah against the dollar (rupiah appreciates). Every investor certainly will expect a high return on selected investment; it is corresponding to the theory of demand assets.

The higher the relative inflation in Indonesia compared United States, the higher the exchange rate of the rupiah against the dollar (rupiah depreciated). This is corresponding to the theory of *purchasing power parity*, the point is the increasing the inflation in the country would cause the domestic currency depreciates against the partner. The increasing the output relative growth in Indonesia will have an impact on the decrease in the exchange rate of the rupiah against the dollar (dollar appreciates). The growth of output, closes to the increasing the revenue, and increasing incomes will result in an increase in the demand for money, will further encourage the currency appreciates. In addition, the growth in output will also increase optimism the market participants and will strengthen the value of the currency. The higher the capital flow, it will have an impact on the decrease of the exchange rate of the rupiah against the dollar (dollars appreciated). The purchase of domestic assets in Indonesia stock exchange by foreigners will push the rupiah currency appreciates.

Microstructures variables that affect the exchange rate is inventory. The greater inventory, the higher the exchange rate of the rupiah against the dollar (rupiah depreciated). Dealers will adjust dollar inventory in accordance with the desired target level. Dealer will increase the price of the dollar when it wants the increase in inventory.

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External Sanctions as Motivation to Develop Clusters Infrastructure in Agricultural Branches

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Abstract:

Traditionally a high level of risks and ambiguous nature of the impact of external sanctions and limitations on the Russian agriculture shift focus in the agrarian policy from the monetary regulation to structural reforms. The authors consider the cluster policy to be one of their tools. The article hypothesizes the necessity to develop infrastructural cluster nuclei in various segments of the agro-food market. The research used the methods of modeling social and economic systems, systematic, problem, institutional, and SWOT analysis. As a result, the authors come to the conclusion that the applied aspects of implementing the infrastructural approach in the cluster policy have individual peculiarities for separate agricultural branches. It is stipulated by their operational and organizational specificity. The example of one agricultural branch – vegetable production – shows principles of forming cluster establishments, reveals risks of the sanctions policy and new opportunities for the internal Russian market, and systemizes elements of the industrial structure and structural and functional modeling of the infrastructure cluster nuclei in segments of the large- and small-sized agricultural business based on the results of the strategic analysis of the environment.

Keywords: clustering, logistic centers, consumer cooperation, outsourcing agricultural technological parks.

JEL Classification: F42, O13.

1. Introduction

The introduction and maintenance of economic sanctions mode for the indefinite term in the relations with a number of European, other North-American countries create additional risks and opportunities for the Russian agriculture and associated production, transportation, and logistics industries. Basic geopolitical risks are related to the partial loss of the sales markets, limitations on the import of equipment and technologies, outflow of foreign investments, volatility of the national currency, and decrease in the population's purchasing power. The retaliation measures – food embargo, policy related to creating motivation for the import replacement in the agro-food branch and achievement of the food security parameters – have the opportunities of the accelerated development of the agro-industrial complex and require modernization of basic elements of the economic mechanism related to the agrarian production that complies with the current conditions.

The research hypothesizes that it is impossible for the Russian agriculture to minimize the consequences of sanctions and fully implement the preferences that include new economic realities only by using monetary measures. It is reasonable to inflow additional liquidity in financial and credit institutes and to increase the volumes of donations to the branch at the first, sharpest phase of the crisis. In the future, the need in structural reforms, including those related to creating motivation for the horizontal and vertical integration of the production and forming stable territorially grocery complexes and clusters, comes to the fore.

Taking into account the differential nature of the agriculture, it is possible to distinguish a number of basic principles of the territorial allocation of its branches and formation of the cluster establishments:

- *In the production branch.* The basis of the rent in the agriculture is the differential rent (Buzdalov 2004). That is why the territorial allocation and clustering of the production must take into account the natural

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differentiation of the rent forming factors (decreasing soil fertility, location in relation to sales markets and resources, decreasing efficiency of marginal inputs in the land and infrastructure), and mechanisms in their economic implementation in separate agricultural branches.

- *In the infrastructure branch.* Strengthening of the mutual integration and diffusion of regional agro-food markets within the national economy and in the global market space define the disputability of separate provisions of the territorial and industrial approach of the clusters theory, particularly about the dominating role of processing enterprises or large agricultural holdings integrated vertically in the agricultural clusters. In case of the infrastructure approach "the nucleus" of the cluster is thought to be the key infrastructure object that consolidates the chains of the products distribution in the relevant segment of the agro-food market, provides producers and consumers with comprehensive logistic service, performs responsible storage, manages sales, and renders other services. The formation of agricultural clusters on the basis of the infrastructure "nuclei" will contribute to the convergence of the production and turnaround areas, expansion of the sales geography, decrease in the turnaround expenses and increase in the products competitiveness. Such approach is true for agro-food markets of various levels – regional, interregional, and nationwide.
- *In the regulation branch.* Since sources of new risks are within political contradictions, the state gets definite social and financial obligations on minimizing the occurrence of external shocks. Herewith, the volume of measures related to direct budgetary support for national producers is limited both by narrowing opportunities of the budget, and the agricultural agreement between Russia and the World Trade Organization (WTO). On the contrary, the measures on contributing the structural transformation of the industry and developing the infrastructure are related to the green box measures. Obligations on relating the volume of the budgetary financing do not cover these measures. Consequently, the implementation of infrastructure projects based on the principles of the state and private partnership will have a positive impact not only on the development of national markets, but also it will weaken the impact of external sanctions on the national economy.

2. Materials and methods

Fundamental theoretical and methodological aspects related to the formation of agro-industrial clusters in terms of their classical interpretation and taking into account the specificity of agricultural branches have been considered in the researches of such authors as Firsova *et al.* (2014), Maya-Ambía (2011), Partiwi *et al.* (2014), Tsathlanova *et al.* (2015), Wolman and Hincapie (2015), Yang *et al.* (2015), Popova *et al.* (2015), etc.

Sanctions as an economic category, the evolution of their use practice and peculiarities of their application under contemporary conditions have been reflected in numerous research publications. Among them it is possible to distinguish the works of the following researchers Hufbauer *et al.* (2007), Cox and Drury (2006), Lacy and Niou (2004), Marinov (2005), etc.

The formation and development of the infrastructure of agro-food markets, including logistic, national, and global tendencies of its development, as well as clustering of the agrarian production around large infrastructural objects are in the center of attention of such researchers as Timofeeva *et al.* (2009), Ovchinnikov *et al.* (2014), Popadiuk (2014), Korobeynikov *et al.* (2013), Likholetov *et al.* (2015), Levin (2012), etc.

The research methodology is based on the combination of the content-related and formal approaches. The content-related approach and the use of the methods related to systematic, problem, strategic, and institutional analysis allowed to reveal elements of the industrial structure and interrelation between them that define the opportunities and mechanisms of clustering the agrarian production. The formal approach and the use of the method related to modeling social and economic systems allowed to develop structural and functional models of the infrastructure cluster nuclei for the segments of the large- and small-sized agricultural business that define organizational changes and relations inside the cluster. The impact of external sanctions on the development of the agricultural branches and conditions of forming infrastructure clusters have been revealed by using SWOT analysis (Table 1).

Table 1 - SWOT analysis of the sanctions impact on development of Russian agriculture

THREATS ▪ Barriers for the import of equipment and technologies, including in sectors that are sensitive to import (agricultural machines and equipment, seed industry, pedigree work, etc.); ▪ Partial loss of traditional sales markets; ▪ High volatility of national currency; ▪ Decrease in foreign investments, restrictions for external loans.	OPPORTUNITIES ▪ Barriers for the import of agricultural raw materials and products that create preferences for Russian producers; ▪ Perspectives of long-term growth of the global demand for food; ▪ Changes of approaches to state regulation and support for the industry within the import replacement policy; ▪ Decrease in the share of import in internal consumption.
WEAKNESSES ▪ Deficit of internal resources and availability of natural barriers (considerable volume of the required investments, duration of reproduction processes) for quick production increase; ▪ Decrease in the capital-labor ratio, soil fertility, and personnel potential as a result of the internal migration; ▪ Dependence on the import of equipment and transfer of technologies in the branch of innovations.	STRENGTHS ▪ Growth of internal demand for the Russian products on the background of the import that became more expensive and consumers' traditional loyalty to national producers; ▪ Opportunities of considerable growth of sales due to involvement of the lands that are not used in the turnover and intensification of production; ▪ Products sustainability.

As Table 1 shows, under the conditions of favorable environment on the raw materials (firstly, hydrocarbons) markets structural problems that had accumulated for decades were solved due to the import of both food and resources and technologies for the agriculture. Sanctions and associated barriers on external markets cause the need in the accelerated development of national markets of the agro-food raw materials, products, and resources for the agriculture. The limited financial opportunities of the state determine the priority of the mobilization of internal resources of the industry, in particular through the development of the infrastructure and clustering of production.

3. Results and discussion

The intensity of the processes related to the integration and clustering of the production in Russian agricultural branches as well as forms of the organizational changes caused by them depend on two groups of factors:

- Operational – technological, resourceful, logistic and other peculiarities of the specific branch or a group of complementing agricultural branches, associated infrastructure or processing branches that form closed territorial and production complexes. Within the technologically related processes of production and processing of agricultural raw materials, enterprises are integrated in the vertical chain of forming the value added of the final product,
- Organizational – in different ratios the structure of Russian agricultural branches includes segments of the organized forms of the commodity production (agricultural organizations, agricultural holdings, cooperatives, farms, individual entrepreneurs) and non-organized consumer forms (people's households).

Consequently, the priorities of the integration and clustering of the production must be based on individual operational and organizational peculiarities of a specific agricultural branch. The task of the research has been solved through the example of the vegetables production in three stages: at the first stage tendencies and peculiarities of the branch development were analyzed; at the second stage elements of the structure of the branch were systemized; and at the third stage structural and functional modeling of the infrastructure cluster nuclei for separate segments of the vegetables market was made.

In accordance with the food security doctrine, Russia must produce above 17 mln. tons of vegetable products, including above 2 mln. tons of glass-raised vegetables. However, in spite of the positive dynamics, the level of self-efficiency with vegetables does not exceed 90% (Table 2). It is also impossible to ignore natural and climatic factors that do not allow to get more than one yield per year even in the southern regions of Russia. It decreases the competitiveness of the internal production of separate types of vegetables. In the inter-season 80-85% of their supply is formed due to the import.

Table 2 - Basic Parameters of the Vegetable Production Industry in the Russian Federation

INDICATORS	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cultivation branch – total, thous. Ha	758	744	641	635	624	641	653	662	698	681	671	684
Gross output – total, thous. Tons	11,275	10,822	11,348	11,370	11,509	12,960	13,401	12,125	14,696	14,626	14,690	15,458
Agricultural organizations	2,847	2,475	2,119	2,284	2,174	2,488	2,462	2,069	2,891	2,502	2,397	2,554
People's households	8,280	8,084	8,448	8,092	8,338	9,158	9,554	8,668	9,783	10,111	10,199	10,803
Farms	148	263	781	994	997	1,314	1,385	1,388	2,022	2,013	2,094	2,101
From total volume of production, % Agricultural organizations	25.3	22.9	18.7	20.1	18.9	19.2	18.4	17.1	19.7	17.1	16.3	16.5
People's households	73.4	74.7	74.4	71.2	72.4	70.7	71.3	71.5	66.6	69.1	69.4	69.9
Farms	1.3	2.4	6.9	8.7	8.7	10.1	10.3	11.4	13.7	13.8	14.3	13.6
Yield, dt/ha	148	143	170	173	179	196	199	180	208	211	214	218
Level of marketability, % Agricultural organizations	71.3	74.1	82.4	74.6	79.8	75.1	80.9	82.9	65.4	83.6	82.5	83.9
People's households	8.5	8.1	16.5	18.5	19.4	20.2	15.3	16.0	20.2	18.7	18.5	19.1
Farms	40.1	62.7	63.3	70.7	72.2	68.8	71.6	76.9	66.0	74.4	77.0	81.7
Import, thous. tons	1363	2273	3508	3896	3674	2650	2907	3158	3155	2806	2817	2929
Level of self-sufficiency with vegetables, %	92.7	85.6	84.9	82.8	80.2	86.8	87.3	80.5	93.2	88.7	88.2	90.2
Average prices of producers for vegetables, RUB/ton	1,439	6,764	15,788	16,888	21,162	26,635	22,516	26,546	28,692	24,508	31,460	36,306
Indices of prices for vegetables (in % as to the previous years)												
Producers'	220.0	132.1	121.6	121.9	119.7	121.6	94.1	119.8	109.1	84.5	109.8	106.7
Customer prices	158.2	100.4	121.6	109.2	130.1	95.8	105.8	167.1	57.3	119.8	112.9	122.0

Source: (Agriculture and forestry, 2015)

Today in addition to natural and climatic factors, the fragmentarily of the modern logistic infrastructure and a decrease in investments in its development prevent full import replacement with Russian vegetables. For example, in 2014 storehouses for potatoes, vegetables and fruits with the capacity of 116.5 thous. tons for simultaneous storage (as compared to 231.8 thous. tons in 2012) were put into operation. This is equivalent only to 0.2% of the aggregate annual production (Agriculture and forestry 2015). It is also necessary to note such modern tendency of the branch development as the disproportion of the organizational structure. 70% of vegetables are produced in people's households. It restricts technical and technological process and determines the deficit of the market supply because their marketability does not exceed 20%.

Elements of the industrial structure can be grouped within the block model of the regional vegetables market (Figure 1). Organizational changes on such markets must focus on: strengthening of functional relations between economic agents in the whole chain of the commodities distribution from producers to final consumers; providing fair allocation of income between subjects of the supply, demand, and service industry according to the share of the value added formed by them in the price for final consumers; and combining the market self-regulation and regulating impacts of the state.

One of the key problems of regional vegetables markets includes infrastructure restrictions of agricultural producers' access to sales markets under conditions of the increasing monopolization of outlet chains and weak development of cooperation in the branch of producing and selling agricultural (including vegetable) products. That is why the state agrarian policy must contribute to the development of the infrastructure to promote commodities of local producers on regional and external markets, the formation of market mechanisms, and relations in the area of sales and commodities distribution.

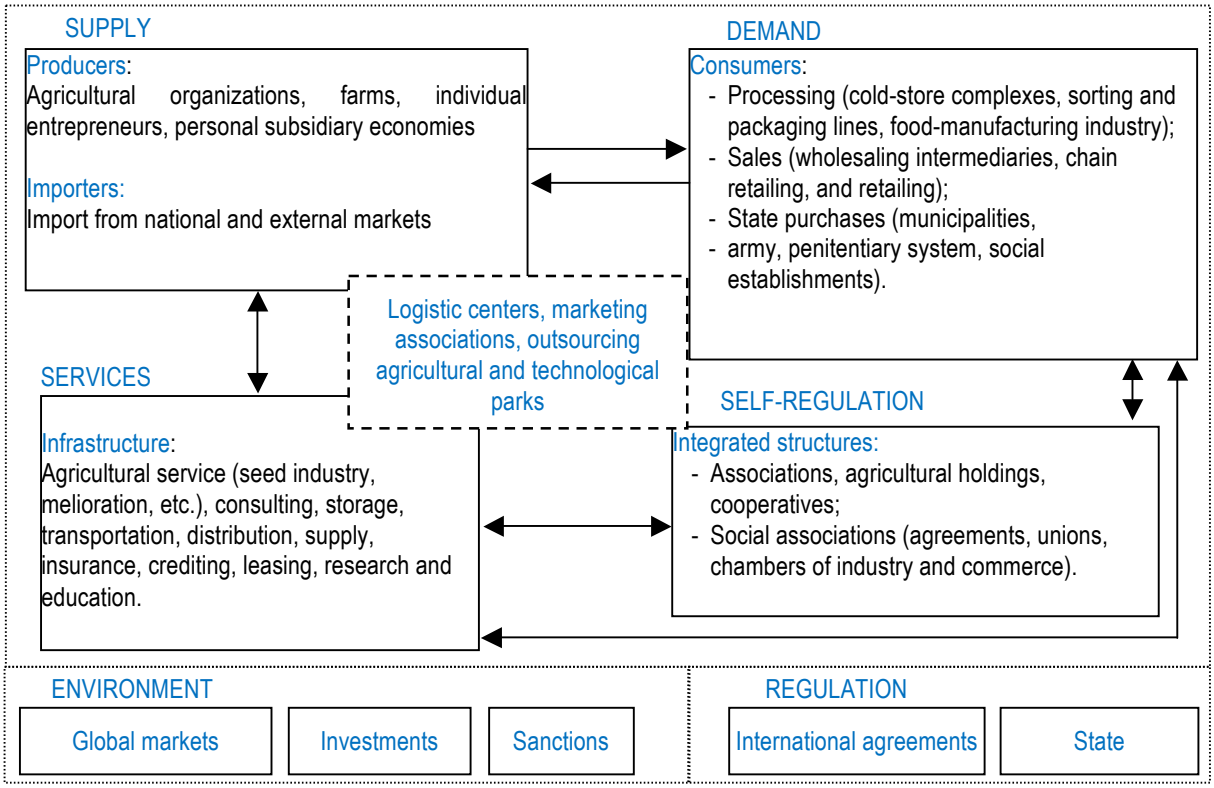

Figure 1 - Organizational mechanism of the regional market of vegetables

Structural and functional modeling of infrastructure cluster nuclei in the segment of large- and medium-sized agricultural business assumes the research of two key variables:

1. Level of the development of production and logistic infrastructure; the competitiveness of agricultural production, its resource provision, and efficiency of products promotion on national and external markets depend on this level,
2. Depth of the horizontal cooperation and vertical integration of production that influences the coordination and agreement of economic interests of subjects of the agricultural business, infrastructure, service, processing, and habitat.

The variables mentioned above determine four forecasting scenarios of the development of large- and medium-sized agricultural business that are generalized in the strategic matrix (Figure 2). It is possible to form territorial and production clusters in various sectors of the agro-food market (including in vegetables production) only in case of the relevant level of the development of the production and logistics infrastructure and creation of motivations for the cooperation and integration of economic subjects.

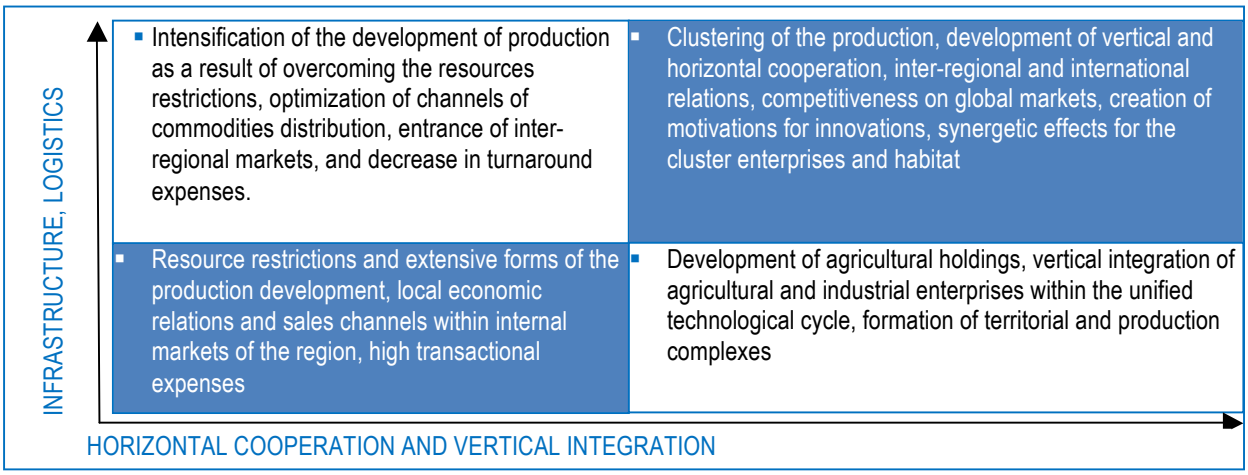

Figure2-Strategic matrix of the environment of the cluster development of the large- and medium-sized agricultural business

Specialized logistic centers are a potentially promising cluster nucleus of regional vegetables markets. In terms of functionality this is an organization that renders comprehensive services in the area of cargo traffic management, responsible storage, transportation, process documentation (phytosanitary, customs, and certification), and distribution via its own dealer network and partner organizations specializing in vegetable products subject to special storage conditions.

In terms of organization, the structure of the regional logistic center on storage, transportation, process documentation, and distribution of vegetable products may include basic, additional, and service subdivisions, as well as separate individual organizations that function on its territory (Figure 3). The offered model is based on the generalized experience of forming Regional Logistics Center of Distribution (RLCD), Local Logistics Center of Distribution (LLCD), and Trade Logistics Center of Distribution (TLCD).

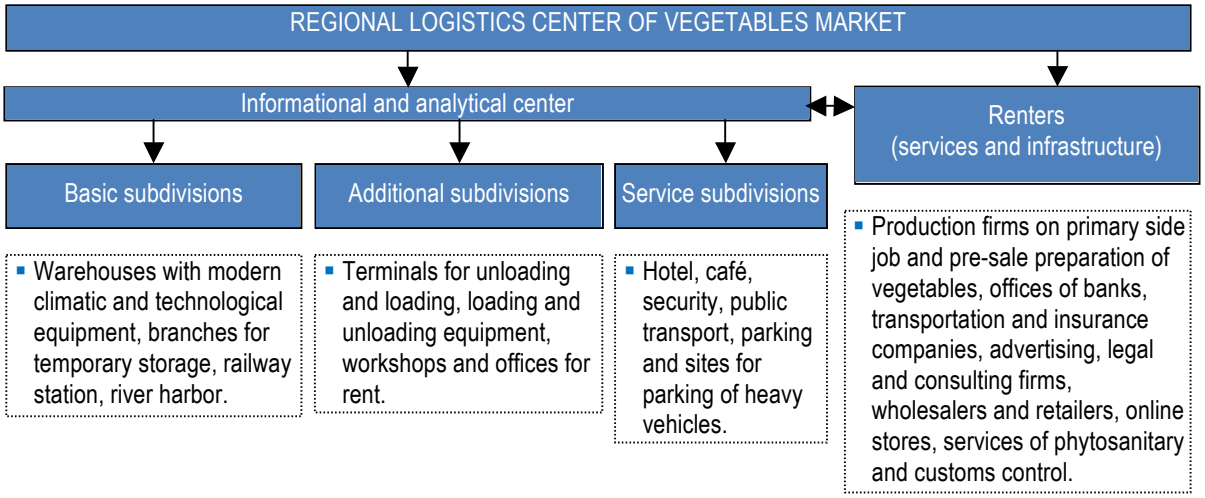

Figure 3 - Possible organizational structure of regional logistics center of vegetables market

The scenario modeling of possible variants of the evolution of the institute related to specialized logistics centers according to the forms of participation of private and state investors allows to single out three basic variants:

1) The logistics center is established by means of the private investments as a warehouse complex – a vegetable store that complies with the modern technological requirements (Russian agrarians often understand logistics centers in this sense). Under this variant the offered services will not be beyond the scope of the rent and warehouse technological operations, and the minimization of storage expenses (especially capital investments) and selling at higher prices in the winter and spring period will provide farmers with the growth of the value added.

2) The logistics center is established by means of the private investments to render comprehensive logistic services on storage, transportation, process documentation, and distribution of vegetable products. Their services are beyond the scope of the warehouse ones, and in terms of the vegetables market may include:

- Maintenance of warehouse reserves on the level of the capacity of the regional market to provide the regularity of supplies to trading networks (processing), rational loading of vegetable stores complying with necessary terms and conditions of storage,
- Documentary and physical control over the incoming products, documenting via the informational system and forming a warehouse cargo unit that belongs to a specific agricultural organization,
- Responsible storage that includes the placement of vegetables in vegetable stores, storage subject to complying with the relevant mode of temperature, humidity, gas environment, and other terms and conditions,
- Packaging and shipping including the receipt of orders, selection of every vegetables item at the client's request, packaging the selected commodities and preparing for forwarding (sorting, primary processing, packaging, taring), process documentation of the prepared order and control over its preparation, orders consolidation in a lot for forwarding and issuing bills of lading, and shipping to carrier vehicles, and
- Transporting, dispatching, etc.

In addition to the growth of the value added, the clients of such center will get another positive effect related to minimizing marketing risks that is important taking into account almost the entire absence of marketing services in agricultural enterprises. Besides, the comprehensive nature of the rendered services will contribute to removing

logistic, transportation, and infrastructure restrictions in the development of the regional vegetables market and minimize thereby the risks associated with it.

3) The logistics center is established in the form of a state and private partnership to render services on storage, transportation, process documentation, and distribution, as well as to fulfill the functions related to regulating the regional vegetables market. Combining private investors' and state means (this opportunity is legally provided) in the investment process will provide the formation of the most functional structure. Technologies related to servicing agricultural and trading organizations themselves will be analogous to the ones that have been considered. There will be differences in the development of additional functions of marketing and regulation. In practice, it can be fulfilled via the interrelation of the informational and analytical center of the logistics complex with the informational and consulting service of the Ministry of Agriculture. The integration of the above informational systems will allow to monitor and forecast the environment of regional (in perspective national) vegetables markets, and the state participation will provide the formation of operative regulation tools.

The strategic analysis of the environment for small forms of the agrarian production allows to single out two most important variables:

- Level of direct and indirect support for the industry by the state that general terms and conditions of business operation depend on,
- Level of the development of agricultural consumer cooperation and vertical concentration of the production that define the feasibility and competitiveness of small business (Figure 4).

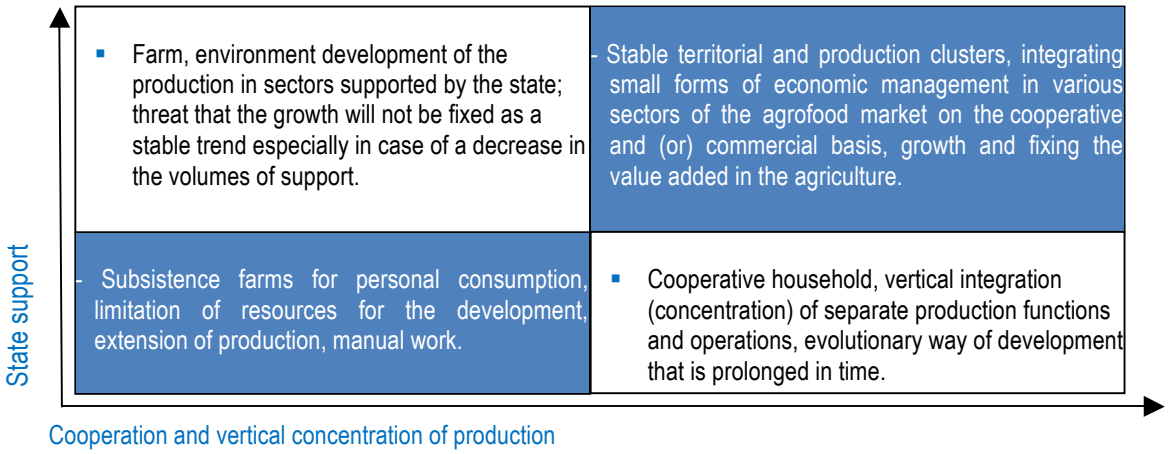

Figure 4 - Strategic matrix of the environment of the cluster development of small forms of agrarian production

The mentioned variables define four forecasting scenarios of the development of the small agrarian entrepreneurship generalized in the strategic matrix. The growth of the state support and congruent development of the cooperation and vertical concentration of the production will contribute to the transformation of the people's consumer households into trading family farms, and the creation of stable territorial and production clusters that integrate small forms of economic management in various sectors of the agrofood market.

Institutionally the infrastructure cluster nuclei for the segment of small forms of economic management may include consumer cooperatives of various types (supply and sales, credit, servicing, etc.) and outsourcing agricultural and technological parks that service separate production functions of people's and farmers' households.

The development of various forms of the consumer cooperation in the small-scale sector is an efficient alternative to the processes of horizontal concentration of the production within agricultural organizations that produce large-scale commodities. Cooperating contributes to the growth of the marketability and efficiency in the segment of small forms of the economic management and provides vertical concentration of production. Such confirmation is based on the primary organizational idea of cooperation – joint fulfillment of separate production functions is more preferential in comparison with their individual fulfillment due to the scale effect (Popova *et al*. 2015). In our opinion, strategic alternatives of the development of consumer cooperation are defined by two basic factors:

- Size and segmentation of needs in outsourcing services in terms of production functions and forms of the organization of agricultural business that produces small-scale commodities,
- Variability of forms of the development of cooperatives in terms of specialization or unification of the functional branch (Figure 5).

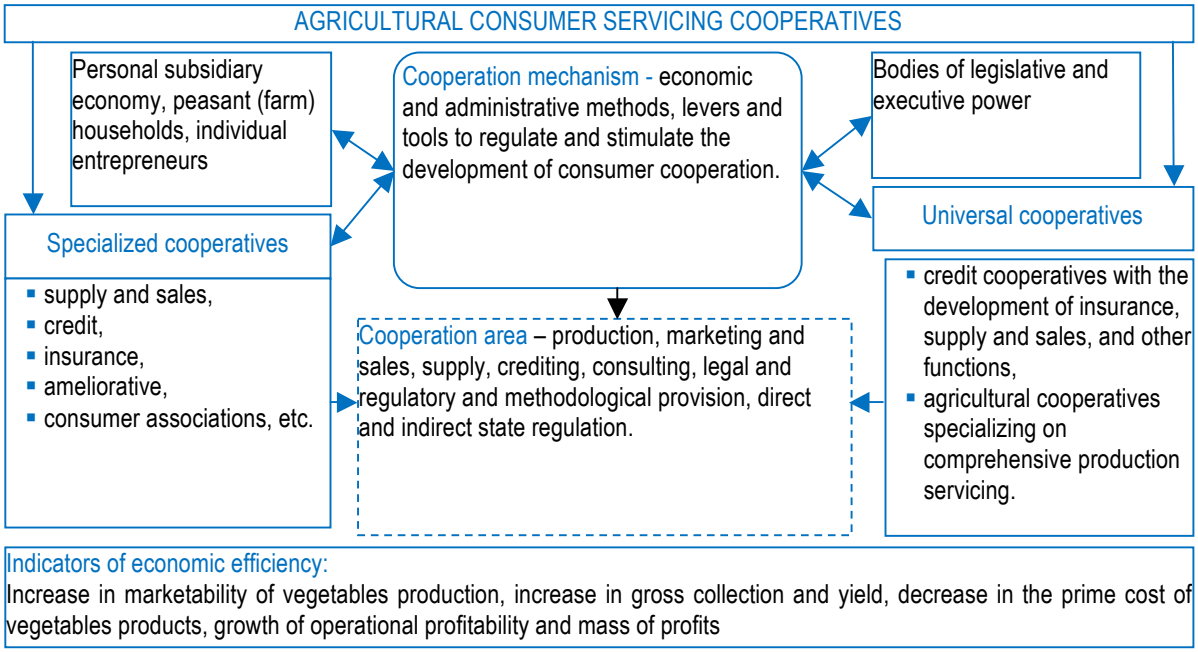

Figure 5 - Strategic alternatives of development of consumer cooperation in vegetables production

As stimuli for cooperating center around removing functional restrictions that are characterized for small-scale production, it is necessary to research strategic alternatives of the development of the consumer cooperation in vegetables production in terms of forming additional competitive advantages that are created by the membership in the cooperation. The basic difference of the specialization or unification is in the fact that specialized consumer cooperatives provide vertical concentration of separate functions of the economic mechanism of its shareholders, and the competitive position is achieved due to the scale effect. Universal cooperatives provide a higher level of the vertical concentration due to comprehensive servicing of a number of interrelated production functions under simultaneous simplification of organizational relations and economy of the expenses of the economic interrelation.

Outsourcing agricultural and technological parks, being a substitution of the consumer cooperation, function as organizers and outsourcers of the commodity production and goods distribution in small forms of economic management. The basic difference lies in the fact that the cooperative movement is a form of self-organization of the rural population (formally on the non-commercial basis). In case of the agricultural and technological park the private investor, who deprives profits from this activity or the municipality (state) acts as an initiator of the vertical concentration of the production.

In virtue of the uniqueness of every pilot project of such parks implemented today in various regions of Russia, it is rather difficult to unambiguously formulate the common business model and to define the organizational structure of the appearing institutes. They combine features of outsourcing (servicing separate production functions), production (development of own production capacities), and trading companies (warehousing and trading branches), as well as actually technological parks (commercialization of innovations of regional agrarian higher educational establishments, consulting).

The establishment of outsourcing agricultural and technological parks focused on small forms of economic management must be based on the following principles:

- Collaboration of the private initiative and state support (legislative, methodological, and financial) in the process of implementing investment projects on their creation based on the principles of state and private partnership,
- Comprehensiveness of servicing production needs of small-scale production for the purpose of stimulating the transformation of people's households into family farms of various sections (depending on traditional production specialization that prevails on the specific rural territory),
- Vertical concentration of small-scale production of individual entrepreneurs' subject to their maintenance of economic independence and formation of stable territorial and production clusters on the basis of agricultural and technological parks that render a set of logistic, technological, and consulting services to small forms of economic management at all stages of production and products sales, and

- Geographical accessibility that is especially important taking into account inconsiderable volumes of the production of people's households and short terms of life of many types of products.

Organizational and production structure of agricultural and technological parks must be adaptive to production and other conditions of a specific branch and territory. In terms of vegetables production the configuration of the agricultural and technological park may include an agricultural cooperative market, mobile office that receives vegetables, processing productions, vegetable stores, machine and technological station that services productions, centers of comprehensive preparation of seeds, consulting and agronomic service, and other infrastructure facilities for the organization of trading production of vegetables on individual courtyards and farm households (Figure 6).

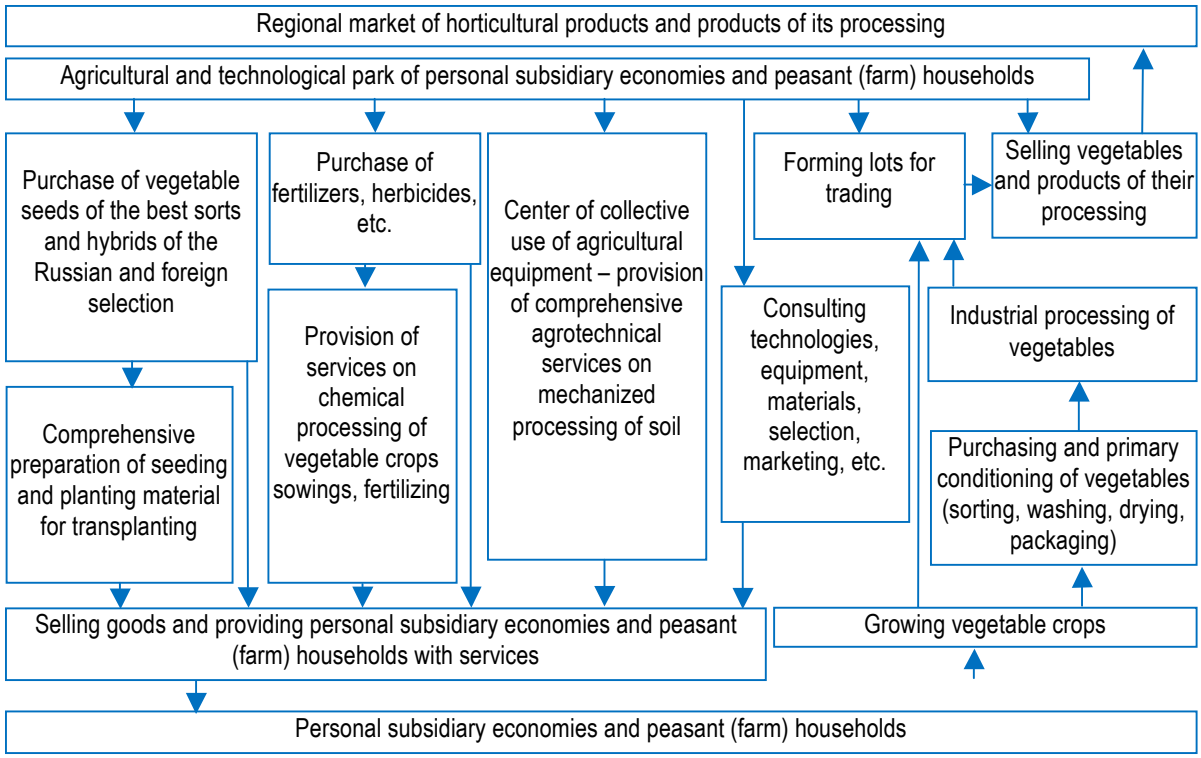

Figure 6 - Model of outsourcing agricultural technological park of households and farms

The functional area of the agricultural and technological park is limited by bilateral (multipartite) agreements with people's households and farmers. In accordance with them the agricultural and technological park can:

- purchase wholesale quantities of certified seeds of vegetable crops sorts and hybrids, prepare (warm, pretreat, enrich with micro-elements, process against virus diseases, and sprout) seeding and planting material,
- purchase wholesale quantities of mineral fertilizers, herbicides and other means of agricultural chemistry, perform works on adding them in soil,
- render comprehensive agro-technical services on performing the whole cycle of mechanized field works on the basis of the center of the collective use of agricultural equipment that functions on the basis of principles of machine and technological stations,
- consult on issues related to agricultural methods of growing vegetable crops, popularize and promote innovations, and
- organize purchasing of vegetables, transportation to the places of primary conditioning or to the canned vegetables enterprises with subsequent selling via its own trading capacities or to wholesaling intermediaries and retailing chains.

The innovational component of the activity of agricultural and technological parks must become their important aspect. It is provided by the partnership with regional industrial universities and research institutes.

The expected effects from outsourcing agricultural and technological parks in the vegetables production can include the improvement of the marketability of the production in personal economies and farm households,

creation of the specialized logistic production and processing and commodity distribution system in the small-scale sector of the habitat, and the growth of rural population's profits and stability of the development of rural territories. Herewith, the basic effect will be manifested notably in the growth of the marketability of production and transformation of consumer people's households into trading family farms, because now, with the share in the total production of vegetables being on the level of 70%, the marketability of people's households does not exceed 20%.

Conclusion

Thus, the results of the conducted researches prove the developed hypothesis and achievement of the set goal. The example of today's Russia proves the reasonability to form infrastructure clusters in the agrarian branch within the implementation of the policy related to overcoming external sanctions and import replacement. The conducted research considerably contributes to developing the clusters theory due to reconsidering the territorial and industrial approach and singling out infrastructure objects as promising centers of forming clusters in agricultural branches.

It is necessary to note the limitation of the research results in the form of the contradiction between the universality of the stated theoretical provisions, and principles of the development of infrastructure agrarian clusters with individual peculiarities of their applied implementation displayed through the example of the vegetables production, stipulated by operational and organizational inhomogeneity of the agrarian industry that consists of a number of agricultural branches and segments of the agro-food market.

That is why the directions of the future researches in the area of the impact of the permanently risky environment and external sanctions on the agrarian sphere, and the development of infrastructure agricultural clusters are related to the adaptation of the developed models and practical recommendations to the specificity of separate agricultural branches.

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Growing Skepticism towards Transatlantic Trade and Investment Partnership in Europe – Causes and Consequences

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Abstract:

The goal of this article is to analyze the development of public support for the TTIP agreement in Europe and to identify the main factors causing the growing skepticism with the treaty. The first part of the article describes the state of TTIP negotiations since their beginning in 2013 until today, while the second part focuses on the analysis of the public support for the agreement using the Eurobarometer public opinion survey. The final part of the article analyses the TTIP debate in Germany – one of the most TTIP skeptic countries in Europe. In this part, we examine the key factors driving the public debate in Germany and study the positions towards TTIP in key stakeholders' groups – general public, political parties and interest groups. The article shows that the cautious German disapproval of TTIP has evolved into a broad social opposition within a short period. Some of the stakeholders, who had initially voiced skepticism but supported the agreement in principal, have become outright opponents of the treaty. They do not see the possibility to improve some of the controversial provisions of the treaty during the negotiations process as real.

Keywords: Transatlantic Trade and Investment Partnership (TTIP), public support, skepticism, Germany.

JEL Classification: F13.

1. Introduction

The increasing volume of global trade in the 1990s led to an elevated interest in international cooperation in trade related issues. While global trade talks within the WTO framework collapsed in the first years of the 21st century, key players in the global economy were trying to secure free trade entry to their key markets via regional and bilateral trade agreements. Because of this trend, the number of free trade agreements registered at the WTO increased considerably after the year 2000. Despite the considerable number of trade agreements being negotiated in the global economy, the public showed limited interest in these initiatives.

After the Doha negotiations within the WTO framework remained deadlocked, the USA were seeking to strengthen ties with their strategic allies in Europe and East Asia (Gamble 2015). Thus, in a radical departure from the trade policy practiced for several decades (Hayes 2015), the USA initiated the Transatlantic Trade and Investment Partnership (TTIP) with the EU and the Trans-Pacific Partnership (TPP), which is a trade agreement with twelve Pacific Rim countries. Although there was an initial public support for these trade agreements in most countries involved, they came under increasing public scrutiny after certain political parties and environmental non-governmental organizations made an important topic from these technocratic trade agreements.

The goal of this article is to analyze the development of public support for the TTIP agreement in Europe and to identify the main factors causing the growing skepticism with the treaty. The first part of the article describes the state of TTIP negotiations since their beginning in 2013 until today, while the second part focuses on the analysis of the public support for the agreement using the Eurobarometer public opinion survey. The final part of the article analyses the TTIP debate in Germany – one of the most TTIP skeptic countries in Europe. In this part, we examine the key factors driving the public debate in Germany and study the position towards TTIP in key stakeholders' groups – general public, political parties and interest groups. Additionally, we ask whether only traditional free trade skeptics oppose TTIP or there is a general shift towards free trade and globalization skepticism across social classes, political parties and other interest groups.

2. Transatlantic Trade and Investment Partnership

The idea of a free trade agreement between the EU and the USA is not new; it was on the table in various forms since the early 1990s. Although trade barriers between the EU and the USA are relatively low in the WTO

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global framework, there were always voices suggesting that a harmonization of regulation could lead to significant economic gains from increased trade volumes for both partners. The support for an EU-USA trade agreement increased after the collapse of the WTO Doha around of global trade negotiations with corporate lobbyists pushing for a bilateral trade agreement between the two biggest economies in the global economy. German chancellor Angela Merkel voiced her support for a trade agreement between the EU and the USA already in 2006 (Spiegel Online International 2006).

The notion of a free trade agreement between the EU and the USA started to solidify after 2007, when both partners created the Transatlantic Economic Council. This advisory board, that consists of representatives from firms operating on both sides of the Atlantic with the goal to advise the European Commission (EC) and the US government, created a high-level expert group in 2011 in order to consider negotiations of a tree trade treaty between the EU and the USA. The work of this expert group resulted in a report published on 11th February 2013 that strongly endorsed negotiations about free trade between the EU and the USA (Mayer 2015).

Events started to move quickly after the publication of the report, as President Barack Obama used his annual State of the Union speech the next day (12th February 2013) to invite the EU to start formal negotiations on a free trade agreement. On 13th February 2013, the president of the USA, the president of the European Commission and the president of the European Council made a joint announcement to the effect that the EU and the US have agreed to launch formal negotiations on the TTIP with the aim of signing an agreement in the following years. The European Commission received the green light to start talks with the USA from the EU member states in June 2013 and the first round of negotiations was held in Washington in July 2013 (European Comission 2015). Despite previous unsuccessful aspirations and some severe obstacles, there was a strong political will and huge optimism about the mutual economic benefits (Mayer 2015).

TTIP belongs to a new type of trade agreements that go beyond the abolition of tariffs and non-tariff barriers between the participating parties. The proposed agreement covers a wide range of issues – such as market access for good and services, regulatory cooperation in specific sectors, public procurement or investor protection. TTIP will not include financial services or air transportation as these sectors are subject to a different kind of policies (Grancay and Szikorova 2014).

The wide range of topics makes negotiations complicated, as some of the issues are very sensitive. The agreement is divided into 24 chapters and a joint EU-US working group is negotiating every chapter. At first, position papers are exchanged, introducing each side's aims and ambitions. These are followed by textual proposals from each side, accompanied by each side's "initial offer". The negotiations and draft documents can evolve through various stages of their development. When both sides are ready, a consolidated text is prepared, with remaining differences for discussion expressed in square brackets. These texts are then provisionally closed as a working consensus is reached in each topic.

The TTIP negotiations are organized in regular rounds that alternately take place in Brussels and in the USA. Until today, 14 rounds of negotiations were held. The last round took place in July 2016 in Brussels. The nature of the negotiations is very secretive, as they are held behind closed doors and all participants must sign non-disclosure agreements. Thus, the public receives only sparse information from the negotiations. However, growing public pressure from political parties and non-governmental organizations in Europe forced the European Commission to improve the transparency of the negotiations and to release more comprehensive information.

3. Public support for Transatlantic Trade and Investment Partnership

Traditionally, trade agreements have not been at the top of the public debate agenda. For instance, in 2010, the EU signed a free trade agreement with the Republic of Korea without facing any serious public concerns during the negotiation and ratification process. TTIP (and likewise CETA between the EU and Canada) is an agreement of a new type, provoking huge interest in the public as well as in civil society. While traditional trade agreements were aimed mainly at reducing tariff and non-tariff barriers, the main objective of TTIP lies in the harmonization of the regulation framework in key industries of the USA and the EU. Since the EU and US regulators work within very different institutional and legal frameworks (Hayes 2015), standards in the USA and the EU differ significantly in many industries. This fact has triggered serious concerns in the public.

Table 1 - Public support for TTIP in the EU member states November 2014 – November 2015 (%)

	November 2014			May 2015			November 2015		
	For	Against	Do not know	For	Against	Do not know	For	Against	Do not know
EU	58,27	25,18	16,55	56,30	28,13	15,57	52,93	31,67	15,40
Austria	39,05	52,62	8,33	23,45	67,05	9,50	22,16	70,36	7,49
Belgium	65,83	25,87	8,29	53,16	35,11	11,74	59,30	30,43	10,27
Bulgaria	64,02	13,92	22,07	66,73	15,41	17,86	57,58	21,35	21,06
Croatia	66,83	23,35	9,82	63,39	25,99	10,62	55,10	33,8	11,10
Cyprus	58,88	24,75	16,37	63,27	21,36	15,37	59,8	28,6	11,60
Czech Republic	61,86	25,05	13,09	62,10	23,11	14,79	49,21	36,98	13,81
Denmark	70,62	16,83	12,55	65,78	17,65	16,57	61,84	23,48	14,69
Estonia	72,65	10,68	16,67	63,34	14,19	22,48	58,07	14,94	26,99
Finland	62,28	20,56	17,17	57,65	21,82	20,53	56,63	21,73	21,64
France	50,00	32,41	17,59	52,56	32,8	14,64	50,00	33,82	16,18
Germany	38,70	41,18	20,12	31,08	50,9	18,02	27,07	58,59	14,34
Greece	60,85	32,21	6,94	65,93	27,86	6,21	63,77	28,94	7,29
Hungary	62,05	27,50	10,45	62,78	26,04	11,17	53,31	34,32	12,37
Ireland	71,03	14,99	13,99	77,21	11,69	11,10	69,19	17,65	13,16
Italy	57,73	21,87	20,39	58,31	23,81	17,88	55,22	25,98	18,80
Latvia	65,70	18,25	16,05	61,89	21,00	17,11	57,54	26,77	15,68
Lithuania	79,04	8,78	12,18	79,36	6,48	14,16	77,61	8,36	14,03
Luxembourg	39,53	43,28	17,19	37,18	48,51	14,31	40,12	47,04	12,85
Malta	74,90	10,67	14,43	79,52	6,96	13,52	71,17	14,31	14,51
Netherlands	74,16	17,62	8,22	63,37	26,93	9,70	52,88	35,78	11,34
Poland	72,70	11,62	15,68	71,47	13,51	15,02	65,45	17,08	17,47
Portugal	59,60	23,28	17,11	59,64	23,18	17,18	60,53	23,64	15,83
Romania	74,56	11,49	13,95	77,86	10,43	11,72	71,87	12,64	15,50
Slovakia	62,39	25,65	11,96	56,14	28,73	15,13	50,34	37,20	12,46
Slovenia	56,64	31,52	11,84	45,73	42,26	12,00	40,75	46,69	12,56
Spain	63,41	18,39	18,20	63,07	19,06	17,86	62,57	19,96	17,47
Sweden	59,04	25,90	15,05	63,78	23,51	12,72	59,43	27,41	13,16
United Kingdom	65,22	18,53	16,25	63,32	20,29	16,39	62,48	22,53	14,99

Source: Eurobarometer surveys 82.3, 83.3 and 84.3

A first EU-wide inquiry on the public support for TTIP was carried out in November 2014 within the framework of the Eurobarometer survey, which is a series of public opinion surveys conducted regularly on behalf of the European Commission since 1973. As a unique source of cross-national and cross-temporal data, the Eurobarometer is an important indicator of the evolution of public opinion in all EU member states. With regard to TTIP, there are hitherto three available Eurobarometer surveys – Fall 2014 (Eurobarometer 82.3), Spring 2015 (Eurobarometer 83.3) and Fall 2015 (Eurobarometer 84.3). The time series are thus relatively short; however, they clearly demonstrate basic trends in the support for TTIP on the national as well as EU level. There are other surveys with regard to TTIP, but these are usually carried out at the country level. Despite some divergences,

they all show the same trend of a declining support for TTIP. We chose Eurobarometer as the starting point of our analysis because of the possibility to compare the results across EU member countries. We will refer to other, more detailed surveys, later in the article, discussing the specific case of Germany.

Considering the EU level data, a clear trend in the evolution of the public support for TTIP can be observed. In the fall of 2014, there was still a relatively strong support for the TTIP with 58% of the respondents expressing their consent with the agreement and only 28% explicitly rejecting it. However, within a year the public support for TTIP has fallen sharply. By fall of 2015, the agreement was supported only by 52%, which is still a majority but a very fragile one, and it is highly probable that it will drop under the 50% threshold during the year 2016.

There are of course considerable variations across EU member states. In 2014, the group of the biggest supporters of TTIP could be divided into two subgroups. The first subgroup consisted of several new EU member states from Central and Eastern Europe (CEE) such as Lithuania (79% support), Romania (74%), Poland (72%) or Estonia (72%). This could be explained by the fact that people in these countries still have more trust in free trade and market economy.[2] The second subgroup consisted of smaller states from the original EU15 which are very open and trade-dependent - for instance the Netherlands (74% support), Ireland (71%), Denmark (70%) and Belgium (68%).

A year later, the declining enthusiasm for TTIP is clearly visible in almost every member state. While in 2014 there have been eight member states exceeding the 70% level of support, in 2015 we can find only three such states. The biggest decline in support for TTIP was recorded in the Netherlands, where the public opinion has undergone a dramatic change, with support plunging from 74% to only 52%. The biggest support can still be found in two new member states – Lithuania (78%) and Romania (72%). The support for TTIP remains unchanged in France (50%) and has slightly (by less than 1 percentage point) increased in Cyprus, Luxembourg, Sweden and Portugal. Interestingly, the only country where the support for TTIP increased noteworthily (by almost 3 pp), is Greece, a country experiencing a deep economic and social crisis. The support for TTIP remains comparatively high in the EU context despite the disappointment from the market economy and liberal economic policy.

Looking for the countries with the lowest support for TTIP, we can clearly identify three states that have been very skeptical (public approval less than 40%) towards the agreement since the very beginning – Germany, Austria and Luxembourg. While the numbers have remained almost the same for Luxembourg, support has plunged dramatically in Germany (by 12 pp) and Austria (by 17 pp). These are momentarily the only two countries with a support level below 30%.

What is behind the rapidly fading public support for TTIP in Europe? When the negotiations on TTIP started in 2013, it was a low-interest topic for the public, thus the dominating narrative was the one of the TTIP promising higher economic growth, creating new jobs and boosting the transatlantic cooperation not only in the economic area but in other policy areas as well. TTIP was praised as the largest, most ambitious and comprehensive bilateral trade initiative ever negotiated, with a potential to set an example for future partners and agreements (De Gucht 2015). It has been considered more than a classic trade agreement limiting itself to reducing tariffs and opening markets. As the greatest obstacle to business currently lies in the regulatory framework, the importance of TTIP is in the elimination of these non-tariff barriers (Bacaria 2015). However, the initial enthusiasm about TTIP has faded completely and the public debate became dominated by the agreement´s opponents. The TTIP critics present a wide range of arguments, ranging from very specific issues such as chlorine-washed chickens and hormone-treated cattle to more general concerns about democracy being undermined through secretive negotiations and corporate tribunals challenging national laws (De Ville and Siles-Brügge 2015). Apparently, TTIP became a convenient vehicle for a wide range of concerns (Mayer 2015) and the anti-TTIP movement uses the agreement as a perfect mobilizing tool to raise awareness towards a broader formulated criticism of capitalism, globalization processes or the perceived economic and political hegemony of the USA. The declining polls are threatening a successful conclusion of the negotiations and are casting doubt on the desirability of the ambitious goals delineated in the TTIP. The future prospects of the TTIP depend heavily on the way in which the public debate will evolve in the countries of the key players. Nowhere in Europe is the debate as lively as in Germany, the country considered the decisive political and economic force in Europe

[2] The attitudes towards free trade can also be found in the Eurobarometer surveys. According to the last Eurobarometer edition (November 2015), the most positive perception of free trade was observed in Lithuania (85% of respondents had a very or a fairly positive image of free trade). Poland was third (79,3 %), Estonia tenth (75,8%). Interestingly, the support in general for free trade was relatively low in Romania (65,8), a country showing on the other hand a high support for TTIP.

(Mayer 2015). Thus, understanding the specifics of the German debate is essential for assessing the general prospects of the whole TTIP project; especially in a situation when the public support for the increasingly controversial project has fallen sharply since the start of the negotiations in 2013. Therefore, in the next section, we will discuss the factors behind the growing skepticism towards TTIP in Germany in more detail.

4. The German Transatlantic Trade and Investment Partnership debate

Germany is known as a country that has a strong tradition of public mobilization (Morin *et al.* 2015). Consequently, it is experiencing one of the most heated national debates on TTIP (De Ville and Siles-Brügge 2015). In Germany, the TTIP is seen not purely as a classic trade-agreement. It is rather being discussed in a broader historical and geo-political context. Issues such as the already mentioned chlorine-chicken or the fear of unlabeled genetically modified foods from the USA flooding the European market, served as convenient and powerful symbols, but the roots of the fierce TTIP opposition have to be sought for elsewhere. The relatively technocratic trade agenda of TTIP has become intertwined with geo-political, geo-strategical and even ideological concerns. In the eyes of many Germans, the TTIP is the ultimate product of the neoliberal agenda and a vehicle for enforcing US interests in Europe. Furthermore, the mobilization against TTIP was also supported by the highly critical debate in the German media.

According to Mayer (2015), the German debate on TTIP developed a "very unique dynamic", integrating a wide range of overlapping concerns. Mayer identifies three groups of arguments. Firstly, there is a set of concerns regarding technical questions of trade standards, investor-state relations and consumer protection. Secondly, there are wider concerns regarding the preferred nature of capitalism, German foreign policy and transatlantic partnership in general. Finally, there are philosophical considerations about the relationship between the individual and the state or freedom vs. security. In order to add empirical evidence to Mayer´s observation, we look at the data from surveys carried out by German institutes conducting demoscopic research. We ask whether only traditional free trade skeptics oppose TTIP or whether there is a general shift towards free trade and globalization skepticism across social classes, political parties and other interest groups.

In the next part of the paper, we look separately at three groups of stakeholders in Germany: general public, political class and main interest groups. Our analysis is based on a combination of secondary data sources and a wide variety of empirical evidence provided by institutions conducting demoscopic research. As there is only one general question regarding TTIP in the Eurobarometer survey[3], we have collected data from various German institutions, which provide a more complex picture of the issue of our interest.

4.1. Public debate

The hitherto most detailed survey on TTIP was conducted by the German Institute for Demoscopy Allenbach (IfD) in 2015. We will use primarily the data provided by IfD Allensbach to assess the dimensions of the public protest against the TTIP, as outlined by Mayer. When necessary, we revert to data provided by other institutions. In addition to the three dimensions defined by Mayer (technocratic, geopolitical and philosophical concerns), we define two more parameters – concerns regarding the negotiation process (transparency, lack of information, the influence of lobby groups) and considerations regarding the economic benefits of the project. We will proceed from the more concrete issues, starting with the economic benefits and procedural issues, continuing with political, strategical and ideological concerns and finally touch upon some philosophical considerations regarding TTIP.

The question, whether the projected economic benefits of TTIP benefits to economic growth and consumer well-being are exaggerated, is particularly important for Germany as one of the leading world exporters. The European Commission´s assessment of the likely benefits of TTIP is based on an analysis carried out by the Centre for Economic Policy Research (CEPR)[4]. CEPR predicts that the overall impact of an ambitious TTIP would be an increase in the size of the EU economy around 0.5% GDP in the EU and 0.4% of GDP in the US (European Commission 2013). However, the study has been widely discussed and objections have been raised pointing to possible adverse economic effects. For instance, Dieter (2014) criticized the study for not taking

[3] The question regarding the support for TTIP can be found in the Eurobarometer questionnaire under the number QA15 (Please tell me for each statement, whether you are for it or against it), statement No. 5: A free trade and investment agreement between the EU and the USA.

[4] CEPR is a leading independent pan-European economic research organization. The CEPR study uses a state-of-the-art CGE (computable general equilibrium) model to simulate the impact of TTIP. As the European Commission, has admitted, it is important to understand limitations of CGE models, thus the figures are best understood as indications of the economic effects rather than precise predictions.

the negative repercussions of preferential agreements into account. According to Dieter, TTIP will create considerably fewer jobs than expected due to grave deficiencies in the economic model presented in the CEPR study. De Ville and Siles-Brügge (2015) criticize the researchers for feeding the model with biased and unrealistic data, thus overstating the gains from transatlantic liberalization and downplaying the potential costs.[5]

Experts are not the only group voicing their doubts about the positive effects of TTIP. The growing concerns over TTIP found their way also into the German public. As showed in the previous section, the public support for TTIP in Germany declined by almost 12 pp within 12 months (the number of opponents rose by more than 17 pp). We can gain an even better picture of the way how the German public is assessing the impact of TTIP on the economy, looking at the above-mentioned survey by IfD Allensbach (Table 2). In 2015, only 27% of respondents saw the advantages of TTIP for the economy and even less considered the agreement being of advantageous for consumers (23%).

Table 2 – Public perception of TTIP in Germany 2014 - 2015

Advantage/Disadvantage in %		2014	2015
For the economy	Advantages	27	26
	Disadvantages	26	22
	Evenly distributed	23	26
	Do not know	24	26
For the consumers	Advantages	23	23
	Disadvantages	33	32
	Evenly distributed	21	23
	Do not know	23	22

Source: IfD Allensbach 2015 (Question: Do you see the free trade agreement with the US having more advantages or disadvantages?), own translation and processing.

There were some even more specific questions with regard to the economic benefits included in the study by Allensbach (Table 3). Generally, we can say that the German public is quite skeptical about the possible benefits for consumers and neither do Germans believe in TTIP creating new jobs in Europe. They are, however, more optimistic with regard to the effects on German exports and on the economy, as a whole. On the other hand, they expect difficulties resulting from the increased competition of US enterprises.

Table 3 – Public perception of the economic benefits of TTIP in Germany, 2015 (in %)

Do you agree with the following statement?	All	Proponents	Opponents
Because of TTIP many European companies will encounter difficulties resulting from increased US competition	54	41	76
Exports to the USA will increase due to TTIP	46	62	36
The economy of the EU will benefit from TTIP	44	72	21
Consumers will benefit from TTIP because of sinking prices	28	44	16
New jobs will be created through TTIP in Europe	27	40	12
TTIP provides good export chances for European food companies offering a wide variety of products	50	68	27

Source: IfD Allensbach 2015, own translation and processing.

There is even more skepticism with regard to technocratic issues of TTIP, what is mirroring the overwhelming German preference for European regulations over US ones. A majority of Germans believe that German environmental and food quality standards (79%) as well as product safety standards (68%) are higher than in the US. Therefore, although a significant majority of Germans believes, that harmonization of standards is a good thing (62%); they fear US products of lower quality entering the EU market (67%). The issue of differing standards in the production process, environmental protection and consumer´s safety has become one of the main argument of the anti-TTIP campaign. It offers illustrative examples (chlorine chicken) which appeal to the general public more than concerns about trade tariffs or investor-state dispute settlement.

From the onset of the negotiation process, there was a lot of criticism regarding the lack of transparency and restricted access to the drafts of negotiation positions. The real content of the negotiation positions had been kept secret until the growing pressure from public and from some political parties became unbearable and limited

[5] For an overview of various estimates of economic gains from TTIP, see Federica Mustillis article: *Estimating the Economic Gains of TTIP*

access to negotiation documents has been provided to German MPs. However, the provisions of this access have been criticized as inacceptable and the widespread feeling that the agreement is negotiated upon behind closed doors between politicians, lobby groups and corporations, has not faded. 79% of the respondents in the IfD Allensbach study (2015) stated that they had not enough information about the negotiation process. According to a survey by Infratest dimap (2016b), 83% of respondents criticized the secretive nature of the negotiations. Another concern regarding the negotiation process is the low level of trust in the capability of the EU (32%) to represent the European interests. 68% of the respondents in the IfD Allensbach study (2015) expressed the opinion that the US will prevail in most points included in the negotiation agenda.

The decreasing public support is definitely not only a matter of the technocratic nature of the agreement. TTIP has become inextricably linked to broader considerations regarding the very nature of the transatlantic partnership. According to Hamilton (2014), geopolitical considerations can play an equally important role as the economic calculus in strengthening or weakening the support for TTIP among key constituencies both inside and outside the transatlantic community. Furthermore, the transatlantic alliance has recently been challenged by the National Security Agency (NSA) scandal. The revelations about the US spy program collecting metadata on Europeans and the allegations that the US had even tapped the mobile phone of the German chancellor Angela Merkel led to a decline in the positive perception of the US as a reliable partner (Mayer 2015). In 2014, a year into the NSA affair, only 38% of Germans considered US as a trustworthy partner (Infratest dimap 2014). Recently, with the NSA scandal losing its salience, the trust in the US has recovered, reaching 58% in April of 2016 (Infratest dimap 2016a), but falling down again to 53% in June 2016 (Infratest dimap 2016c).

Still, the opposition against TTIP is not driven solely by current problems of US-German relations. The growing antipathy towards the agreement is also fueled by more general fears of US hegemony. The majority of Germans believe that the US would profit more from the agreement. Additionally, 64% see the influence of US corporations on Europe rising significantly due to TTIP. Nonetheless, 44% think that TTIP is important for both the US and Europe to compete successfully with China (IfD Allensbach 2015).

As already suggested, some of the considerations regarding TTIP are of a deeper, philosophical nature. These concerns triggered a debate about some of the very basic fundaments of the German society and economy. Such a debate is called in German “Grundsatzdiskussion” and touches upon issues such as the relationship between the state and the individual, between freedom and security or data protection and privacy (Mayer 2015). In the case of TTIP, these concerns were fueled mainly through the issue of the Investor-state dispute settlement (ISDS) which is an instrument of public international law, included in the TTIP, that grants an investor the right to use dispute settlement proceedings against a foreign government. This instrument is considered a threat to the democratic decision-making process in Europe (and in a lesser extent in the USA) and is opposed even by many of those who are in favor of the agreement as such. In addition, TTIP is seen as a vehicle for pushing the neoliberal agenda and many Germans see the European social democratic model under threat. Thus, not only TTIP came under fire in Germany, but the very notion of free trade itself. As a survey by Bertelsmann Stiftung (2016) reveals, almost 30% have a critical view of free trade in general, which is a clear increase in comparison with the results of a previous survey made by Pew Research Center in 2014. While in 2014, the idea of free trade in general was supported by 82%, in 2016, it dropped to only 56%.

4.2. Political parties

After having analyzed the trends in the opinion on TTIP in German public, we now turn our attention towards the positions of German political parties, looking for possible dynamics driven by the rapidly decreasing public support for the transatlantic free trade agreement.

The German government has been one of the major promoters of TTIP (Poplawski 2015). The parties of the Great Coalition (Christian Democratic Union/Christian Social Union - CDU/CSU and Social Democratic Party - SPD) declared their clear support for the project in their Coalition agreement signed in 2013 (Koalitionsvertrag 2013). Despite the increasingly critical and adversarial tone in the German public debate on TTIP, the official position of the German government has remained unchanged, however critical voices have been raised more and more often, especially by members of SPD, who have found themselves under increasing pressure from left-wing circles (Poplawski 2015). Whilst Chancellor Merkel has repeatedly urged to speed up the negotiations, Vice-Chancellor Sigmar Gabriel, the leader of SPD and Minister of Economy, has slowly abandoned his somehow ambivalent position and openly criticized Angela Merkel for her hasty approach towards the TTIP negotiations (Zeit Online 2016). Merkel repeated her supportive stance on numerous occasions, recently during the visit of president Barack Obama to Germany in April 2016 and declared that Germany should be able to conclude negotiations “under any circumstances” by the end 2016. Gabriel´s move is perfectly understandable when taking

into account the context and recent dynamics of German politics. SPD has been in a steady decline for years and is losing appeal among voters from its traditional working class constituencies. Social class is one of the primary cleavages on voting behavior (Lippset/Rokkan 1967). Social democracy has traditionally promoted social justice and the rights of working class. However, under Chancellor Gerhard Schroeder (1998 - 2005), the SPD underwent a major shift in its policies, moving the position of the party towards the political center. As a result, the party has lost many voters to parties not only to the far-left (Die Linke) but surprisingly to the far-right as well (Alternative for Germany). As TTIP is seen by many as an "assault on the working class", by adopting a very critical stance towards the agreement the SPD tries to fight the plunging polls and win back some of its former voters. However, the assumption that the working class of the society is overproportionately opposed to TTIP is not supported by empirical evidence. We have used the Eurobarometer data to analyze the demographic structure of the TTIP protest and found out that the protest against TTIP (Table 4) is even stronger in the middle and lower middle class. The working-class support for TTIP in the latest Eurobarometer survey in November 2015 (27.4 %) corresponded with the average support in Germany (27.1%). Not surprisingly, the highest number of supporters can be found among the members of the higher class of the society.

Table 4 – TTIP approval in Germany according to social class, 2014 –2015 (in %)

Social Class*	For		Against		Do not know	
	2014	2015	2014	2015	2014	2015
The working class	37,8	27,4	39,5	52,7	22,6	19,9
The lower middle class	39,1	25,0	42,2	58,3	18,7	16,6
The middle class	38,9	28,2	42,1	60,2	19,0	11,5
The upper middle class	39,4	26,1	41,0	61,1	19,7	12,8
The higher class	66,7	42,5	24,4	27,6	8,9	29,9
Other (SPONT.)	43,8	0,0	56,2	62,8	0,0	37,2
None (SPONT.)	32,7	43,7	40,3	50,1	27,0	6,2
Refusal (SPONT.)	49,4	23,7	30,4	59,2	20,2	17,2
TOTAL	38,7	27,1	41,2	58,6	20,1	14,3**

Source: Eurobarometer 82.3 (November 2014) and Eurobarometer 84.3 (November 2015). Datasets available at GESIS Data Catalogue 2.1. Zacat online analysis tool was used for the analysis.

Note: *Social Class was determined by self-assessment. ** The factor for population size weighting "WEIGHT GERMANY" was applied. For more information on the weighting procedure see: http://www.gesis.org/eurobarometer-data-service/survey-series/standard-special-eb/weighting-overview/

Similarly, an analysis of the TTIP support when taking into account the positioning of the Eurobarometer survey respondents on a left-right scale from 1 to 10, offers interesting results. As expected, those who positioned themselves left are overproportionately against TTIP. However, we can observe an interesting dynamic in the Right group, which has seen the biggest decline in the support (by almost 20%) and an even bigger increase in the refusal (by almost 25%), as the number of those who do not have an opinion, has declined. A remarkable change can be observed in the Right Group in East Germany, where the support has dropped from 52% to 13% and the refusal has risen from 38% to 86%. This could be explained with the emergence of a new political party on the German political stage – the right-wing populist Alternative for Germany (AfD). AfD was established in 2013 as an opposition to the euro rescue policies pursued by the German government during the sovereign debt crisis in the Eurozone. From the onset, there were tensions in the party with regard to TTIP positioning. After the party split in July 2015, the liberal wing that had supported TTIP, left the party. The opposition against TTIP became the party´s official stance and was reflected in the new party program adopted in April 2016 (AfD 2016).

Table 5 – TTIP approval in Germany according to Left-Right placement, 2014 –2015 (in %)

Country/Region	Left-Right placement	For		Against		Do not know	
		2014	2015	2014	2015	2014	2015
All	(1 - 4) Left	31,4	24,8	54,3	66,3	14,3	8,8
	(5 - 6) Centre	43,7	30,1	37,0	55,8	19,3	14,2
	(7 -10) Right	46,4	26,7	35,8	60,2	17,8	13,0
	DK/Refusal	27,3	20,5	34,0	49,3	38,7	30,1
Germany - West	(1 - 4) Left	27,5	22,2	56,0	68,4	16,4	9,3
	(5 - 6) Centre	43,7	30,9	36,3	54,7	20,0	14,4
	(7 -10) Right	45,5	29,2	35,5	55,5	19,0	15,2

Country/Region	Left-Right placement	For		Against		Do not know	
		2014	2015	2014	2015	2014	2015
	DK/Refusal	28,9	21,0	33,3	47,2	37,9	31,8
Germany - East	(1 - 4) Left	42,6	32,1	49,3	60,4	8,1	7,5
	(5 - 6) Centre	43,8	26,3	39,7	60,4	16,5	13,3
	(7 -10) Right	51,6	13,2	37,8	85,6	10,5	1,2
	DK/Refusal	16,1	17,4	39,3	64,2	44,6	18,4
TOTAL		38,7	27,1	41,2	58,6	20,1	14,3

Source: Eurobarometer 82.3 (November 2014) and Eurobarometer 84.3 (November 2015). Datasets available at GESIS Data Catalogue 2.1 Zacat online analysis tool was used for the analysis.

Note: *Left-Right placement was determined by self-assessment on a scale from 1-10 and recoded to 3 categories. **The factor for population size weighting "WEIGHT GERMANY" was applied. For more information on the weighting procedure see: http://www.gesis.org/eurobarometer-data-service/survey-series/standard-special-eb/weighting-overview/

As Sigmar Gabriel made it clear that he will insist on the removal of the most controversial provisions (especially the ISDS), CDU/CSU remains the only party in the Bundestag supporting the TTIP almost unreservedly (Poplawski 2015) and trying to denounce many of the TTIP opponents 'arguments as myths (CDU 2015). The Liberals (FDP), traditionally proponents of free trade, narrowly missed the 5 % threshold for entering the Bundestag in the 2013 federal election for the first time in the post-war history. The position of FDP remains in favor of TTIP, although they voiced some concerns over civil rights issues. As individual freedoms are essential for Liberals, they demand an agreement on data protection be linked with the TTIP (FDP n.d.).

The remaining political parties in the Bundestag, The Greens and the Left Party, are clearly against the TTIP from the onset. The Greens oppose the agreement principally, criticizing a trade policy oriented exclusively on liberalization. In the view of the Greens, CETA and TTIP go in a completely false direction, hampering the inevitable socio-ecological transformation of the world economy. They call for a modern trade policy, using a catchy slogan – "fair trade instead of free trade" (The Greens 2015, 2016). A similar argumentation is used by the Left Party that accentuates the alleged lack of democratic legitimacy and sees the TTIP as a dictate from the already privileged large corporations. It is also fueling anti-American sentiments that are on the rise in Germany for reasons discussed above. Therefore, it supports actively the European Citizens' Initiative "STOP TTIP" (Die Linke n.d.).

As we can see, the positioning towards TTIP has been extremely difficult especially for the parties of the coalition government. While in the CDU/CSU doubts over TTIP have been neutralized by the strong and regularly repeated commitment of Chancellor Merkel, the leadership of SPD gradually adopted the reservations voiced at the grass roots as well as in the public. Deputy Chancellor Gabriel made it clear that he will not accept a bad deal. If TTIP will have to be ratified also by consent from national parliaments, to add legitimacy to the process, the hitherto ambivalent position of SPD will have to be cleared.

4.3. Other interest groups

The positions of the political class have to reflect the opinion of the public as well as the opinion of various interest groups. On the other hand, political parties often rely on the help of interest groups and NGOs with shaping the general mood in the society towards specific issues. In the case of TTIP, the CDU/CSU counts on its traditional ally – the Federation of German Industries (Bundesverband der Deutschen Industrie, BDI). BDI is campaigning in favor of the agreement from the very beginning, with industry representatives denouncing the arguments of the anti-campaign as myths and half-truths (Mayer 2015). The official position of the BDI representatives mirrors the optimistic view of the majority of German companies. Surveys, regularly carried out by the Association of German Chambers of Industry and Commerce (DIHK), show that despite the erosion of the public support for TTIP, German companies remain positively tempered towards the deal. In a 2013 survey, 60% of the companies operating abroad regarded TTIP as (very) important (DIHK 2013). The surveyed companies named the harmonization of the different regulatory frameworks in the EU and the US as the highest priority (75%). The reduction of tariffs was second (61%) and dispute settlement regulation a distant third (25%). In 2014, the number of companies having a positive view of TTIP rose to 70%. Only 3% had a negative view, the rest remained neutral (DIHK 2014). The last available survey by DIHK (2015) focused on expectations and priorities of internationally operating companies with respect to TTIP. Almost half (47%) of the companies surveyed does business with the USA, the vast majority of which indicate that they are confronted with barriers to trade. They expect that TTIP can help to remove existing barriers. The survey revealed that the most relevant topics for the

companies were simple rules of origin (90%), the simplification of customs handling (89%), reduction of non-tariff barriers (88 %), regulatory cooperation (86%) and the reduction of tariffs (85%).

Nevertheless, there are differences in the perception of TTIP´s effects across industries. The size of the enterprise also plays a role. There are for instance controversial opinions on the effects of TTIP on the food industry. On one hand, it has been argued that TTIP could bring cost savings and other benefits for small food companies. On the other hand, many fear the competition from US farmers and warn about sensitive issues such as genetically modified food, product name protection or different (less strict) standards for food quality. A survey among German food companies (BVE & PWC 2014) showed that the firms see more chances than risks linked to TTIP. Of the surveyed companies, 47% expect higher exports to the USA thanks to TTIP and 27% expect less bureaucracy. Only 10% of the businesses fear disadvantages from increased competition. On the other hand, 40 % of the companies expect product innovation impulses. With respect to the company´s size, there is more skepticism among the small and medium-sized enterprises (SMEs). A survey carried out among 800 German SMEs (Prognos 2016) revealed that the SMEs expect positive effects on the corporations themselves but mostly negative on the economy as a whole and on the medium-sized businesses. The majority (70%) would also prefer multilateral solutions over a bilateral agreement with the USA. Only a few SMEs consider the ISDS an important instrument, 36 % of them fear disadvantages resulting from the application of this mechanism.

Trade unions are another major interest group in Germany. In many European countries, trade unions gained an insider role (Hyman 2015) but their influence on political decision-making process is perceived to be in a long-term decline (Landgraf and Heiko 2014). However, in Germany, the powerful Confederation of German Trade Unions (Deutscher Gewerkschaftsbund, DGB) is a traditional ally of the Social Democrats. With regard to the TTIP, the stance of the DGB has also been similar to that of SPD. In the beginning, German trade unions had not rejected TTIP completely, rather demanded an improvement of the agreement (Mayer 2015). They have expressed concerns over the adverse impact of trade and investment liberalization on the rights of workers and trade unions and conditioned their support for the deal with the implementation of ILO (International Labor Organization) standards by all participating parties (Sparding 2014). In September 2014, the Federal Ministry for Economic Affairs and Energy and the DGB published a joint paper on TTIP, presenting a set of requirements, including those on labour rights and consumer protection, welfare, and environmental standards. The ministry together with the trade unions expressed the belief that a well-designed trade agreement could contribute to fair and sustainable economic relations (BMWI 2014).

However, over the following months, the trade unions´ rhetoric sharpened and policy recommendations shifted (Mayer 2015). In the view of DGB, the negotiations moved into a wrong direction and should therefore be suspended. Drawing a consequence from this development, the DGB decided to actively support the European citizens´ initiative “STOP TTIP”. Subsequently, it participated in the organization of a hitherto biggest anti-TTIP and anti-CETA demonstration[6], which took place in Berlin on 10th of October 2015. The position of DGB is currently much closer to the position of the Greens – they do not oppose only concrete provisions of the agreement; they demand a free trade policy based on different assumptions. In a Newsletter published in May 2015, they state that after decades of the globalization of markets, globalization of social rights should follow. Further liberalization of markets has to be preceded by the creation of fair competition environment. Short-term cost savings cannot be achieved at the cost of labor and environmental standards (DGB 2015). The position of DGB put even more pressure on the SPD whose positioning on TTIP became a delicate balancing act. The latest statements of the Vice Chancellor Gabriel only prove that the opposition against the agreement within the party has reached a critical level. This could even lead to the withdrawal of the party´s principal endorsement of the agreement.

The decline in German public support for TTIP was largely driven by public mobilization by activists from a wide range of non-governmental organizations and civil society subjects: environmental organizations, consumer agencies, social and cultural organizations. More than 500 of them across Europe built an alliance against TTIP and CETA, organizing campaigns and actions to force a termination of the negotiation process. The STOP TTIP initiative argues that both free trade agreements pose a threat to democracy, the rule of law, the environment, health, public services, consumer and labor rights. Stop TTIP collected more than 3 million signatures against TTIP from European citizens; however, the European Commission (EC) rejected its application for registration as an official European Citizens´ Initiative (ECI). ECI is the sole available legal instrument, which can be used to call

[6] The number of participants (250 000) significantly exceeded the organizers' expectations. It was the biggest protest since marches against the Iraq war in 2003, and one of the largest in many decades, surpassing even the anti-nuclear protests of the 1980s.

the EC to make legislative proposals. Despite the rejection, the alliance has not stopped working; it operates as a "Self-organized European citizens´ Initiative". The TTIP coalition also filed a lawsuit against the EC (STOP TTIP n.d.).

The biggest success of the opposition movement so far has been the above-mentioned demonstration in Berlin. It was supported by three political parties (The Left Party, The Greens and The Pirate Party), by the Confederation of German Trade Unions and many NGOs, for instance the citizen movement Compact, environmental organizations like Greenpeace or WWF, organizations critical towards globalization like Attac or the consumer protection group Foodwatch. The demonstration showed that the opponents of TTIP succeeded in converting the initially low-interest theme into a highly salient topic. Additionally, with the help of a critically tempered media, they were able to establish issue ownership over this highly salient topic. While the critics of TTIP have been able to expose the claims made by proponents as over-exaggerated, the advocates have struggled so far to contradict many of the opponents´´ arguments in a convincing way. Partly because they were surprised by the intensity of the protest in the first place, partly because of a high level of professionalism and networking on the part of non-government organizations. It is not the aim of our article to assess which of the opponents´ arguments are legitimate concerns and which are misconceptions, as this seems often irrelevant in heated public debates driven by emotions and sentiments. However, the quickly fading support for TTIP indicates that they are at least perceived as legitimate by the general public. The numbers from the latest Eurobarometer (spring 2016) are not available but we can revert to national surveys which show the support for TTIP dropping immensely. In May 2016 (Infratest dimap 2016b) only 17 % of Germans saw the TTIP bringing rather advantages than disadvantages for Germany. When compared to June 2014, this is a drop by 14 % pp. Selling TTIP in Germany has become almost impossible.

Conclusion

Public opposition plays a key role in the political controversy over TTIP. In this article, we have examined the many facets of the German opposition against the TTIP, analyzing the positions of the general public, of key political actors as well as other interest groups.

We have shown that the cautious German disapproval of TTIP has evolved into a broad social opposition within a short period of time. The public debate dynamics can be characterized by several trends. Firstly, the opponents of TTIP succeeded in converting the initially low-interest theme into a highly salient issue. Secondly, as the public becomes better informed about the negotiations, it also becomes more skeptical towards TTIP. Thirdly, the focus of the debate has shifted from technocratic issues towards geopolitical, geostrategic or even philosophical considerations. As a result, TTIP is often linked to issues, which are not explicitly connected to the agreement. Finally, some of the stakeholders who had initially voiced skepticism but supported the agreement in principal, have become outright opponents of the treaty. They do not see the possibility to improve some of the controversial provisions of the treaty during the negotiations process as real. This applies to trade unions and increasingly also for Social Democrats.

We have also shown that the opposition towards TTIP is not confined to specific socio-economic groups or ideological alignments. The (lower) middle class in Germany is even more skeptical towards TTIP than the working class, which is usually seen as standing on the losers' side of such trade agreements. Although people positioning themselves as left are over proportionally against the agreement from the onset, people positioning themselves as right are rapidly turning into TTIP-skeptics as well, especially in Eastern Germany.

With regard to the position of German political parties, we can conclude that they have predominantly decided to reflect the public opinion instead of shaping it. The only party in the federal parliament still supporting the treaty is CDU/CSU, where Chancellor Merkel has managed to silence party-internal criticism so far. In her aim to complete the negotiations by the end of 2016, Chancellor Merkel can only rely on her last ally – The Federation of German Industries. However, they face a strong and growing opposition from the NGOs and trade unions. The still ambivalent position of Merkel´s coalition partner – the Social Democrats – will probably play a key role in the ratification process. With SPD adopting an increasingly critical view of free trade in general and calling for new, alternative approaches to trade policies, selling free trade agreements can become an unsurmountable challenge. However, with so much effort and political capital invested in the negotiation process, a complete cancelling would be seen as a major backlash to the already fraught transatlantic relations. On the other hand, pushing the TTIP agenda against the public will could have severe consequences on the democratic legitimacy of the decision-making process in the EU.

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Solutions to the Problem of Loan Default in Retail Segment

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Abstract:

Economic importance of solving the problem of reducing the level of arrears on retail loans, contributing to development of commercial banks and establishment of national banking system, determined the basic objective and relevance of the research. The article analyses the dynamics of volume and annual rate of increase in arrears on loans to households at the interim quarterly dates of 2010-2015, examines the structure of loan portfolios in arrears of the retail sector and conducts comparison with the same portfolio of non-financial entities, identifies the main causes of household debt to banks. We have concluded that the banks need to focus on developing their own tools and technologies of debt recovering related to early detection of bad debts in order to take measures to prevent bad debts, which is possible when investing money in their own analytical and technological tools. We proposed an approach to the segmentation of debts and factors that can be used as indicators in the process of maintenance and servicing of loan portfolio.

Keywords: arrears, debt collection tools, loan portfolio, non-financial entities, retail loans.

JEL Classification: M31, M37, M21, M14, L81.

1. Introduction

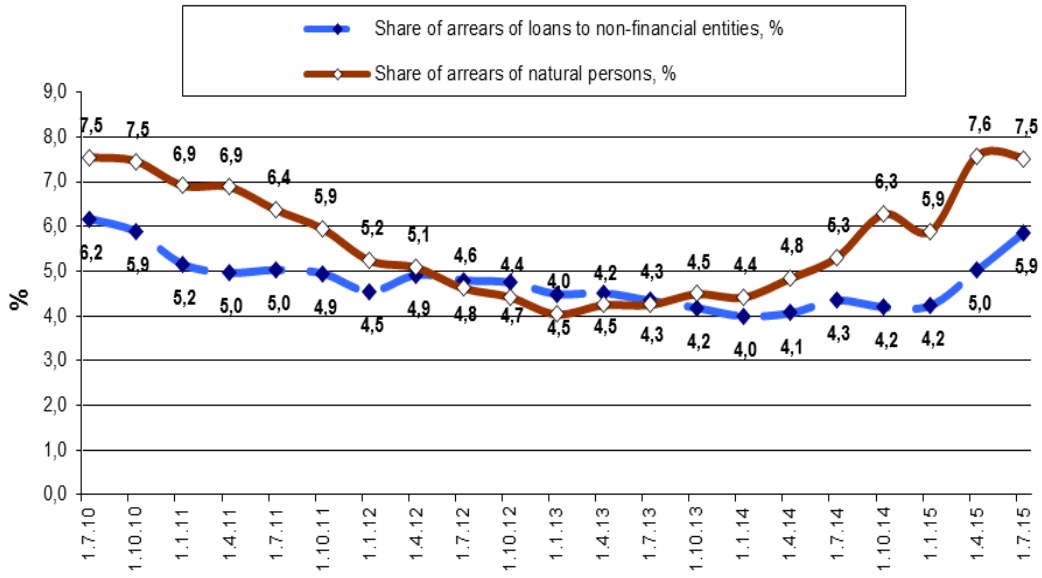
In the context of the general economic downturn and the decline in consumer demand, credit responsibility of households is deteriorating simultaneously. This is primarily due to the deteriorating of economic condition in Russia – a growing number of Russian citizens have overdue loans. And whereas until now, analysts might have said that the reasons are in a low level of households' literacy, today it is obvious that economic factors and causes come to the fore.

In various years, domestic and foreign scientists were engaged in the study of the problem of default loans in the retail segment. Conceptual problems of sanctions are presented in the works of D'Alessio and Lezzi (2013), Dermine and Neto de Corvalho (2004), Frost (2006) and other scientists. Among Russian authors' recent works on this subjects we can highlight those by Belousov (2014), Bobyl (2014), Vaysbek (2014), Kuzina (2013), Mozzhukhina (2013) and others. As analysis showed, the majority of researchers examined the determination of the possible impact of sanctions on the development of sectors of national economies. At the same time, the analysis of current studies demonstrated the need for further research of the considered direction in banking retail, and especially its economic trend, which determined the orientation of this study.

2. Main text

Analysis of banking statistics data showed that the share of arrears in the portfolio of banks in the retail segment exceeds the share of arrears of corporate portfolio: according to statistics of the Bank of Russia at the beginning of the second quarter it was 7.6%, whereas in the corporate one – 5.0%. There was no such a poor

performance in the banking system in the past (from January 2013 to March 2015) (Figure 1) (Central Bank of the Russian Federation 2014).



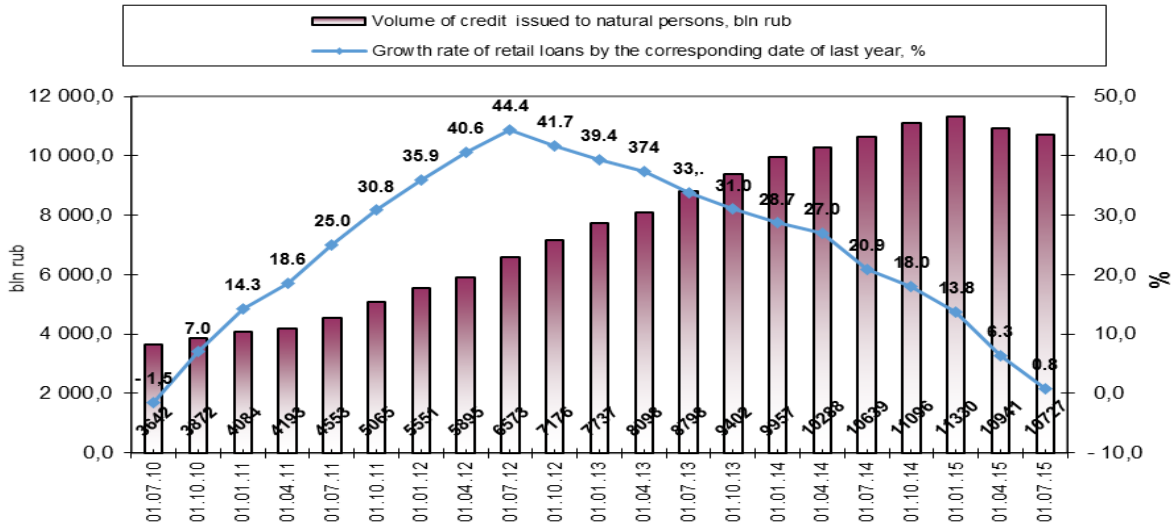
Source: Central Bank of the Russian Federation 2014

Figure 1 - Dynamics of the share of arrears on loans granted to legal entities and natural persons (2010-2015).

Figure 1 shows that during 2010-2015 the share of arrears on loans was almost always higher than the corresponding indicator for loans to enterprises. And only from April 2012 to September 2013 the share of arrears on loans to individuals was observed at approximately the level of arrears on loans to non-financial entities (legal entities).

In some segments of the market as some authors say, the situation cannot be called otherwise than critical. Thus, consumer loans show the highest arrears – 15.2%, the second place is taken by POS-loans (14.9%), the third – the collateral loans (14.4%). One of the largest collection agencies, "Sequoia Credit Consolidation", estimates the number of arrears on auto loans in 2014 equal to RUB 47.6 billion, which is 30% higher than last year (Prime Economic Information Agency 2014).

It should be noted that the share of unsecured retail lending portfolio of homogeneous loans is not virtually decreasing remaining at the level of 54-56% in the current year (Figure 2) (Bank of Russia 2015).



Source: Bank of Russia 2015

Figure 2 - Dynamics of the volume and the annual growth rate of loans to natural persons (2010-2015)

Many experts point out that the Russians started paying down loans less than earlier. The share of loans granted by banks to individuals for whom one or more payments arrears are more than 90 days, increased almost twice from January 1, 2014 to October 1, 2015, *i.e.* for one and a half years, and amounted to 8.0%.

Arrears are growing, despite the fact that banks actively cleanse their portfolios. Some write off bad debts, others transmit them to collection agencies. According to analysts of the National Recovery Service in the first half of 2014 banks offered to sell loans in arrears in the amount of RUB 137 billion, while a year earlier the proposal did not exceed RUB 115 billion. At the same time the prices at which banks are willing to get rid of portfolios in arrears fell by 20-25% in 2014 (Zhelobanov and Yeremina 2014).

The study found that in the middle of 2012 the annual (by the corresponding period of the previous year) growth rate reached a peak, surpassing the mark of 40% (see Figure 3). And arrears on unsecured consumer loans were growing even faster – in this sector the annual growth rate was 60% (Analytics. Bank system 2014).

During the analysis, we found that according to the level of population coverage loan and loan amount, the Russians have low indexes in comparison to other countries. However, due to the fact that consumer loans (more than 50%) prevail in the structure of issued loans, which are characterized by high rates and short terms, the share of borrowers with high load of servicing of these loans (50% or higher from current cash revenues) compared to other countries is much higher, besides debt load is particularly high in small towns. The indicator of penetration rate of consumer crediting in Russia is rather high and by 2.5 times higher as compared to this rate in Europe, where the share of consumer loans in the total volume of loans granted to the population does not exceed 20% on average.

Thus, we should note that the Russian population has ceased to fear loans, realizing that this is a quick and easy way to implement long-planned plans without any delay on the morrow because of a lack of funds.

The growth of arrears is due to the fact that against the backdrop of a slowdown in the growth of loan market, the aging of arrears loans issued at the end of 2012 – the first half of 2013, took place, when banks had less restrictive lending policies, particularly in the retail segment. Clampdown of government regulation in this sector, such as increasing the size of contributions to the reserves for unsecured consumer loans, has led to a decrease in their rate of growth in retail loans. Thus, for the period from July 1, 2012 to July 1, 2015 the growth rate of retail loans (loans to individuals) fell sharply to the corresponding period of last year: from 44.4% to only 0.8% (Figure 3).

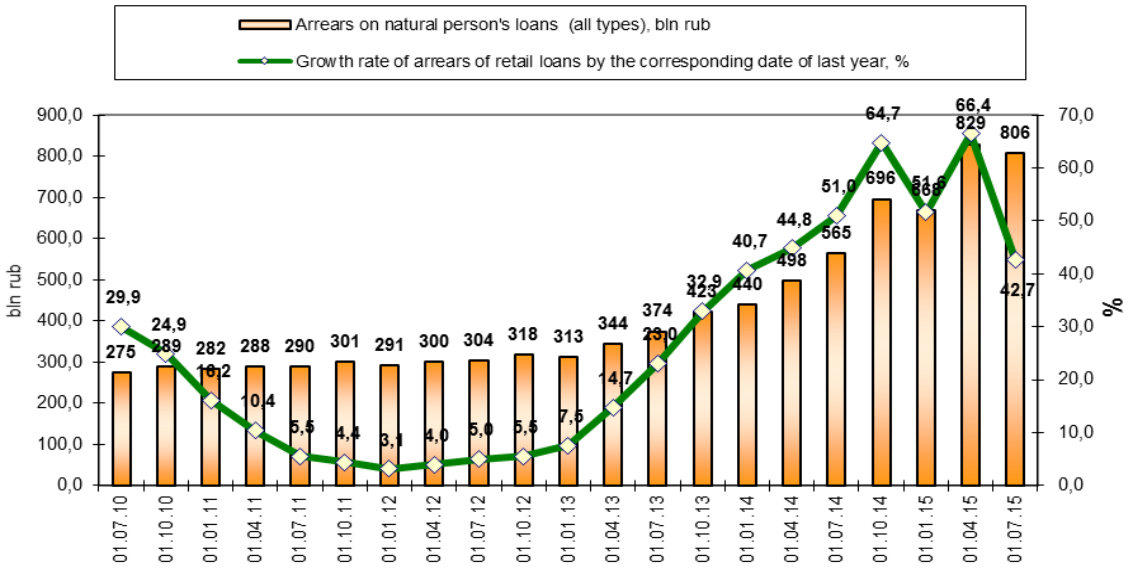
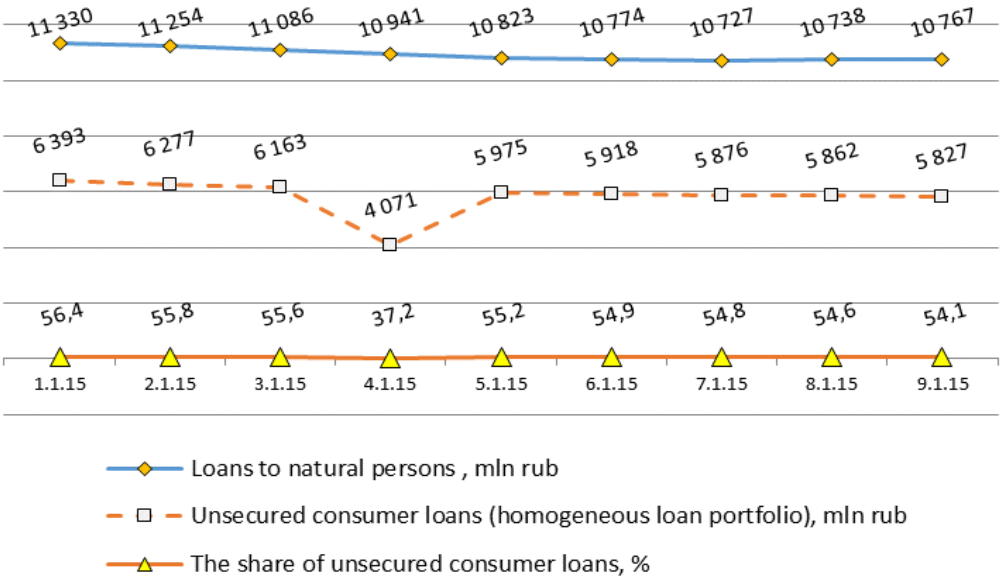


Figure 3 - Dynamics of the volume and the annual growth rate of arrears loans to legal entities (2010-2015)

The inverse picture can be observed when considering the changes in volumes and annual growth rates of arrears on retail loans. Against the background of a pronounced reduction of annual rates of retail credit portfolio the growth rate of arrears increased in more than eight times over the last three years, amounting to 42.7% as of 01.07.2015 compared to 5.0% as of 01.07.2012 (see Figure 4) (Selected indicators of loan entities' activities 2014).



Source: Selected indicators of loan entities' activities 2014

Figure 4 - The share of unsecured retail loans of homogeneous loan portfolio in the Russian banking sector in 2015

The rapid growth of arrears increase observed since mid-2012 to the present is associated with a number of macroeconomic factors: deterioration of the financial situation of population in 2014 (the income of the population grew by only 3.3%, with inflation of more than 7%), an increase in unemployment (5.2% compared to 4.9% in 2012).

Therefore, one of the main reasons for increasing the scale of Russian citizens' debts to the banks is a lack of money among the population. The study (Zayernyuk 2013) proved noticeable connection of loan activity in Russian regions with per capita income. Russian citizens currently spend 21% of revenues to cover loans, which is 2-7 times higher than in developed countries. At the same time, according to Federal State Statistics Service, disposable incomes of Russians in the first quarter of this year were 2.5% lower than last year (Russian Union of Industrialists and Entrepreneurs 2014).

The second reason, as the study revealed, is an easy access to retail loans. Our citizens love to buy, but more often – on credit. Quick, contracted in the store, cash loans take 48 percent in the structure of population liabilities. Another 13 per cent are credit cards, 25 and 14 percent –the mortgage and auto loans respectively. In addition, there is already a large number of people who take new loans to pay off old ones. The growth in the number of borrowers is noticeable. Experts of the National Bureau of Credit Histories call the retail loan segment the fastest growing sector in the Russian economy (Anti-Russian Standard Project 2015).

Last year one of the leaders of Russia's Central Bank expected the growth of arrears in banks that specialize in retail loan, believing that all those loans that were issued massively in the past two years now face the arrears. According to his assessment, the growth of arrears may continue in the next year, that is, in 2015 (MSN-Finance 2015). His prediction was fully confirmed: the volume of bad debts in the first 10 months of this year has grown by 30% at the reduction of the retail loan portfolio by 5% (Central Bank of Russian Federation Department of Banking Supervision 2015).

According to the Central Bank of Russia data at the beginning of May 2014, on average, Russian citizens spend about 20% of their income to pay credit commitments. Experts from the Association of Russian Banks do not agree with such statistics; they believe that the share of payments on credit commitments of certain Russian citizens may reach 35%-40% of monthly income. In these circumstances, banks reduced their volume of issued loans and thereby substantially restrict clients to obtain new loans. Nevertheless, retail borrowers' possibilities to pay off existing loans rapidly reduce and that is the main reason for this situation.

Federal State Statistics Service data show that households' incomes have been recently declining. Real disposable income in the Russian Federation in the 1st quarter of this year amounted to 98.5% compared to the corresponding period of 2014, and compared to the 4th quarter of 2014 even lower – 72.5% (Federal State Statistics Service 2014).

In the current realities, we are not talking about low-income segments of the population. Banking experts note the emergence of arrears even among conscientious borrowers who have never given cause for concern and always fulfilled their loan commitments on time. Such a situation may lead actually to the failure of the retail

banks' system of credit risk forecasting. This is due to the fact that such incidents are not common both for years of banking statistics of retail loans service, and banks have no operational mechanisms to adjust methodology and technology of debt collection.

Statistical data of the Bank of Russia and the rating agencies indicate that citizens started having late payments of credit obligations not only more frequently but also much faster. If we compare the data for the last three years, we can see that currently there has been a significant reduction between the time of the loan issue and the date of the creation of natural person's loan in arrears.

The analysis of banking statistics showed that if in 2010 the average gap between the issuance of the loan and the arrears was 12 months, in 2011 the average period of falling in arrears is 11 months, and in 2012 – 8 months, in 2014 this period declined up to nearly 4.5 months (excluding mortgage debt portfolios). As a result, due to a sharp reduction in the gap between the issuance of loans and arrears, there is a significant change in indicators of quality of retail portfolios.

We consider the structure of arrears portfolios. The analysis showed that the most significant growth was observed in the credit card portfolio. Next foreground is occupied by consumer loan portfolios; car loans are next.

The rapid growth of arrears is certainly due to individuals' "debt load". It is difficult to give a definition of what we should consider the debt load. Some scientists define this phenomenon by the term of "high debt ratio" (Kuzina 2013). Regarding this issue, both in the academic literature on this subject, and among practitioners there is no consensus. In general, despite the existing differences, debt load (high debt ratio) is associated with a high risk of default on loans, so those variables that increase the likelihood of such a default fall to the number of its indicators. A set of indicators of household over-indebtedness proposed by Italian researchers Giovanni D'Alessio and Stefano Lezzi (2013) is noteworthy, which is not considered in this study by the authors.

As the analysis, has shown, a significant debt load of citizens affects the growth of arrears also on the other hand. Thus, earlier the family had one, maximum two credits. Currently, the average number of credit contracts for the average family is four and more. The population has got more difficulties to comply with the payment discipline against the background of the overall debt load: the national average is 1.3-1.4 loan per a debtor; the maximum is 17 loans in arrears in different banks (Sokolova 2014).

That is one of the reasons for improper fulfillment by borrowers of their obligations to pay debts. Borrowers with so many loans are confused about the dates and payments, forget to make the necessary funds to repay debt, and this leads not only to the emergence of arrears under the contract, but to the interests and penalties on the part of banks. Borrowers' loan commitments are growing like a snowball, and the loan debt becomes a burden.

In conditions of deteriorating of general economic situation, which caused a general deterioration of quality indicators of banks' retail portfolios we cannot talk only about the responsibility of borrowers, and assert that the fault of arrears growth is the low literacy rates, poor payment discipline and the lack of ability to plan citizens' budgets and spending. At the stage of rapid growth after the crisis of retail business two or three years ago banks gave loans almost to everyone, with a minimum package of documents and a brief inspection procedure. A "thaw" that came after the global financial crisis of 2008-2009, contributed to the fact that many banks began to increase their retail portfolios, since it allowed them to provide a higher level of earning profits. At the same time, banks often forgot to inform borrowers about their upcoming date of payment. In such a situation, it is not surprising that all borrowers attracted by banks during the period of the "thaw" learnt by fact about the existence of loans in arrears, while, as a rule, the duration of arrears has already amounted to more than 30 days.

As researcher Kuzina (2013) has found, credit load drags 40% of the population below the poverty line. Paying off his monthly credit commitments, borrowers can no longer "live in peace", as the family budget is less than the subsistence minimum.

There are also some facts that still indirectly indicate the low financial literacy of population that are away from cities with a million-plus population. It is difficult to deny that the financial literacy of the population decreases with the remoteness from cities. But, nevertheless, in the decision to grant the loan, banks should have to be guided first and foremost by an adequate risk assessment and to take into account the debt burden of the potential borrower. And here the important role is played by educational function of bank employees: they must clearly explain to the potential customer that an increase in the number of credits increases the debt burden primarily on borrowers themselves, that the new loan may become unsustainable in the service, in the end to refuse in a new loan issue.

It must be admitted that in this situation retail banks are faced with the fact that they do not conduct proper personalization and verification of the borrower and the information provided to them, do not make proper prediction of credit risks. If we return to the statistical data, in the period of issuance of loans, which are now

actively generating arrears for retail banks, banks were puzzled by escalating volumes of loan issuance and increase in portfolio profitability. However, currently there is a shift of priorities and now lending institutions have to think about how to survive in the conditions of significant volumes of debt arrears on the background of increasingly stringent requirements of the Bank of Russia and to maintain the retail business.

How credit institutions should cope with this situation, taking into account the existing heritage of "bad debts"? First of all, credit institutions need to improve the mechanisms for supporting loan portfolios and collection technology. Particular attention should be paid to preventive measures aimed at preventing the emergence of arrears, in other words, to focus on pre-collection stage.

Pre-collection is a set of measures, which enables the bank to carry out preventive measures to avoid arrears. Typically, this is done via E-mail or SMS mailing. According to certain characteristics borrowers' credit agreements are selected from the portfolio, which are processed by the banking system and formed into files, which are then sent to Internet service providers for mass notification. The practice of working with problem assets of retail banks demonstrates the high efficiency of preventive measures based on the monitoring of arrears in the early stages of its creation. This approach to support and collect arrears significantly reduces the credit risk of the bank, resulting in the maintenance and servicing of credit, as well as provides mainly pre-trial decision of debt disputes and minimize the costs of credit institutions.

But how should bank select the loans of borrowers from a large number of loans (often hundreds of thousands) who need to be informed about the date of the payment in advance? It should be noted that in the current circumstances, banks are forced to count the cost of recovery, and the cost of a single SMS can often take up to two rubles (without taking into account the cost of labor to pay bank employees, who will accompany and generate files to send messages). How do we know which credit will exactly in arrears? How do we distinguish borrowers who regularly forget to make payments, thus have a regular "technical arrears" up to 5 days, at the same time repay the debt, regardless of the bank's reminders?

The answer to all these questions lies in the approach to segmentation of the debts, which is used in the majority of collection agencies and the factors that should be used as indicators in the maintenance and servicing of the loan portfolio. But considering the growth in the volume of retail loans, banks are forced to develop and improve their own recovery mechanisms to prevent the creation of arrears and to deal with the arrears in the early stages. This is not surprising, it is far easier and more efficient to return the borrower in the schedule in the early stages of the arrears, rather than "treat" long arrears.

First of all, the portfolio is subject to analysis of initial information about debtors (their assets, their environment, etc.): search for contact information in its absence to establish contact, analysis of state of arrears (including credit program, etc.).

In the absence of information about the borrower's contact after the issuance of the loan, the bank employees need to receive it for further work with the credit. This will allow, first of all, identifying of illegitimate schemes and bad debts at an early stage, as well as is one of the factors of success in the future work with the debtor. To check and receive data on the retail portfolio, the banks tend to use further data verification methods on loans. It is possible to use several ways to check the presence of data: a mandatory test sample "canvas calling" of borrowers using dialer systems, spot check of the availability of documents in the loan file.

As a rule, the first procedure is carried out by employees of the bank contact center. The procedure for checking the availability of a set of documents in the credit file of the borrower is carried out by back-office employees of the bank either before the issuing of credit, or just in the first month after loan disbursement.

Actually, mechanisms of segmentation of the loan portfolio for the implementation of measures of a preventive nature are involved next. To analyze the information banks, use their own data warehouse and as a rule, analytical systems or specialized analytical complexes. Each bank often has its own set of data for segmentation, which should be used at evaluating and segmentation of the retail portfolio, but they are all based on the information about the loan agreement and the debtor. We consider this information in detail.

- Information of the loan agreement: debt structure (principal, interest, penalties), overdue period, type and description of loan product, amount of the original loan, payment history + DPD (flow/roll rates), processing stage (pre-trial, court, executive office), used tools, the number of placements in collection agencies, complete information on the pledge, fact of data transferring to the credit bureau.
- Information about the debtor: date of birth, region of residence, presence of contact information, information about the last contact with the debtor, gender, position (information about the employer), education, marital status.

Further the sampling of the loan portfolio of these parameters is carried out considering the array of statistical data according to the specified array (historical sampling). At this stage of sampling we can obviously

identify segments hopeless for recovering (not a single payment from the date of issue), fraudulent schemes. And at this stage the bank determines the segment to which it is necessary to apply measures for preventing arrears. As tools used by the bank for such segmentation, statistical modeling method and mathematical modeling method is most commonly used.

Using statistical modeling method allows the bank to form a projected fees and charges:

- multivariate polynomial regression (determination of forecast charges);
- logit model (determination of the payment probability);
- auto-regression model (formation of projected payment schedule);
- Monte Carlo method (determination of fees on the portfolio level).

On the basis on the mathematical modeling method the credit institution forms the strategy of selecting the best tools and collection process itself:

- simplified structural-functional models (determination of the debtor's behavioral characteristics)
- simulation models (building of a collection process model)
- variation calculus (choice of optimal collection tools).

And it is the use of predictive analytics systems that facilitates portfolio segmentation process for identifying credit, subject to the use of pre-collection tools.

As the study showed, scorecards are used by banks for canvas calling and informing the debtor in advance of the maturity date of the loan. Card options are different, however, in view of statistics and collection tools we can clearly judge that data on debtors, who at least once previously fell in arrears, are used for preventive measures. And in order to avoid subsequent late payments analytical system just chooses loans in respect of which the debt has accrued. Canvas calling and informing these borrowers will enable bank to maintain the quality of loan portfolio and to prevent growth of arrears level.

As exemplified by a large, systemically important Russian bank with state participation, included in the first 5 banks in Russia, we would like to supplement the information of an interesting statistical fact. In a sample of more than 1.0 mln credit agreements the bank's analysts found one interesting pattern. After analyzing the loan pool, issued in 2013-2014, it was found that 75% of the volume of arrears portfolio form the loans issued during the week (working days). At the same time loans issued in the weekend are served much better. Thus, the pattern has been identified, related to the fact that borrowers receiving loan at weekend days are more disciplined in terms of payments, rather than borrowers who received loans at weekdays. The bank has taken into account this fact in the scorecard for lending and supporting portfolio. On weekdays, at the stage of issuance the number of rejections increased significantly, while borrowers who received loans during the week and at the same time did not allow any arrears, were called by the bank in advance of the date of payment. This could not but affect the increase in the number of refusals for applications filed during the week. However, by the end of 2014 the quality of retail loan portfolio of the bank has improved and the level of loans in arrears decreased by 0.4%.

Conclusion

Thus, in the current financial and economic situation, banks need to focus on developing their own tools and technologies of collection aimed at identifying the problem of debt and prevent arrears at an early stage. And this is possible only in case of investing funds of bank in analytical and technological tools which allow accompanying and servicing loan portfolios, while maintaining the level of quality.

In the context of the announced by US economic war against Russia we will have in mobilization order to look for new management solutions to the practice of consumer credit, particularly in dealing with arrears. In this context, it seems appropriate to introduce additional consumer credit control measures through a balanced approach to the optimization of the risk factors existing now and reserve requirements, which could contribute to strengthening and enhancing the stability of the banking system. After all, the stability of the national banking financial and credit system is beneficial to everyone, and it is can be considered as a key factor for sustainable economic growth.

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Nexus between Public Health Expenditure and Income: Empirical Evidence from Indian States

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Abstract

Using the public (government) health expenditure data of sixteen states in India from 1980 to 2013, the paper examines the long-run relationship between an increase in public health expenditure and income. We use real GSDP and real per capita GSDP as proxy for income. We apply Westerlund (2007) error correction based cointegration test for estimating the long-run relationship and panel dynamic OLS (DOLS) method for estimating the long-run coefficient of health expenditure. The empirical result shows that public health expenditure and income is cointegrated in the long-run. There is a positive and significant impact of income on growth of public health expenditure whereas the elasticity of public health expenditure is less than one in the long- run. It has also been found that there is a bidirectional causality between income and public health expenditure in the short-run while being unidirectional in the long-run. These research findings would serve as effective policy instruments aiming at achieving universal health coverage by generating more additional resources for health sector and minimizing the state level disparity in the growth of public health expenditure in India

Keywords: public health expenditure, indian states, panel cointegration, income.

JEL Classification: H51, C22, E01.

1. Introduction

There is a growing literature on the nexus between public health expenditure and income ever since the publications of Kleiman (1974) and Newhouse (1977), which can be broadly grouped into three different strands of inquiry in the health economics literature. The first type of literature examines the elasticity of public health expenditure with respect to income in the short as well as in the long-run. The literature such as Sen (2005), Wang (2009), Baltagi and Francesco (2010), Cantarero and Lago Penas (2010), Farag *et al.* (2012), Fan and Savedoff (2014), and Reeves *et al.* (2015) deal with short-run estimator of health expenditure studies. On the other hand, literature such as Narayan *et al.* (2010), Khan *et al.* (2015), Wang (2011), Tamakoshi and Shigeyuki (2014) deals with the long-run estimators of health expenditure. These studies find per capita income to be one of the most important determinant of public health expenditure. The economic interpretation of these findings is that, the elasticity of public health expenditure with respect to income is equal to or greater than one indicating that health care is a luxury rather than a necessity. When elasticity is less than one, health care is closer to being necessity and hence needs more government intervention. Culyer (1988) and Di Matteo (2003) argue that luxury or necessity has an implication on the link between public health expenditure and the well-being of the citizens. The second type of literature (Gerdtham and Mickael 2000, Herwartz and Bernd 2003, MacDonald and Sandra 2002, McCoskey and Thomas 1988, Wang 2011, Dreger and Hans 2005, Tamakoshi and Shigeyuki 2015) discusses the evidence for a long-run (cointegrating) relationship between public health expenditure and income. The third type of literature (Devlin and Paul 2001, Erdil and Yetkiner 2009, Hartwig 2010, Wang 2011, Amiri and Venetelou 2012) examines the causality between public health expenditure and income in the short as well as long-run. There are two types of causality between public health expenditure and income; it could be either unidirectional (that is, health expenditure as a function of income or income as function of health expenditure) or bidirectional (that is, both health expenditure and income causing each other). The direction of causality is important, as the health policy implications are vastly different for each possible direction. The unidirectional causality from public health expenditure to income (reverse causality) indicates that the health expenditure has both direct and indirect effects on income growth (Hartwig 2010). The theoretical argument is that health expenditure can be considered as an investment in human capital and leads to healthier workforce. Hence as a factor of production, an increase in the efficiency helps augmenting the economic growth (Devlin and Paul 2001). On the other hand, the unidirectional causality from economic growth to growth of health expenditure is a general

phenomenon in almost all countries. But the implication of increasing health expenditure is that, it reflects the intention of economic development, and exhibits the improvement in the quality of life of people (Wang 2011). The presence of bidirectional causality between public health expenditure and income implies that public health expenditure and income growth are jointly affected by shocks and conservative health policies may have an adverse effect on income and vice-versa (Amiri and Venetelou 2012). The argument of bidirectional causal relationship would be that public health expenditure growth can stimulate income and vice versa. Also, increased public health expenditure is both a cause and consequence of increased income, and lack of public health expenditure may pose a restraint on the economic growth in the long-run. The bidirectional causality shows the confirmation of both growth-led health and health-led growth hypothesis.

Contrary to international evidences, there is not much work on the nexus between public health expenditure and income. Bhat and Nishant (2006), Rahman (2008) and Hooda (2015) examined the relationship between income and public health expenditure by taking major states of India. The aim of these studies was to identify major drivers of health expenditure in India. The empirical result shows that regional income (per capita GSDP) is one of the statistically significant driver/factor determining the level of regional health expenditure. These studies use panel random effect regression model to estimate the short-run impact of income on the growth of public health expenditure. The result shows that the value of income elasticity of public health expenditure varies in the range of 0.47-0.68%, which indicates that health care is a necessity good among the Indian states. These studies have not examined the long-run impact of regional income growth on the public health expenditure among the states of India. To the best of our knowledge, no study has been undertaken which examines the short- run as well as the long-run causal relationship between public health expenditure and income among the states of India. Some exceptions are Pradhan and Bagchi (2012) and Khandelwal (2015), who examined the causal relationship between income and public health expenditure in India. Pradhan and Bagchi (2012) found a bidirectional causality between public health expenditure and income both in the short and the long-run. Khandelwal (2015) found only unidirectional causality running from income to public health expenditure in both short as well as long-run.

The contribution of this paper may be underlined as follows: First, the empirical techniques used are more efficient than the techniques used in earlier studies. The past studies used short-run estimator of public health expenditure, applying panel random effect model, which provides the elasticity of public health expenditure with respect to income in the short-run. For determining the long-run impact of income on public health expenditure, we use panel dynamic ordinary least square (DOLS) estimation technique. Apart from that, we apply Westerlund (2007) cointegration test for the long-run relationship between public health expenditure and income. Second, 'include' only medical and public health expenditure[1] which is state specific and 'exclude' all the central assistance in the form of family planning as well as disease control programme. Third, we convert all the data in real value as well as real value adjusted to the population figure at constant 2004-05 base price because the variable is well adjusted to the changes in price level and population. The previous studies had used current prices (nominal value) and some of them have used 1993-94 constant prices.

Based on the background information mentioned above, the objective of the paper is to examine the long-run relationship between public health expenditure and income using panel cointegration, panel long-run estimator and panel Granger causality test for sixteen major states of India over the period 1980-2013. The rest of the paper is organized as follows. Section 2 represents the growth of public health expenditure over the period of study among the selected major states of India; Section 3 discusses the data and methodology used; Section 4 focuses the empirical findings; and Section 5 offers the conclusion.

2. Growth trends of public health expenditure of Indian states

This section provides a narrative of the public health expenditure trend as percentage to Gross State Domestic Product (GSDP) of sixteen Indian states. We begin with Table 1, where we report the trends of public health expenditure as percentage of GSDP. We present 10-years' averages for the period 1980-2009 and 5-years' average for the period 2000-2009 for each of these sixteen states. Two important results are derived from Table 1. First, for India as a whole, the public health expenditure as percentage of GSDP reduced from 1.30 percent over the period 1980-1989 to 0.70 percent of GSDP in the period 2000-2009. The second result is that,

[1] The provision of health care is mainly the responsibility of the state government and ninety percent of the total health expenditure comes from the state budget. The center's grant is mainly meant for certain centrally sponsored disease control programme and family planning programmes of the states. Therefore, we have focused only on the state's budgetary expenditure on public health and medical expenditure.

almost all states, public health expenditure as a percentage of GSDP has decreased in the period 2000-2009 compared to the 1980-1989 period. But the public health expenditure has increased since 2000 among all the states after comparing 5-years' average from 2000-2009 and massive improvement in the growth of health expenditure have been witnessed in the low-income states of India such as Bihar, Odisha, Madhya Pradesh, Rajasthan and Uttar Pradesh.

Table 1- Public health expenditure as percentage of GSDP of 16 major states of India for 1980-2013 (Annual average %)

Major Indian States	1980 – 1989	1990 – 1999	2000 – 2009	2000 – 2004	2005– 2009	2010- 2013
Andra Pradesh	1.91	1.18	0.99	1.03	0.95	1.11
Assam	1.14	0.86	0.77	0.66	0.88	1.05
Bihar	1.40	1.26	0.90	0.84	0.96	0.77
Gujarat	0.90	0.61	0.43	0.48	0.39	0.55
Haryana	0.89	0.47	0.38	0.38	0.38	0.42
Himachal Pradesh	2.78	1.75	1.36	1.44	0.37	1.22
Karnataka	1.05	0.78	0.59	0.63	0.56	0.26
Kerala	1.33	0.87	0.69	0.72	0.66	0.79
Madhya Pradesh	1.35	0.93	0.70	0.74	0.67	0.31
Maharashtra	1.03	0.53	0.45	0.50	0.39	0.43
Odisha	1.06	0.75	0.61	0.70	0.53	0.60
Punjab	0.93	0.70	0.59	0.70	0.49	0.61
Rajasthan	1.53	0.89	0.73	0.75	0.71	0.68
Tamil Nadu	1.20	0.78	0.54	0.57	0.50	0.59
Uttar Pradesh	1.10	0.84	0.80	0.63	0.97	0.82
West Bengal	1.15	0.89	0.67	0.74	0.60	0.66
All States	1.30	0.88	0.70	0.72	0.63	0.68

Source: State finances study of budget and Handbook of statistics on the Indian economy report, RBI (2015).

3. Sources of data and methodology

Data description

Our analysis uses annual data on sixteen major states of India[2] from 1980 to 2013 (T=34) collected from the RBI data set. The selection of the states is based on the population (around 93 percent) and income (around 95 percent) coverage of India as a whole. The selection of the study period was influenced by two factors: (a) to include the period prior to the first national health policy which was in the year 1983, and (b) to include the recent available data on health expenditure for these states. The data on public health expenditure and population are taken from the reports on 'State Finances – A Study of Budget' and the 'Handbook of Statistics on the Indian Economy' published by the Reserve Bank of India (RBI) in 2015. The study considered real GSDP and real per capita GSDP as independent variables, and real public health expenditure (PHE) and real per capita public health expenditure (PCPHE) as dependent variables. The health expenditure and GSDP data are converted to real series with constant 2004-05 base year prices in million Indian Rupees (INR). Since price deflators data are not available at state level in India, the national level (India) price index for all commodities at constant (2004-05=100) prices was used for the conversion of the nominal figure of health expenditure and GSDP data to real figures of income and health expenditure series for all states included in the study. Finally, all variables in the empirical model are expressed in natural logarithm.

[2] India is subdivided into twenty nine states and seven Union Territories. All states are represented by the state government, and the head of state government (Chief Minister) is chosen by the legislators elected by the people, of the concerned states. The study has taken sixteen major states because of the data availability over the entire study period.

Table 2 - Result of descriptive statistics

VARIABLES	Mean	Std.Dev.	Maximum	Minimum	Jarque-Bera	Probability
PHE	9000.59	6508.48	42960.31	1452.93	883.26	0.000
PCPHE	198.72	114.83	851.27	59.37	1308.24	0.000
GSDP	1223511	1180627.4	8967674.9	65168.64	2905.79	0.000
PCGSDP	24252.53	14576.54	76916.99	6117.53	235.35	0.000

Note: PHE = Public Health Expenditure; PCPHE = Per Capita Public Health Expenditure; GSDP = Gross State Domestic Product; PCGSDP = Per Capita Gross State Domestic Product. PHE and GSDP are million INR; PCPHE and PCGSDP are in INR.

Table 2 presents descriptive statistics of the variables for the states in our empirical analysis during the period of study. The result shows that the variable PCPHE has a minimum value of INR 59.37 and a maximum value an INR 851.27 with a mean value of Rupees 198.72. So, there is high degree variation in per capita health expenditure among the Indian states. Also, it shows that all the variables PHE, PCPHE, GSDP and PCGSDP reveal a considerable degree of standard deviation with huge difference in minimum and maximum values.

Empirical methods

In this section, we provide a brief description of the tests used in the empirical analysis in this paper. The test for causal relationship between income and public health expenditure in a panel context is usually conducted in four steps. First, the order of integration of the variables is tested by applying IPS unit root test proposed by Im *et al.* (2003) and CIPS unit root test proposed by Pesaran (2007). Second, after having established the order of integration in the series, panel cointegration tests of Westerlund (2007) are used to examine the long-run relationships between the variables in question. Third, after confirming the long-run cointegration among the variables, we applied the panel Dynamic Ordinary Least Squares (DOLS) technique to estimate the long-run and short-run coefficients. Finally, we applied panel Vector Error Correction Model (VECM) Granger causality test to determine the direction of causality between public health expenditure and income in both short-run as well as long-run.

The panel unit root test

To avoid any spurious and harmful interpretation of the findings, first we have to test the stationarity property of the variables in the data series. In this paper, we applied Pesaran (2007) panel unit root test to all the four variables namely real GSDP, real per capita GSDP, real PHE and real per capita PHE to determine the order of integration of these variables. Since we use a balanced panel data, Pesaran (2007) test is more suitable in dealing with heterogeneity across cross-sectional units. All the standard unit root test such as Levin-lin-Chu's, Breitung's etc assume that the individual time series in the panel are cross-sectional independent. These standard unit root test do not work if the residuals are cross section dependence. In the presence of such cross-section dependency, Pesaran (2007) proposed the cross sectionally augmented regression for the individual series for models without residual serial correlations.

The error correction based panel cointegration test

In the next step, we conduct a panel cointegration test to examine the long-run relationship among the variables included in the model. Westerlund (2007) uses four panel cointegration tests namely Pt, Pa and Gt, Ga to test the null hypothesis of no cointegration. First pair of the statistics Pt and Pa referred as panel statistics, are based on pooling the information regarding the error correction along the cross-sectional dimension of the panel. The second pair Gt and Ga referred to a group mean statistics. The first two tests are meant to test the alternative hypothesis that the panel is cointegrated as a whole, while the other two test the alternative that at least one unit is cointegrated. The advantages of these tests are that they are normally distributed and also accommodate unit-specific short-run dynamics, unit-specific trend and slope parameters and cross-sectional dependence. Also, bootstrapped version of this test provides robust result which is very effective in eliminating the effects of the cross-sectional dependence without sacrificing power. But before applying Westerlund error correction based cointegration test, first we need to test the unit root of order one, $I(1)$ and then whether the variables or residuals are serial correlated or not through the cross-sectional dependency tests.

The panel long-run estimators

After the detection of long-run relationship among the variables, the next step is to estimate the long-run effects of real income on public health expenditure. To estimate the long-run effects, we use the panel dynamic ordinary least square (DOLS) estimator proposed by Kao and Chiang (2000). Kao and Chiang (2000) examined the finite sample properties of ordinary least squares (OLS), fully-modified OLS (FMOLS) and DOLS. They found that, OLS and FMOLS exhibit substantial bias in panels up to N = 60, T = 60, all that DOLS is superior to OLS and FMOLS in all cases. Here we use the group mean panel dynamic OLS (DOLS) estimator suggest by Pedroni (2001) by adopting the same model specification for the estimation of real PHE and real GSDP (Model 1) and real per capita PHE and real per capita GSDP (Model 2). This simple panel regression equation becomes:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \mu_{it} \quad (1)$$

In equation (1), Y_{it} and X_{it} are cointegrated with slopes β_i which may or may not be homogeneous across i. In this case the null hypothesis is $H_0 : \beta_i = 1$ for all i. Let $\varepsilon it == \left(\hat{\mu}_{it}, \Delta X_{it}\right)'$ be a stationary vector consisting of the estimated residuals from the cointegrating regression and difference in X_{it}. Let $\Omega_i \equiv \lim_{T\to\infty} E\left[T^{-1}\left(\Sigma_{t=1}^{T}\varepsilon_{it}\right)\left(\Sigma_{t=1}^{T}\varepsilon_{it}'\right)\right]$ be the long-run covariance matrix and it can be decomposed as $\Omega i = \Omega_i^0 + \Gamma_i + \Gamma_i'$, where Ω_i^0 is the contemporaneous covariance and Γ_i is a weighted sum of autocovariances In a similar way, the panel DOLS regression equation becomes:

$$Y_{it} = \alpha_{it} + \beta_i X_{it} + \sum_{k=-K_i}^{K_i} \gamma_{ik} \Delta X_{it-k} + \mu_{it} \quad (2)$$

From equation (2), we construct the panel DOLS estimator, mentioned as below:

$$\hat{\beta}_{GD} = \left[N^{-1} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} z_{it} z_{it}' \right)^{-1} \left(\sum_{t=1}^{T} z_{it} Y_{it} \right) \right] \quad (3)$$

where $\hat{\beta}_{GD}$ is group mean distributer of panel dynamic OLS, $Z_{it} = \left(X_{it} - \bar{X}_i, \Delta X_{it-K}, ..., \Delta X_{it+K}\right), Y_{it} = Y_{it} - \bar{Y}_i$ and Z_{it} is the $2(K+1)^*1$ vector of regressors.

The panel Granger causality test

Given the existence of long-run relationship between GSDP/PCGSDP and PHE/PCPHE, we next proceed to examine the causal relationship between the variables in a panel context. We employ the panel causality test proposed by Engel and Granger (1987) to do this analysis, which requires the estimation of following equations:

Model – 1 (4)

$$\Delta \ln PHE_{it} = \beta_{1g} + \sum_p \beta_{11ip} \Delta \ln PHE_{it-p} + \sum_p \beta_{12ip} \Delta \ln GSDP_{it-p} + \psi_{1i} ECT_{t-1}$$

$$\Delta \ln GSDP_{it} = \beta_{2g} + \sum_p \beta_{21ip} \Delta \ln GSDP_{it-p} + \sum_p \beta_{22ip} \Delta \ln PHE_{it-p} + \psi_{2i} ECT_{t-1}$$

Model – 2 (5)

$$\Delta \ln PCPHE_{it} = \beta_{1g} + \sum_p \beta_{11ip} \Delta PCPHE_{it-p} + \sum_p \beta_{12ip} \Delta \ln PCGSDP_{it-p} + \psi_{1i} ECT_{t-1}$$

$$\Delta \ln PCGSDP_{it} = \beta_{2g} + \sum_p \beta_{21ip} \Delta PCGSDP_{it-p} + \sum_p \beta_{22ip} \Delta \ln PCPHE_{it-p} + \psi_{2i} ECT_{t-1}$$

Here all the variables are previously defined in the descriptive statistics. Δ-denotes the first difference of the variables, p denotes the lag length and ECT is white noise error term. The long-run causality can be identified by examining the significance of the error correction terms in the above model using the Wald test. If the p parameter of $\beta 12_{ip}$ are jointly significant then $GSDP$ Granger cause PHE in Model 1 and $PCGSDP$

Granger cause $PCPHE$ in Model 2. Similarly, if the p parameter of β_{22ip} are jointly significant then PHE cause $GSDP$ in Model 1 while $PCPHE$ cause $PCGSDP$ in Model 2.

4. Empirical results and discussion

Table 3 presents the estimated results obtained from Pesaran (2004) cross sectional dependency test. The test statistics indicate that the null hypothesis of no cross-sectional dependency can be rejected for all variables, which implies the existence of some serial correlations among the states of India. This type of correlation arises from macro-economic shocks with heterogeneous impact across states of India. Due to the rejection of the null hypothesis that variables are cross sectionally independent, this study further employs the cross sectionally augmented Im-Pesaran-Shin (CIPS) unit root test which accounts for cross state dependence.

Table 3 - Results of Pesaran cross sectional dependency test

VARIABLE	CD-test	*p*-value	Corr	Abs (Corr)
ln PHE	56.26	0.000	0.881	0.881
ln PCPHE	45.02	0.000	0.705	0.705
ln GSDP	63.36	0.000	0.992	0.992
ln PCGSDP	62.37	0.000	0.976	0.976

Notes: ln natural logarithms.

Table 4 presents the results obtained from the Pesaran (2007) CIPS unit root and Im, Pesaran and Shin (2003) IPS unit root test for GSDP, per capita GSDP, PHE and per Capita PHE with individual intercept and time trend. The result implies that GSDP, per capita GSDP, PHE and per capita PHE are panel unit root at level. After converting to first difference, the variables are integrated of order one. CIPS test applies under the assumption that variables are cross sectional dependence and IPS as well as other traditional unit root tests follows only cross sectional independence. So, using both types of unit root estimation techniques which captures both cross section dependency as well as cross section independency, we find that public health expenditure and income are unit root at level and no unit root at the first difference.

Table 4- Results of Panel Unit root tests

VARIABLE	IPS (2003)	CIPS (2007)
ln PHE	3.381 (0.999)	-0.993 (0.160)
Δ ln PHE	- 18.891 (0.000)	-3.716 (0.000)
ln PCPHE	4.116 (1.000)	-0.780 (0.218)
Δ ln PCPHE	-18.829 (0.000)	-3.627 (0.000)
ln GSDP	1.838 (0.967)	0.037 (0.515)
Δ ln GSDP	-21.428 (0.000)	-1.731 (0.042)
ln PCGSDP	3.600 (0.999)	0.422 (0.663)
Δ ln PCGSDP	-21.972 (0.000)	-1.238 (0.108)

Note: Probability t values are given in parenthesis; estimation is made no individual intercept and trend.

Long-run relationship between public health expenditure and income

After conforming unit root test of order one $I(1)$, we proceed to test for cointegration in order to determine the long-run relationships between PHE and GSDP in Model 1 and PCPHE and PCGDP in Model 2. The results from Westerlund panel cointegration test is reported in Table 5. Model 1 explains that public health expenditure is a function of real GSDP. It represented error correction statistics in both asymptotic and bootstrapped p-values. When applying the asymptotic *P*-value, the results of group means as well as panel test statistics lead to a clear rejection of the null hypothesis at 1 percent level. The Robust P-values also indicate that the null hypothesis of

no cointegration should be rejected at the P<0.01 level The Model 2 also indicates that the null hypothesis of no cointegration for PCPHE should be rejected at P<0.01 level. So, the robust *P*-value result also confirms that there are long run relationships between public health expenditure and income.

Table 5 - Result of Westerlund error correction panel cointegration tests

Statistics	Value	*Z*-value	*P*-value	Robust(*P*-value)
Model 1(PHE and GSDP)				
Gt	-2.546	-6.036	0.000	0.000
Ga	-6.113	-2.032	0.021	0.000
Pt	-7.094	-4.328	0.000	0.000
Pa	-5.119	-5.655	0.000	0.000
Model 2 (PCPHE and PCGDP)				
Gt	-2.366	-5.342	0.000	0.000
Ga	-5.711	-1.678	0.047	0.010
Pt	-7.011	-4.256	0.000	0.000
Pa	-5.253	-5.839	0.000	0.000

Note: All variables are formed in natural logarithm and estimation are made no individual intercept and trend.

Cointegrating estimator of public health expenditure and income

Based on the confirmation of cointegration, we estimate the long-run elasticity of public health expenditure with respect to income by using panel dynamic OLS techniques. The results for the two models are reported in Table 6. Across the two models, we find that real GSDP has a statistically significant and positive effect on real public health expenditure. The magnitude of the coefficients suggests 1% increase in real income translates on an average to a 0.7% increase in the real public health expenditure. We have got similar results from Model 2. The elasticity of real per capita GSDP is 0.52 at 1% level of significance. So, the results imply that a 1% increase in real per capita income, increases real per capita public health expenditure by 0.52%. The estimated coefficient from the estimators of real GSDP (real per capita GSDP) is unity and positively significant in full sample panels. So, it indicates that public health is not a luxury good, rather it is a necessity in India.

Table 6 - Result of DOLS test (Dependent variables are PHE and PCPHE for model 1 and model 2 respectively)

Statistics	Model (1)	Model (2)
	GSDP	PCGSDP
Coefficient	0.707	0.524
Std.Error	0.002	0.002
Prob.	0.000	0.000

Note: All variables are formed in natural logarithm and estimation are made no individual intercept and trend.

Granger causality between public health expenditure and income

After conformation of the long-run relationships between public health expenditure and income, the Table 7 reports the results of the short-run and long-run panel Granger causality tests. The results for short-run Granger causality are estimated from the lagged difference terms of the variables while the evidence for long-run Granger causality is obtained from error correction term. The relevance of Vector Error Correction Model (VECM) estimation result shows the direction of short-run and long-run causality between public health expenditure and income. As shown in Table 7 there is an evidence of bidirectional Granger causality between PHE and GSDP (Model 1) as well as per capita PHE and per capita GSDP (Model 2) in the short-run in the major Indian states as indicated by *p*-value. However, in the long-run, there exists only unidirectional causality from PHE to GSDP (Model 1) as well as from per capita PHE to per capita GSDP (Model 2). In other words, though in the short-run both public health expenditure and income cause each other, in the long-run income does not cause public health expenditure. Our findings are thus in line with that of Pradhan and Bagchi (2012), Wang (2011), Khan *et al.* (2015), Amiri and Ventelou (2012) and Erkan and Yetkiner (2009) which had reported short-run bi-directional causality between increase in health expenditure and increase in economic growth. But in the case of long-run causality, our results found only unidirectional causal relationship from public health expenditure to income, while earlier studies like Pradhan and Bagchi (2012), Wang (2011), Khan *et al.* (2015), Amiri and Ventelou (2012), Erkan and Yetkiner (2009) and Elmi and Somaye (2012) found long-run bidirectional causality between public health expenditure and economic growth. So, our findings conform the health-led growth hypothesis in the long-run and investment in health having positive implication for sustainable economic growth.

Table 7- Results of Granger Causality test

Statistics	Model (1)			Model (2)		
	Δ ln PHE	Δ ln GSDP	ECM_{t-1}	Δ ln PCPHE	Δ ln PCGSDP	ECM_{t-1}
Δ ln PHE	--	22.378 (0.000)	-0.073 (0.177	--	--	--
Δ ln GSDP	4.312 (0.013)	--	-0.102	--	--	--
Δ ln PCPHE	--	--	--	--	25.165 (0.000)	-0.070 (0.194)
Δ ln PCGSDP	--	--	--	3.176 (0.042)	--	-0.105 (0.046)

Note: Probability values (*p*-values) are given in parenthesis.

Conclusion

The objective of this paper was to examine the long-run relationship between public health expenditure and income, and to investigate the direction of Granger causality between these two variables for sixteen Indian states using the panel data during 1980-2013. The motivation of our study was based on the argument that whether the budgetary space of the state governments is enough for financing health care for achieving universal health coverage. We took growth of real income/real per capita income as the proxy for budgetary space of the state government in order to spend on medical and public health care expenditure over the time period. The result confirms that health is a necessary rather than a luxury good in India as the elasticity of income with respect to public health expenditure is less than one in the long-run regression estimation. The result suggests significant long-run relationships between public health expenditure and income in Indian states. Further, our result indicates the presence of bidirectional causality between public health expenditure and income in the short-run. In the long-run, however, the causality is unidirectional running from public health expenditure to income. The findings of the present paper have important policy implications for the state governments. First, the positive and significant relationship between GSDP and PHE in both short-run as well as long-run implies PHE is vulnerable to any economic shock. Further, since PHE causes GSDP both in the short as well as in the long-run, it can be inferred that there is a necessity of other sources of funding for strengthening the budgetary space for health. Hence there is need for central allocation not only in the health sector but also in other social sectors because states cannot maintain all health sector demands on its own. The state government should also formulate policies which can strengthen health care financing mechanism thereby mobilizing more revenues for the health sector.

The paper suffers from a few limitations primarily due to the unavailability of relevant data and the choice of methods for empirical analysis, and therefore results should be interpreted with great caution. First, it has not considered some important variables like non-income determinants of health expenditure such as the age structure of the population and literacy rate due to non-availability of data. Secondly, it did not include the central allocation for health which might have given a better insight to the analysis. Thirdly, it has not tried any structural break test to examine whether any policy change during the time period 1980-2013 has had any effect on the public health expenditure. Finally, it has taken into account only income, and ignored the taxation capacity of the state government that induces growth in public health expenditure.

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Allocation of Management Zones of Territories of Innovative Development: Methodical Basis

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Abstract:

The authors suggest a special methodology of management of territories of innovative development (TID), based on the definition of the positions of the territory on the key components of the "values of social and economic indicators - sustainability - risks." The current state of the individual functions of the TID, by means of identifying with a point in the three-dimensional space, is characterized by a specific management zone, which is peculiar to the most appropriate measures in the framework of the TID's management system.

Keywords: territory of innovative development, management, functional approach, three-dimensional model, management zone, alignment matrix.

JEL Classification: O32.

1. Introduction

Currently the extension of theoretical and methodological bases of creation and management of the development of territories with a high concentration of scientific and innovative potential is gains the particularly importance in connection with the initiative for the development of the Strategy of scientific and technological development of the Russian Federation - 2035.

In the draft of the document the support of creation for at least 4-5 large modern globally competitive regions in Russia occupying a leading position in the field of research and development in the world is included with the number of activities aimed at institutional development in science, technology and innovation (The Strategy of scientific and technological development of the Russian Federation- 2035).

Geographical location and the level of intensity of use of scientific and technological potential in the Russian Federation are extremely heterogeneous (Territorial organization of research and development), regions vary in innovative activity considerably (The rating of innovation activity of regions by National Association of Innovations and Information Technologies development (NAIITD)).

According to the developers of the Strategy, the concept of cluster development of territories is getting very popular today and should become the basis for faster growth of the global competitiveness of the territories. Meanwhile the regions which were currently selected for the pilot projects are already has all the key features of territories of innovative development and some of them, for example Tomsk region, were putting into practice the concept of TID in the last 10-15 years in its boundaries.

It is obvious that in order to achieve the significant competitive advantages of the territory the consistent steps and the long-term innovative strategy are necessary. Such strategy is targeted ultimately to achieve a leading position in the country and in the world in terms of innovative development.

Effectiveness in innovation, by definition, associated with scientific, technological and innovative potential, *i.e.,* its concentration in the boundaries of certain territories is an important factor of development. Following the environmental concepts of innovative development (Lepsky 2010), there is the fact that it is the increased concentration of innovative potential in the certain points of the territorial space is able, thanks to its "critical mass", to create a much larger innovative effect due to the synergies.

In this regard, it is the conceptual basis of creation of TID and its directional sustainable growth that are the theoretical basis for the development of those regions, which in the long view are aimed to achieve a leading position in innovation. By creating the separate points of innovative growth in its boundaries - TID, they can count on the involvement in future into the innovative activity municipalities, regions and etc. The single innovative ecosystem of a territory can be formed by combining such municipalities, regions into a cluster.

2. Related works

Articles dedicated to the issues of innovative development of territories are widely represented in special journals. It is necessary to highlight the works of such authors as Gössling and Rutten (2007), Cooke (2012), Bernard *et al* (2014), Zhou and Xin (2003), Capello and Lenzi (2013).

In the studies of the authors some aspects of the methodology of creation and development of TID were actively studied (Maltseva *et al.* 2015). So, on the basis of the functional approach the system of indicators characterizing the potential of the territory for creation of TID and the assessment of the level of its current development was highlighted (Maltseva 2014), a system of dynamic norms for determining the degree of sustainability of TID's growth was suggested (Maltseva 2015), as well as the possible risks were determined, the impact of which could cast a pall over the performance of territory's strategy (Maltseva 2016).

In this case, the proposed tools should be used in a complex: the strategic vectors of development should be pointed out in accordance with the values of the indicators. This vectors should be regularly adjusted taking into account the level of compliance of the dynamics of indicators to dynamic norms that characterizes the stability of growth of a territory, herewith the possible impact of risks on the strategic vector should be taken into account and the activities aimed at minimizing of their negative influence or neutralization should be carry out.

Thus, for convenience and the quality of development of management of TID a comprehensive methodology, based on the organic combination of the developed instruments and promoting its most effective use, is required.

3. Results

The authors propose to use the matrix approach as a tool to determine the current level of development of TID and the most appropriate management actions aimed at the transition of the TID in a more prosperous area for each of the selected zones should be determined. The key characteristics (integral variables) for creating management zones in the proposed framework are:

- values of social and economic indicators;
- sustainability of social and economic development;
- the level of risks.

Building the management matrix is carried out for each of the highlighted features of TID; the results are integrated into the matrix of components, and then - into the final management matrix. To formalize the integrated variables and to determine their values at a particular time the scales is used. The characteristics of such scales are showed in Table. 1. They allow to determine the belonging the current characteristics of TID to a particular classification group.

Table 1 - Characteristic of the scales of integral variables to creation management zones of TID

Integral variable	Classification group (scale)	Order of formalizing
Values of social and economic indicators	- Very low (X_1); - Low (X_2); - Average (X_3); - High (X_4); - Very high (X_5)	Within each function the values of the indicators in the reporting period are determined and are compared with the all-Russian ones. Based on the comparison results the function is referred to the correspondent classification group in the following way: X_1 - below the all-Russian average more than 50%; X_2 - below the all-Russian average less than 50%; X_3 - match the all-Russian average with a deviation of no more than 10%; X_4 - exceed the all-Russian average no more than 2 times; X_5 - exceed the all-Russian average more than 2 times In that case, if there are the significant differences between the values of the function parameters, the base group is selected (to which the most of the indicators are attributed), and then if there are the indicators which are differed by groups of more than one order then the adjustment is held: the subsequent or previous to base group respectively is recognized as a group for this function of TID. *For example,* the base group, which includes most of the indicators is X_4, herewith one indicator refers to the group X_1, then this function of TID belongs to the X_3 group.
Sustainability of social and economic	- Low (Y_1); - Average (Y_2); - High (Y_3)	For each function the comparison of growth rates of indicators with dynamic norms is carried out, then the function is included to one of the following groups by this integrated variable: Y_1 - more than a half of

Integral variable	Classification group (scale)	Order of formalizing
development		inequalities of dynamic norm are not met; Y_2 - less than a half of inequalities of dynamic norm are not met; Y_3 - compliance with the dynamic norm
The level of risks	- High (Z_1); - Average (Z_2); - Low (Z_3)	Risk assessment is carried out based on risk maps for each function. The definition of group of each function on this integrated variable is performed in the following way: Z_1 - more than a half of the risks are higher than a border of tolerance for risks; Z_2 - less than a half of the risks are higher than a border of tolerance for risks; Z_3 – there are no risks higher than a border of tolerance for risks

The three-factor model is used to select the management zones. This model characterizes the current state of TID by the point in the three-dimensional space, which is located in one of the blocks (cubes) of this space. Each block (cube) is characterized by the certain intervals of integral variables, is corresponded to a specific current level of development of the system, and, consequently, to a certain strategic vector of management, aimed at achieving the best results (Figure 1). For the purposes of the study each block (cube) can be considered as the management zone.

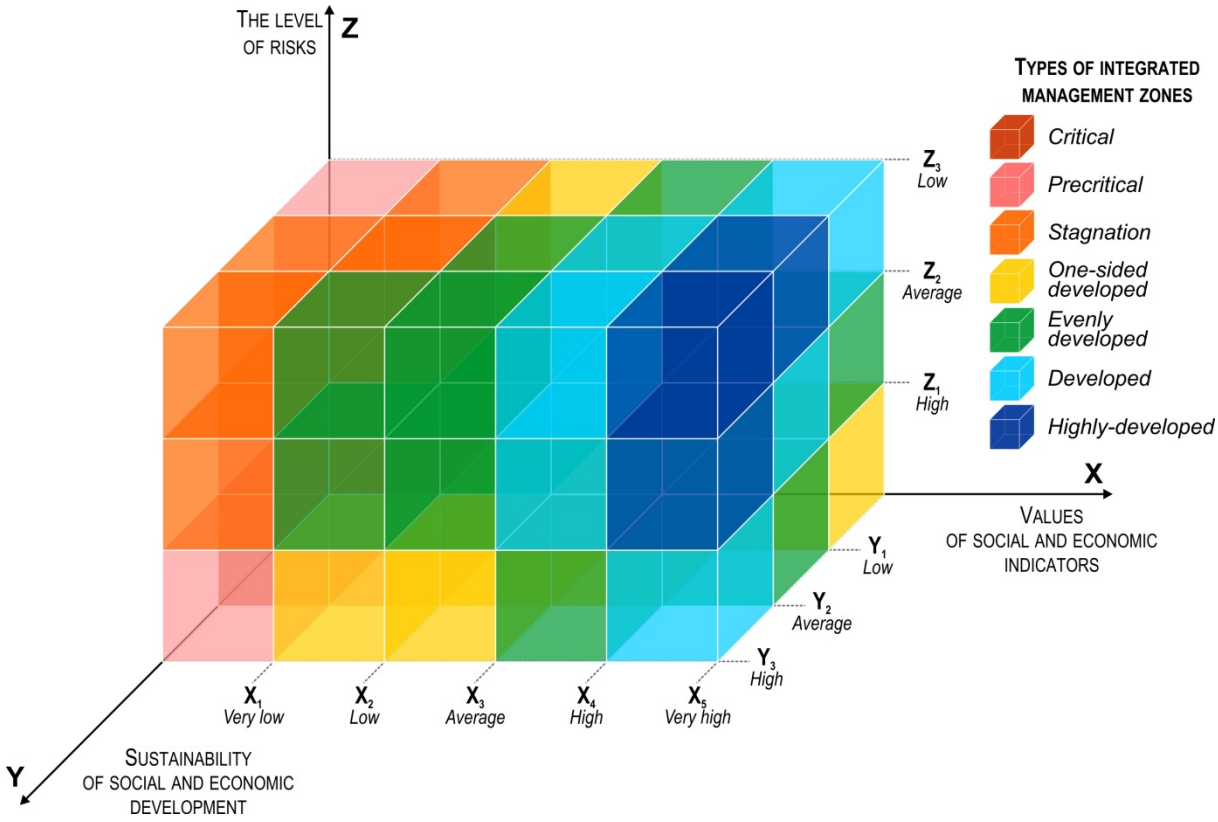

Figure1 - Types of integrated management zones

As the figure 1 shows it is possible to marked out 45 management zones of TID, which are divided into 7 types of the integrated management zones, the characteristics of which is given in Table 2.

Table 2 - Characteristics of the integrated management zones

№	Types of integrated management zones	Characteristics	Development directions
1	Critical	Low or very low values of indicators of social and economic development and at the same time low sustainability and high or medium risks, which in the long term does not provide the opportunities for faster growth rates of indicators which are necessary for the efficient operating of TID and they rather show the strengthening of crisis tendencies in the long term	The expediency of creation and development of TID is virtually absent. Perhaps this type of territory is represented by a municipality with the once-developed city-forming scientific-industrial complex, which at the time of the analysis is not operational and has no prospects for development. It requires the radical measures to transform the territory and large investment projects
2	Precritical	Low or very low values of indicators of social and economic development and at the same time an average level of sustainability and risks, demonstrating the uncertain prospects: changes can be both positive (they can to slow down the crisis and transfer the system on the level of stagnation) and negative, that may lead to a transition to the crisis stage	Prospects of development of TID within the territory are very dubious. As in the previous version, it is likely that it was once developed territory in terms of research and innovation, but in virtue of restructuring it turned out that this territory is out of the mainstream of scientific and technological development. To ensure the stable growth dynamics of the territory requires radical targeted measures, including big investment projects in the sphere of innovation
3	Stagnation	Low indicators of social and economic development and at the same time a sufficient sustainability and low risks, which in the long term may create conditions for the advanced development of innovation, but with sufficiently long planning horizon.	Potentially it can provide the conditions for the creation of TID. Chances are high that the achieved sustainability and the level of risks of territory due to the lack of dynamic developing companies, which is the necessary condition for TID. It requires the activation of activity of economy subjects of the territory, which at some stage it will take the system away from a state of sustainability and in a number of cases it will result to high risks, but it will create the conditions to achieve sufficient indicators of innovation development
4	One-sided developed	Average indicators of social and economic development and at the same time a low sustainability and significant risks, which may further lead the territory both to a crisis and to a developed type	It mostly typical for promising TID at a very early stage of development, without a clear selected vector of prospective development. To ensure the development of TID within the target vector requires a well-established management system and governing bodies must rapidly respond to the risks
5	Evenly developed	Average or above average indicators of social and economic development and at the same time a sufficient level of sustainability and low risks, which determine the prospects for a smooth transition to the stage of developed systems	TID which characterizes by such a state is at the stage of creation and most likely it contains a well-functioning control system of development and risks. Stable dynamics of indicators related to capacity-building by economic subjects which in order to ensure accelerated growth requires further measures for their support from the government
6	Developed	High and very high indicators of social and economic development and at the same time a sufficient level of sustainability and low risks, that characterizes the system, which with the growth of certain factors is capable to achieve a highly developed state	It mostly typical for TID, which are on the project level. Certain risks and variations in growth rates of indicators and sustainability are not systemic, but due to the specific current situations of economic subjects. In some cases, achieving a higher level of development is not possible due to the current external circumstances: the state of the external environment, public policy, the original characteristics of the territory (climate, border position and so forth).

№	Types of integrated management zones	Characteristics	Development directions
7	Highly-developed	Very high social and economic indicators, sustainability and low risks	A system's state, which is achieved in exceptional cases if the policy of regional authorities is effective. In practice, mostly it is the ideal final result, the ideal model of TID. It is noted that if a system will really achieve this state, then it cannot be in it permanently due to the fact that further development requires new innovative projects for the most part characterized by a high risk. These projects will temporary transfer the system into a developed condition or into developing condition. If there are no such projects, then a system may be in a stage of stagnation.

Allocation of the integrated management zones is due to the similar characteristics which have the specific management zones and which determine mostly the further administrative actions. Furthermore, due to the fact that a number of indicators for determination of the management zones is detected using the expert method, there are possibilities of errors and inaccuracies associated with the expert's subjective perception of the specific characteristics of territory's activity. Introduction of the integrated zones are more likely to guarantee the accuracy of the determination of the positions of a territory in the management matrix, and, consequently, the proposed management actions to achieve the highest possible results.

The classification proposed in the table was considered in relation to the TID as a whole, at the same time on the first stage of the study the integrated control zones are defined for a particular TID's function, and then for their components. For this purpose, the integrated zones are identified for each function, and then among them the most common function is selected as typical for all components. In this case, if there are significant deviations from the most common variant, the adjustment of type to one or another side is carried out. For example, if the most of the functions are characterized by stagnation type, and one function - the developed one, then the entire component is referred to the one-sided developed type and etc.

Herewith the functions which are characterized by critical or precritical type should be put into the special management matrix for priority analysis and control. Similarly, the type of TID in whole can be identified on the basis of the analysis of the integrated management zones of individual components. The integrated zones of components and TID in whole are determined exclusively for the understanding of the decision-maker, the general state of the question. For management purposes to consider the integrated management zones for the individual functions is advisable.

The relatively sustainable growth in all areas of operation is determined as one of the key principles of TID's management, *i.e.*, for the purposes of effective management it is viable to align the development of the individual functions. As the tool, it is suggested to use an alignment matrix, in which, in accordance with the components and integrated control zones the functions of TID are arranged in a specific point in time (Figure 2).

Measures implemented within the management of TID should aim at transfer of the respective function from the current status to the zone with a higher level of development, herewith the priority is given to the functions located in the alignment matrix in its first lines.

Managerial alignment matrix that is showed above can be a tool for effective management of TID, because with its help it is possible to classify the measures which are necessary for development of a territory in dependent of importance and priorities, as well as to identify the most important areas of government support and investment.

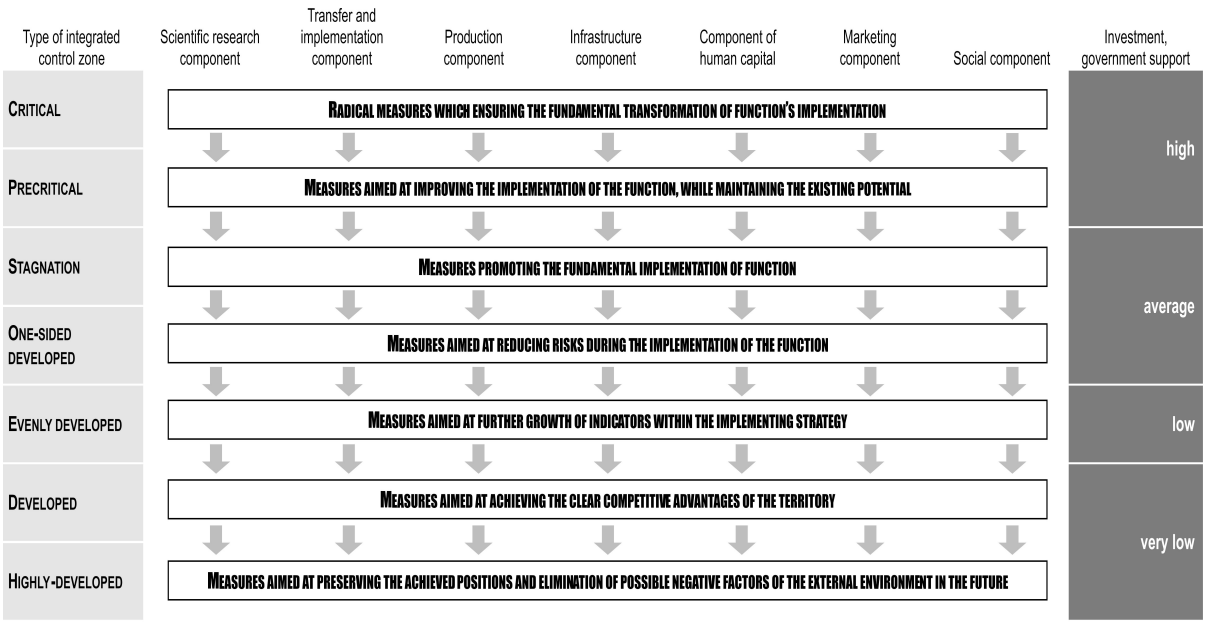

Figure 2 - Alignment matrix

So, it is suggested that for the functions belonging to developed and highly developed types will be a very low investment costs and government support measures, but there is the opportunity for the private initiative. In this case, it is assumed the primarily organizational measures which makes possible the "crossflow" of financial resources into the most unfavorable areas for the development of those functions, which are characterized by the critical and precritical state.

A specific list of measures and areas of use of investment resources of the territory is composed depending on the real conditions of the operating and targeted vector of development. Herewith it is noted that at the stage of creation of TID's management system the basic list of features for each component must be clarified and adjusted. In some cases, when the TID's function is in a critical state zone that in theory it is not realized on this territory because of absence of its demand.

Thus, the proposed management tools for TID's management based on multi-component model of "social and economic indicators - sustainability - risks" with the allocation of seven integrated management zones and creation on its basis the alignment matrix can greatly simplify the process of management decision-making and ensure the achievement of the highest eventual result of TID's operating.

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The Impact of Value Added Taxe Rates on the Economy of the European Union Countries using Data Mining Approach

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Abstract:

A value-added tax (VAT) is currently a key element of tax system and an important source of revenue of EU Member States' budgets. VAT revenues in 2014 represented 7.75% of GDP and 21% of total tax revenues. The highest proportion was in Croatia, 34.1%, and the lowest in Italy, 13.8%. The present contribution deals with the problem of impact of changes in the VAT rate on the economy of the EU countries. Methodology Knowledge Discovery in Databases and within it the technology of decision trees and webs graph let us handle analysis of the relationship between the change in the VAT rates and selected macroeconomic indicators, namely: gross domestic product (GDP), household consumption expenditures, exports of goods and services and unemployment rate. The subjects of review were the EU countries in the period 2004 - 2015. Modelling results indicated, what applies in general, that the reduction in GDP will change the value-added tax thereby it confirmed the validity of the relationship between the changed rate and economic growth.

Keywords: economic growth, gross domestic product, value added tax rate, macroeconomic indicators, decision tree.

JEL Classification: H21, H25.

1. Introduction

The rise of value added tax represents the most significant developments in the area of tax policy and administration of the last decades. The reason for its introduction was the need for tax revenues through improved tax administration and compliance with the tax laws (Keen and Lockwood 2006). Today's form of value added tax first appeared in France, in 1954, and covered only large businesses. With the passage of time, the VAT related to all sectors in the country (Economy Watch 2010).

In the next decades VAT expanded to the other countries in Western Europe. Italy, as the last original EC member state, introduced VAT in the 70's of the 20th century. Ireland, Great Britain, Spain and other EC member states introduced VAT at the end of the 20th century. Croatia with Slovenia introduced this tax as the last countries from the European Union. Another example is Denmark, which introduced the tax even before the entry into the community (European Commission 2016). Sixth Council Directive 77/388/EEC of 17 May 1977 on the harmonization of the laws of the Member States relating to turnover taxes led to a uniform coverage of VAT in the European Union. Council Directive 2006/112/EC of 1 January 2007 on the common system of the value-added tax replaced the Sixth Council Directive and has included legislation on the common system of VAT nowadays.

The present contribution deals with the effect of a change in VAT rate on the economy of the EU countries in the period 2004 – 2015. To fulfil the objectives, the contribution is divided into five main parts. The rest of the paper is organized as follows: content of the first part is the literature review of the impact of changes in VAT rates, the materials and methods is discussed in the second part, development of changes in VAT rates in the EU is given in the third part, fourth part provides the results of modelling classifiers when changing VAT rates. The last part is devoted to a conclusion.

2. Literature review

Changes in the VAT rate beside the time aspect also depend on the macroeconomic indicators that affect it. Household consumption has a decisive impact, because this tax influence mainly final consumers. Attanasio and Weber (2010) claims that fundamental change in consumption occurs when unexpected changes in consumers' income appear. Browning and Crossley (2009), Carroll *et al.* (2010) examined how consumers are changing the timing of purchase of durable goods to cope with the transitional external shocks, e.g. a change in tax rates. It is these changes that also give rise to the changes in income and consumption between individual periods, because consumers react to their higher costs or/and future prices with accelerated consumption in the current period. Miki (2011) also claims, that if the tax rate increase is expected and announced ahead, before the rise of the tax rate people will purchase durable goods. One of the main reasons of preferring the consumption

taxation before income tax is the expectation that consumption taxes discourage people from consumption, encourage savings and thus create space for higher economic growth (Alm and El-Ganainy 2012). Miki (2011), Dráb and Mihóková (2013), Mirdala (2014) expect that economic growth will move in the same direction as the aggregate consumption, as consumption is one component of the GDP. According to them an increase in the VAT rate have a negative impact on the purchasing power and the whole economy through the reduction of human consumption.

Through the changes in real wages a change in the VAT rate also affects the labor supply. An increase of VAT causes the decline in the labor supply because consumption compared to leisure time is more expensive (Metcalf 1995). Frederiksen *et al*. (1995) suggest to spend resources on active labor market policies with a focus on structural unemployment. Generally, the impact of changes in the VAT rates on employment is influenced by many interrelated factors. The specific circumstances of each country determine the final result of action of these factors.

The last monitored factor is export. According to the theory of international trade, VAT should not have any impact on export or import. The reason for this is the adjustment of exchange rates, which eliminates export or import incentives through changes in the VAT rate. When a country increases the VAT rate on all goods and services by 8%, it results in an appreciation of the exchange rate by 8%, so the revenues of exporters and importers are not changing. Such adaptation of exchange rate to VAT change has resulted in the assumption that the VAT does not affect international trade patterns (Desai and Hines 2005). Miki (2011) takes the view that VAT does not affect exports because exporters can deduct the VAT from their tax obligation, which means that it does not affect the ability of domestic companies to export. Another opinion hold Carroll *et al.* (2010), who are stating that

the impact of a VAT change on the balance of trade of the country depends on whether it is surcharge on imports to the existing federal tax, or it is a replacement for existing sales tax. Desai and Hines (2005) considered the impact of VAT on international trade and concluded that openness and exports are negatively correlated with the presence of VAT and the extent of reliance on the revenue from this tax.

It goes without saying that a change in the VAT rate does not influence only the previously mentioned macro-economic indicators, i.e. consumption, economic growth, unemployment and net exports. Several authors studied another different view through microeconomic indicators. Katz and Rosen (1983), Stern (1987), Graafland (1990), Stiglitz *et al*. (2000), Auerbach and Hines (2001), Mura and Buleca (2012), Raisová (2012), Collins (2014), Glova (2014) and Hakalova *et al.* (2014) work on the challenge to analyse the impact of indirect taxes, especially VAT by individual economic entities, in particular companies and individuals.

3. Materials and methods

For this analysis, we used a standardized methodology based on the process of knowledge discovery in data, namely methodology KDD (Knowledge Discovery in Databases). It is a knowledge extraction from the selected database. In our case, it comes to assessing the impact of VAT changes on the EU economies of the countries that are members of the Organization for Economic Cooperation and Development (OECD). The data were drawn from OECD and Eurostat databases.

In the first part of the analysis of the paper with aim to evaluate the impact of VAT on the economies of EU countries we have followed the evolution of changes in the VAT rates in the 28 EU countries from 2004 to 2015. The second part of the analysis of the paper quantifies the impact of selected macroeconomic indicators on the VAT rate change. Macroeconomic indicators such as gross domestic product, household consumption, export and unemployment were selected on the theoretical basis of authors Harries (1987), Baker and Brechling (1992), Poterba (1996), Besley and Rosen (1998), Delipalla and O'Donnell (1999) and Carbonnier (2005, 2006), who came to different conclusions about the transfer of the tax burden on the prices of consumed products as well as on the overall economic growth of individual countries.

For the selected countries, we abstracted variables that were categorized into three groups:

- *Tax variables* (change in VAT, old VAT rate, new VAT rate, change in VAT_absolut). Our first four variables were highly correlated with rates of VAT – the change in the VAT, the original VAT rate, the new VAT rate and the total change in the VAT. We decided to work only with the standard rates and we did not take into account other types of VAT rates. Change in the VAT is a variable that can reach values of 0/1. 0/1 indicates whether there is a change in the VAT rate (1) or in that period there is no change in the VAT rate (0) within a given period of time. Next we set a specific level of rate before and after the change and the total value of this change in order to see clearly whether the VAT rate increased or decreased.

- *Crisis.* We also added an attribute associated with the crisis, because sometimes unusual behavior of selected macroeconomic indicators can be related to the ongoing crisis in the country, and is not necessarily associated with a change in the VAT rate. Moreover, many countries have changed the rate during the recession.
- *The main macroeconomic indicators*. They were divided into time periods: *t, t+1* and *t+2*. Specifically, we use:
  - Gross domestic product (GDP) - an indicator of GDP in million EUR at current prices.
  - Consumption (C) - final consumption expenditure of households expressed in million EUR at current prices.
  - Unemployment (UN) - the overall unemployment rate for persons aged 15-64 years in %.
  - Export (EX) - exports of goods and services in million EUR at current prices.

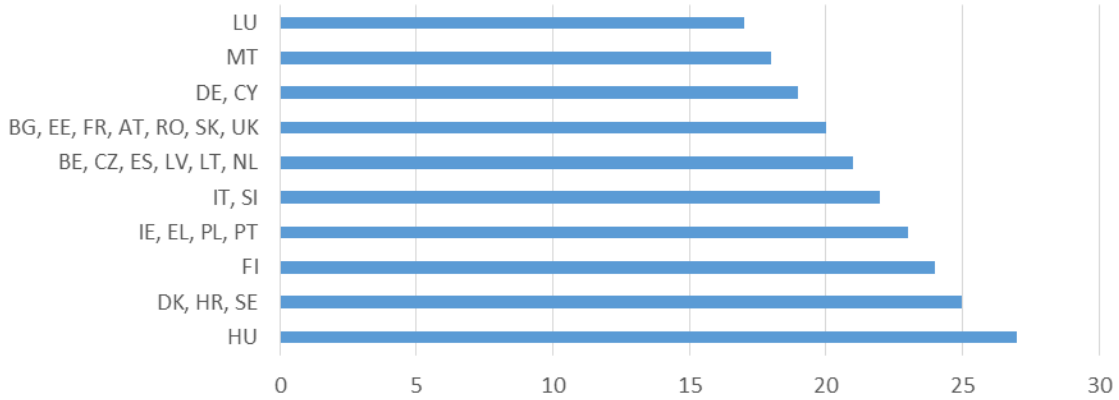
The paper focuses on the impact of a standard VAT rate on the economic growth as an indicator of overall economic performance. We took into account the total impact of the change in the rate on economy, which means before the change in the rate, during the change and the subsequent effects following the change in the VAT rate. We changed the values of GDP, C, EX and UN in all the selected years and the total change in the VAT into numbers by using an object "Derive". The next step was to verify the accuracy of identification of values by using an object "Type". The next few objects were types of "Derive" and they helped us to identify whether annual changes of macroeconomic variables GDP, EX, C and UN (at time *t+1* and *t, t+2* and *t+1*) were positive or negative. We also created a new variable called VAT_increase, which indicates an increase in a VAT rate. We used this variable as a target in modelling. The last used object was "Balance", because the number of cases when VAT rate changed is a lot smaller than the number of cases when changes weren't made. This object enabled us to raise and simulated situation of the change in the VAT rate. An increase depended on the particular model, but so for the greater explanatory power and robustness of models we used multiple values.

In this paper, we used techniques of decision trees and cobweb diagram with annual data from years 2004 to 2015 for modelling. Three decision trees were prepared and they differed in target variable. Change_in_VAT is the first decision tree and a target variable is change in the VAT rate, the second tree is VAT_increase tree and it only regards to the VAT rate increase and the last, third, tree is Change_in_VAT_absolut tree and it focuses on the overall value of changes in the VAT rate. We used IBM SPSS Modeler processing program.

4. Development of value added taxe rates in European Union countries

Currently, the change in VAT rates, and in particular its increase, is the growing trend among EU member states. Increase is mainly used to cover the lack of funds in the government budgets. VAT in 2014 reached 976 billion EUR and was representing 17.5% of the total public revenue. Most countries use a standard rate and at least one reduced rate of VAT. The list of countries with one reduced rate includes Bulgaria, Germany, Estonia, Latvia, the Netherlands, Slovenia, Slovakia and the United Kingdom. Two reduced VAT rates are in the Czech Republic, Greece, Croatia, Cyprus, Lithuania, Hungary, Malta, Poland, Romania, Finland and Sweden. Super reduced rate is applied in Spain, France and Italy. Special rates are established in Belgium, Ireland, Luxembourg, Austria and Portugal. Denmark is the only EU country where goods and services are taxed at one rate without the existence of reduced rates. However, there are also eight member states with a derogation to apply a zero VAT rate on certain goods and services; namely: Belgium, Denmark, Ireland, Italy, Malta, Finland, Sweden and the United Kingdom.

Since 2010 there has been a total of 29 changes in the standard VAT rates in all member states of the EU. In 2015, the average standard rate in the member states was 21.68%, while in 2008 the average was 19.47%, and this was reflecting the need for fiscal consolidation in many member states due to the financial crisis. On the 01.01.2016 the lowest standard rate was in Luxembourg, amounting to 17%. On the other hand, the highest rate of VAT was in Hungary, where it has been increased up to 27% in the post-crisis period (Figure 1).



Source: Own elaboration based on the European Commission

Figure 1 - Standard VAT Rates in EU Countries

VAT rates vary from the introduction of the tax. Cyprus began with the lowest standard VAT rate, at the level of 5 %. Hungary from the beginning introduced VAT at the level of 25%. Also, the number of changes in the rate of this tax is different. The minimum number of changes, specifically two, was done only in Malta and Poland. Malta increased the rate from 15% to 18% in 2004, when it became a member of the EU and harmonized tax policy with the European Commission Regulation (Company Formation Malta 2015). That increased VAT rate was associated with the consolidation of the high budget deficit of 10% of GDP and public debt 72% of GDP. From 2011 Poland was forced to increase the VAT rate from 22% to 23% as well as the reduced VAT rate from 5% to 8% due to the slowdown in the economy after the crisis.

In countries like Bulgaria, Croatia, Lithuania, Austria, Slovenia and Finland, there was an increase in the standard VAT rate twice and only by a small margin, each time by 1% or 2%. For example, in Bulgaria it was from 18% to 20%, in Lithuania from 18% to 21%, and in Slovenia from 19% to 22%. Croatia and Finland started with 22% VAT rate which rose to 25% in Croatia and 24% in Finland. The biggest overall change throughout the whole development of VAT was in Austria, by 4% from 16% to the current 20%. Estonian VAT rate was also increased twice, but the first increase was by 8% in 1993 (from 10% to 18%). This change is related to the transition to a market economy, with a major reform in the monetary area. In 1992 the Estonian kroon was reintroduced, and it was pegged to the German mark (Raju 2012). In the same year, the government gradually promoted reforms in other parts of the economy too, as it was obliged to comply with a balanced budget rule. This led to the reduction in government spending and to the tax reform, which should boost the economic growth (Marrese *et al.* 1995). The standard VAT rate in Latvia was changed three times. Since 2009, the standard and the reduced VAT rate were significantly increased because of the economic downturn and decline in tax collection. The standard rate was increased from 18% to 21% and to 22% and the reduced rate increased from 5% to 10% and to 12%. Last change in VAT rate occurred in 2012 when there was a decrease of several tax rates, including the standard VAT rate, which returned to its original level of 21% (Benkovskis and Fadejeva 2013). Hungary rank beside the countries with the highest VAT rates. At the time of entry into EU Hungary still taxed products and services with 25% VAT rate, but in 2006 it decreased to 20% and from 2012 country has the highest, 27%, standard VAT rate among all EU member states. Suggested increase caused problems at the beginning, because countries believed that the maximum upper limit of the rate is 25%. But in fact, there is no existing upper limit of the VAT rate. The Czech Republic is one of the few member states that gradually reduced the introduced VAT rate from 23% in 1993 to 19% in 2008. VAT in this country went through several changes, the rates changed seven times. The current standard rate is 2% lower than the rate that was in effect at the first introduction of VAT.

Most countries are gradually introducing increasingly higher rates of VAT, for example Luxembourg, Spain, Denmark or Germany. Luxembourg began with the standard rate that was 8% and by 2015 it more than doubled, as the current rate is 17%. Spain gradually adjusted their rate from 12% to current 21%. In Denmark, a similar evolution was observed. The rate rose from 10% to 25% and it was done in six changes. Germany also had the 10% rate, but since 2007 the rate is 19%. The effective tax rate in other member states EU (Romania, Greece, Belgium, Denmark, Great Britain, France and Portugal) is likewise currently higher than it was in the beginning, although during the development it was decreased because of various reasons. Slovakia started to implement VAT when country was changing from a centrally planned economy to a market economy, the time of the establishment of the independent Slovak Republic. At that time the standard rate was determined at 23% and reduced to 5%. In 2003, VAT was reduced to 20% and the reduced rate increased to 14%. In connection with the

entry of the Slovak Republic to the EU and harmonization of tax policy, further amendment of the law occurred and a flat tax rate at 19% was introduced. The reduced rate was completely abolished, but only until 2007, when it was reintroduced at 10%. In 2010 a 6% rate on selected products from the yard sale was instated, but already a year later was cancelled. In that year, there also was a temporary increase in the basic rate to 20% as a measure to reduce the deficit below 3% of GDP. Even though this condition was already met, the government decided not to return the rate to its original level of 19% and from 2015, the basic tax rate is considered to be 20% (The New Agency of the Slovak Republic 2011). Seven rate changes happened in Cyprus, from 5% to final 19%, while already in 2012 another increase for years 2013 and 2014 was set (Borec 2012).

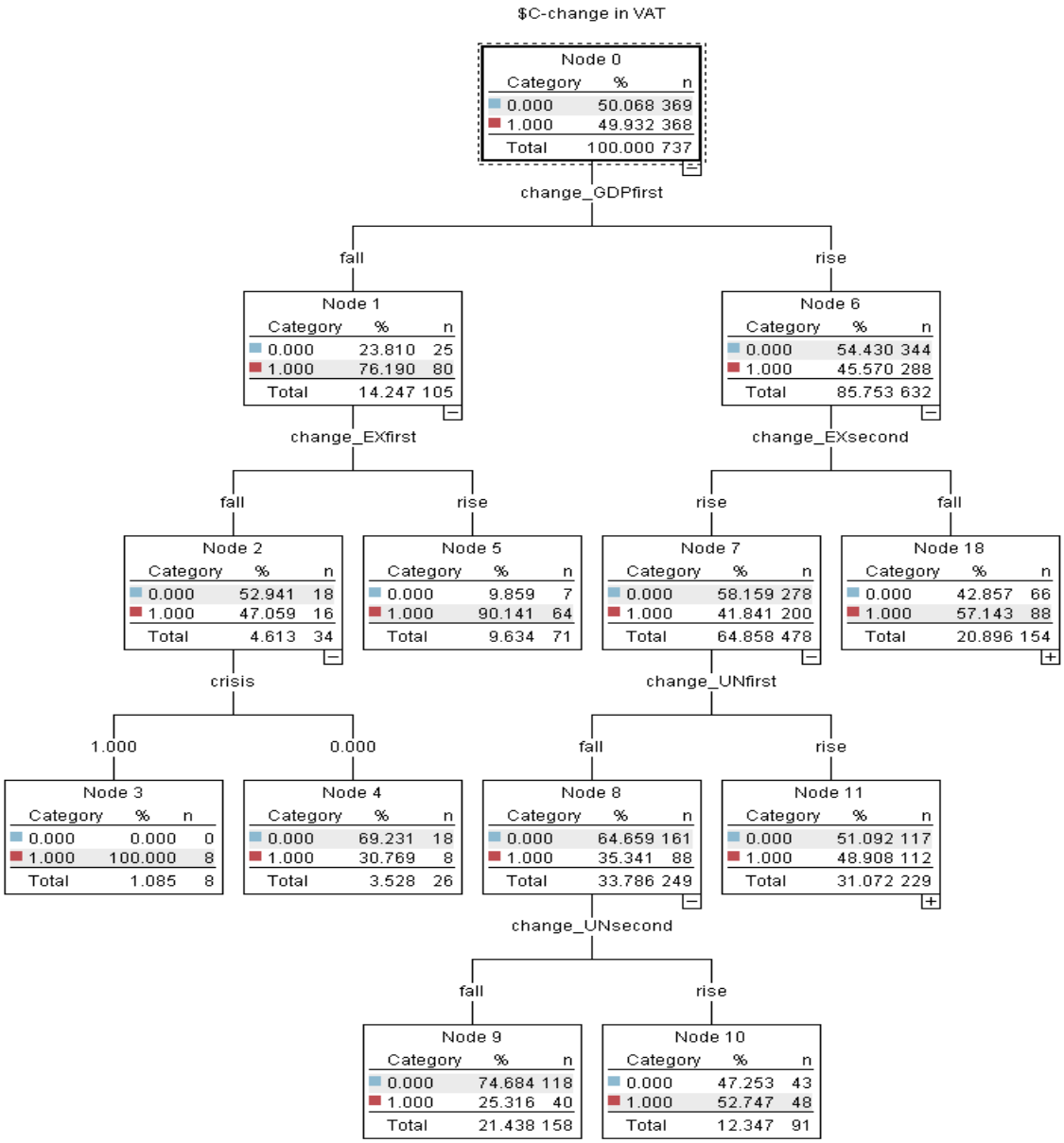
The most changes were made in Italy, the Netherlands and Ireland. The initial rate was the same in Italy and Netherlands, 12%, and these countries gradually moved to 22% and 21% (respectively). Italian Government has already prepared a proposal to gradually increase the rate to 24% in 2017 and to 25% in 2018, depending on the performance of their economy, which is still recovering from the financial crisis. The proposal is part of Italian stabilization law and should help in meeting the deficit below 3% of GDP (Avalara 2015). Ireland is the only Member State which had the standard rate set at a record high level, 30%, and later even increased it to 35%. Since then the rate was gradually reduced to 25%, 23%, 21% and 20% in 2001. In 2002 the rate returned back to 21%. Similarly, the 0.5% increase in 2009 was cancelled straight in the following year. Since 2012 goods and services are taxed at 23% rate. Frequent changes were reflected also in the reduced VAT rate (Tax Policy 2012).

Cnossen (1998) examined the introduction of different rates of VAT in the countries of the European Economic Community and concluded that although the problems with the definition of rules are of legal nature, each option of the definition will also have an economic impact. In order to avoid a gap in the definition of the tax base he suggests spending more on administration and tax collection.

5. Modelling classifiers when changing value added taxe rates

In this phase of data mining we selected two from the earlier mentioned modelling techniques. The first technique consists of using object C5.0 which output is in the form of a decision tree. Input in the analysis, and so the potential classifiers were all selected macroeconomic indicators and an indicator of the crisis. The second technique consists of the establishment of direct cobweb diagram.

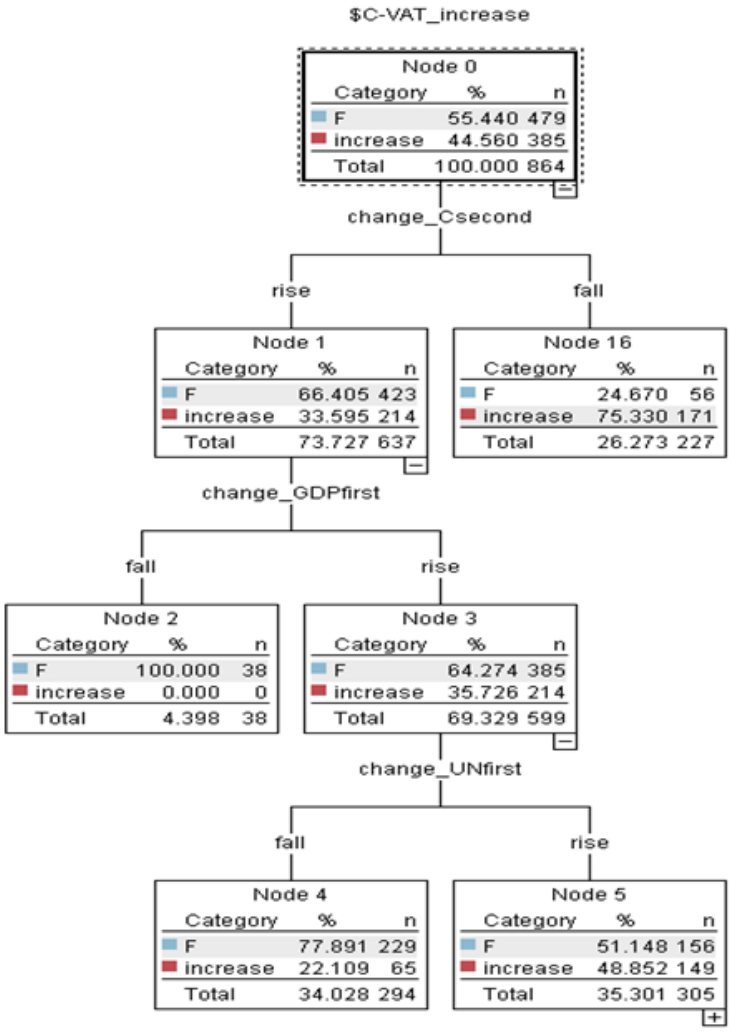
Firstly, we present model of the decision tree called Change_in_VAT. In this model, we ignored increases or decreases in the VAT rate. The aim of modeling is indicator of changes in the VAT rate (0/1) which indicates whether there is a change in VAT rate (1) or there is no change in VAT rate (0) within a given period of time. At the beginning, the data included 46 cases of changes in the VAT rates and 369 cases without changes in the VAT rates. After using the coefficient 8 to increase the number of cases when changed in the VAT rates occurred, the ration was relatively balanced (Figure 2). The Figure 2 illustrates that the most important classifier is the annual growth rate of GDP at a time between t+1 and t. If there is a change in the VAT rate, it proves with 90.14% probability that GDP falls in next few years while exports rises. If there was a decline in exports and the onset of the crisis in the same period, in 100% of cases there was a change in the rate in the previous period. This model provides the same results, even when we multiply the attribute 'change in VAT' = 1.0 by factor 2. The second branch of the tree, which represents the GDP growth, is more complicated. It can be said that if there is no change in VAT rates, it proves with 74.68% probability that GDP grew, also export increased and unemployment was falling even in the both periods.



Source: Own elaboration

Figure 2 - Model C5.0 Change_in_VAT

In the second model, we present the decision tree called VAT_increase. In this model, we focus on the actual increase of the change in the VAT rate, in respect of the fact that 36 of the 46 VAT changes were upwards (increases). The percentage composition of the two categories of the field, as we can see in the top part of the decision tree (Figure 3), is almost the same, which was the result of the use of the object “Balance” with a coefficient 10.66. Object Balance caused that the interpretation of the decision tree is more complicated.

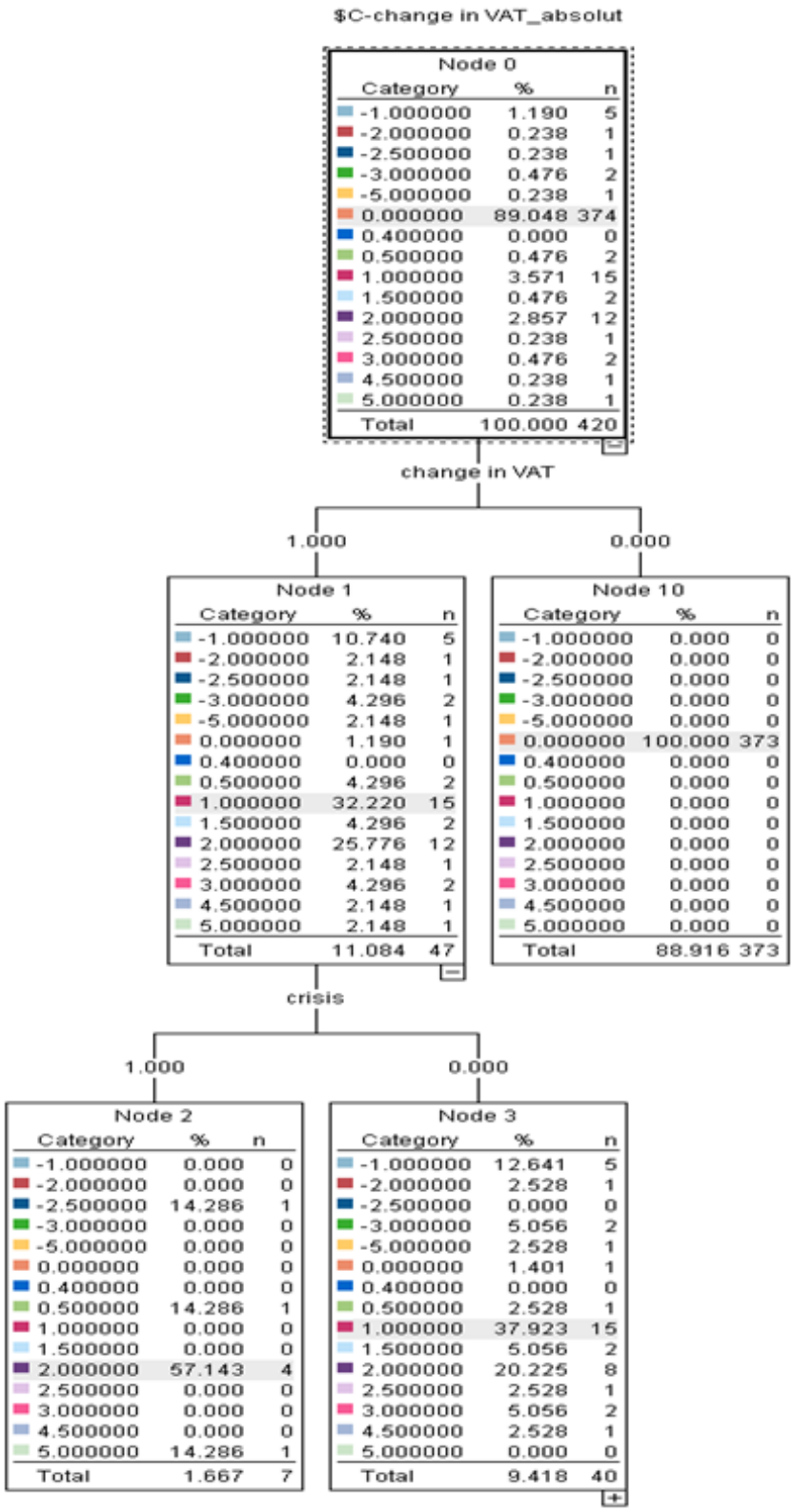


Source: Own elaboration

Figure 3 - Model C5.0 VAT Increase

The first branch of this decision tree proves with 75.33% probability that if the VAT rate is increased, two seasons later there was a decline in annual household consumption. This relationship is also valid for coefficient 3 and such a model points to decrease in GDP right in the next period after the one when change in the VAT rate was implemented. The second branch proves that if the VAT rate is not increased than almost in 78% of the cases a final consumption and expenditure were rising while unemployment decreased. However, if coefficient 2 was used, the results were different, because another prioritization of important factors occurred. It is evident from this decision tree that an increase in the VAT rate is with 70 % probability followed by a decrease in GDP and by an increase in export in the next period. This result is consistent with the result achieved by modelling Change_in_VAT. It is caused by the predominance of recorded increases of the VAT rate compared to their declines.

The third decision tree model allows us to understand the relationship between the absolute value of change in the VAT rate and other selected input variables (Figure 4).



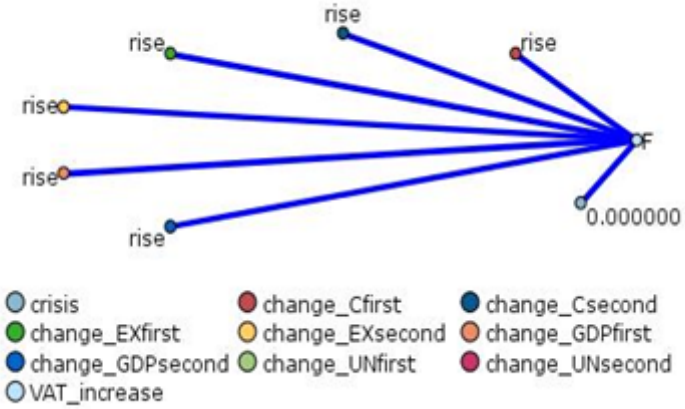
Source: Own elaboration

Figure 4 - Model C5.0 Change_in_VAT_absolut

Of course, the most frequent absolute value of the change in the VAT rate is zero. The data that we used included 374 cases of a constant rate, which represents 89%. There are only ten records of the reduced VAT rates out of all 420 records. We can say that countries mostly approach to an increase in a VAT rate - in 32% of the cases it was a one percent increase and in nearly 26% of the cases it was increased by two percent. If the country was not affected by some crisis (monetary, financial, economic, etc.), in 38% there was a change in the

rate by 1% upwards. Very interesting finding is that 57% of changes during the crisis is in the form of an increase by two percent. However, it appears that most of these changes occurred without the influence of the ongoing crisis in the country.

The next constructed model is direct cobweb diagram with variable VAT_increase (as F variable) in the centre of figure bellow (Figure 5).



Source: Own elaboration

Figure 5 - Direct cobweb diagram

In this model, it can be seen that there is a strong relationship between the value of variable F and variable VAT increase (no increase in rate) and a zero value of variable crisis, together with an annual rate of GDP, C and EX. We can say that in the situation when an economy has a constant value of VAT rate and there is no crisis in the country, the GDP, consumption and export were increasing most of the time in the monitored cases.

The most important classifiers in models are: a change in the rate of GDP between t+1 and t, and a change in export in the same period. Other significant attributes include an annual change in final consumption expenditures of households and an unemployment rate. The results of modelling indicate what is true in general that if the VAT rate changes the GDP decreases. Ramona *et al.* (2011) predict this development only for an increase of the VAT rate, not for any possible change in the GDP. However, in the data that were analyzed prevails an increase in the rate over the deduction, which causes a distortion.

In the same period export increases. As a consequence of lower final consumption by households is a reduced demand for domestic goods and services. This situation forces manufacturing companies to increase the export. Moreover, the goods or services exported outside the EU are in principle exempt from VAT and EU-based companies can deduct the VAT paid on their purchases from the sales tax, they charge their customers. Based on our data, we may conclude that at a time when the government does not accede to a change in the VAT rate, the country's economy is expanding, because the GDP, consumption and export are growing year on year and unemployment rate is gradually decreasing. The same result visualizes the output of the cobweb diagram.

Despite the opinion of economists Desai and Hines (2005), Miki (2011) and Collins (2014) that the VAT increase is associated with the existence of a crisis, in our analysis there were only a few such cases. If there was some increase, in most cases it was by 2%. The most common change in the VAT rate was by 1% upwards, the second most occurred change was an increase by 2%. Generally speaking, there are no frequent reductions in the VAT rates. It seems that this option is in most of the observed countries not really preferred. The development of economic growth is not only influenced by changes in the VAT rate.

There are many studies that focus on the determinants of changes in macroeconomic characteristics. In the future, the analysis could be extended by selecting more variables. Barro (1991) advocates the impact of human capital on economic growth, according to La Porta *et al.* (1998) and Berkowitz *et al.* (2003) the legal conditions are important, Acemoglu *et al.* (2008) demonstrated the relationship between income and democracy. It would also be necessary to consider that the sooner the change in the tax rates is announced by the government, the weaker the subsequent effects will be. Based on empirical evidence we can summarize that there are actually really good reasons for scepticism about the presumption that the VAT increase will bring a significant additional income into the state budget in a long term. VAT proved to be highly susceptible to leakage, so there is no assumption that a VAT increase guarantee adequate long term income into the state budget.

Conclusion

Determining the impact of changes in the VAT rate on the country's economy is a very complex issue, which is influenced by numerous factors, and as well as the results of our analysis suggests it is overconfident to expect clear and visible consequences as the results of the tax changes. Modeling the impact of changes in the VAT rate on four selected macroeconomic indicators by using the methodology of Knowledge Discovery in Databases, particularly with its three decision trees and one direct cobweb diagram, we investigated whether the relationship between selected variables and the tax rate is affected only by the fact that the rate was changing, or even an individual height of the rates. Because of the small number of recorded cases that occurred changes in the rate, we had to use multiple values based on which we came to the robustness of the models.

The change in the GDP between periods t+1 and t, and change in exports in that same period belonged among our most important classifiers. Other important attributes were the final consumption expenditure of households and the unemployment rate. Results from the modeling indicated what applies in general, that the reduction in GDP will result in a change of VAT. Together at the same time there will be an increase in export. However, if the government does not proceed to the change in the VAT rate, the country's economy is expanding because the GDP, consumption and exports grew year on year and unemployment rate was gradually decreasing. The model also pointed out that the most common change in the rate was an increase by 1% and the second one was an increase by 2%. Also, the analysis of development within the monitored period confirmed that the rates of VAT in the countries had a tendency to increase and even by more percent.

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On the State of the Mortgage Market in the Russian Federation in the Conditions of Global Economic Crisis

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Abstract

The study is directed to the one of the main socio-economic objectives of the state – the development of mortgage lending and increasing the affordability of housing in the real estate market.

The article assesses the status and prospects of development of the mortgage lending market of the Russian Federation in the crisis period on the basis of the analysis of dynamics of the following main factors: the amount and structure of mortgage loans, the weighted average lending period, the weighted average interest rate on ruble and foreign currency loans in the period from 2007 to 2015. Particular attention is paid to the factors affecting the volume of mortgage loans during the recession. Based on official statistics, the state of the mortgage market is analyzed, the basic tendencies of its development during the reporting period of crisis, and the factors that influenced the dynamics of the number and structure of mortgage loans are identified. It was found that the state program to support the real estate market in the crisis was effective and gave impetus to the growth of the missing volumes of mortgage loans.

Keywords: mortgage, mortgage lending market, credit, arrears, average interest rate, Russia.

JEL Classifications: E22, E43, E5, G21, G28.

1. Introduction

Features of development and functioning of mortgage lending, its importance is the subject of ongoing research, and are considered both in terms of the economic component, as well as from the perspective of the mechanism of formation of financial resources and its sources. Issues on the formation, development, and regulation of mortgage lending market are considered by a number of economists. Among the foreign scientists who have made a significant contribution to the study and development of certain theoretical aspects of mortgage lending and the content of its mechanism are Clark (2016), Cohen and Renuart (2012), Dobson and Polfreman (2004), Dolan (1996), Dornbusch and Fischer (1997), Elizabeth (2016), Fleming (2014), Guttentag (2010), McElroy (2012), Myers and Shannon (2015), Ross and Yinger (2002), Tyson and Brown (2012), Tyson and Griswold (2015).

Theories of mortgage lending are further elaborated by a number of Russian scientists (*e.g.* see Goremykin 2007, Kudryavtsev and Kudryavtseva 1998, Goremykin 2007, Pavlova 2004). Special attention to the issues on improving the mechanism of mortgage lending in Russia is paid by Lunina (2010). Statistical studies on mortgage lending are held by Tsypina (2013).

Tsypina (2013) established a system of statistical indicators characterizing mortgage lending. Researcher has developed a methodology of statistical research of mortgage lending, which includes an analysis of the dynamics of indicators of mortgage lending, identification and measurement of the factors influencing the volume of mortgage lending in the context of the Russian regions. The study has resulted in a multi-dimensional grouping of regions into homogenous groups of subjects by the level of mortgage lending. Based on the methods of cluster

analysis the author has statistically proven the unevenness of development of the mortgage-lending market in Russia.

Lavrushin (2014), has given a particular emphasis on the currency reform, the denomination and devaluation, in the context of the worsening of the economic situation of the country. Paper suggests that large non-payments between enterprises significantly inhibit exit from the economic crisis. In this regard, the authors set out to reveal in more detail the causes and consequences of payment crisis, the direction of its mitigation – measures to strengthen the monetary unit's purchasing power.

Razumova (2009) focuses on analyzing international best practices in the organization of the mortgage landing systems, while considering its applicability for the Russian banking sector. A special attention is paid to the adaptation of the mechanisms that have proven effective in the world. He undertakes a detailed analysis of all the necessary elements of the mortgage lending system, without which it is impossible to make mortgage transactions an attractive field of activity for commercial banks, and mortgage loans available to the majority of Russian citizens.

Dovdienko and Chernyak (2005) give a particular emphasis on the schemes and programs of financing the acquisition of property, the mechanism of mortgage-investment analysis. Scholars determine the organizational and legal bases of mortgage lending in the Russian Federation, as well as the development of the national housing market. The study provides a generalized Russian and foreign practice on formation of a mortgage lending system, and the methods for socio-economic assessment of real estate in the regional housing markets.

Kosareva (2007) pays a special attention to long-term mortgage lending as the main element of the housing finance system. The study contains current data on the changes in legislation of the Russian mortgage market that form the conditions to increase the scope of mortgage lending as well as the prospects of its development.

The banking sector and the Russian economy in the period from 2007 to 2015 underwent significant changes. The year 2007 has turned out to be very successful for the banking sector (Federal Law 1990). The banking sector showed stable development in relation to negative external influences. The positive dynamics of all the main indicators of the banking sector accompanied by the growth of its relation to GDP marked a continuing increase in the importance of the banking sector in the Russian economy.

The global financial crisis of 2008-2009 has had a significant impact on the Russian economy and the banking sector (FRS 2016). The internal and external demand has reduced, as a result, reduced the production in some sectors of the economy and the unemployment increased. In 2009, the price conjuncture has deteriorated on world commodity markets for Russian exporters, which, in turn, had a negative impact on foreign trade of the country. Condition of the banking sector and the Russian economy in the period from 2010 to 2013 has stabilized. However, the years 2014-2015 were difficult for the Russian economy due to the imposition of economic sanctions against the country, which contributed to the fall of the national currency, reduction of oil prices, stagnation in the real economy, limiting the ability of Russian banks to borrow abroad. It should be noted a massive recall of licenses of commercial banks, which significantly undermined the confidence of customers to the credit institutions.

The mortgage in Russia is in a stage of development and currently does not solve the main housing problems of the population. This is due to several reasons, in particular, among them are: high inflation and interest rates on loans, low income and solvency of the citizens, as well as the instability of the economic situation in general. It should be noted that the mortgage market is part of the economic system, thus, it is not without public support.

In 2014, the mortgage market went into decline. However, in 2015 due to government support measures, it continued its development.

2. Dynamics of the number and structure of mortgage loans in the period from 2007 to 2015

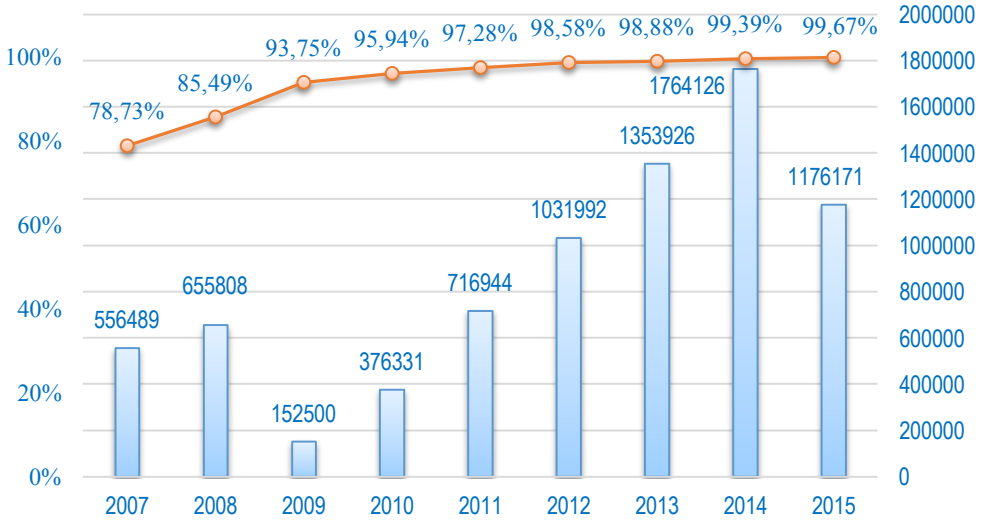
Analyzing the dynamics of the volume of mortgage housing loans, it may be noted that in the period from 2007 to 2008 the mortgage lending by institutions has continued to grow. As a result of the global financial crisis, the situation has deteriorated markedly. In 2009, the situation was the same as in 2006, which significantly affected the state of the economy (Analytical Center for the mortgage lending and securitization 2016).

In 2009, the number of mortgage loans amounted to 130,085 in the amount of 152,500 million rubles, which is 2.7 times less than in quantitative terms and by 4.3 times in volume as compared with 2008 (see Figures 1, 2). Average loan size decreased from 1.88 million rubles in 2008 to 1.17 million rubles in 2009 (*i.e.* the loss of 38%), which, in turn, caused a decline in prices in the housing market.

In 2009, there was a significant change in the structure of the issuance of mortgage loans. While in 2008 the share of loans in foreign currency amounted to 14.5% of the total volume of loans granted, in 2009 it decreased to 6.6% (Figure 1). This dramatic change was due to the macroeconomic situation in the country and the fall of the ruble at the end of 2008 – the beginning of 2009, which significantly increased the cost of servicing foreign currency debt for borrowers and the risk of defaults on foreign currency loans to banks (AHML 2016). Reduced access to financing and refinancing, reduction of credit opportunities of the banks in conjunction with increasing requirements for borrowers, on the one hand, and the reduction of solvent demand of the population, as well as the transition to a wait-and-savings strategy, on the other hand, led to a decrease in the volume of mortgage loans in 2009.

In 2010, there was a restoration in mortgage lending market. In the reporting period were granted loans amounting to 376,331 million rubles, which is 2.5 times more than in 2009. The average loan size increased by 7.7% from 1.17 million rubles in 2009 to 1.26 million rubles in 2010 (CBRF 2016). Increasing the size of the loan reflects the dynamics of household incomes (there was an increase by 4.3%) and housing prices (growth of 7.4%; without considering the inflation).

The year 2011 was characterized by a significant increase in the volume of residential mortgage loans. At the end of the reporting period a total of 583,582 loans has been granted amounting to 716,944 million rubles, which is 1.7 times more in terms of quantity and 1.9 times larger in monetary terms than in the previous year (see Figures 1, 2). The main factors that determined such dynamics were: stagnation or a nominal growth in prices in the housing market, the availability of mortgage lending, the intensification of the construction sector, and the changes in the market demand structure of housing across the country.



Source: AHML, 2016; CBRF, 2016.

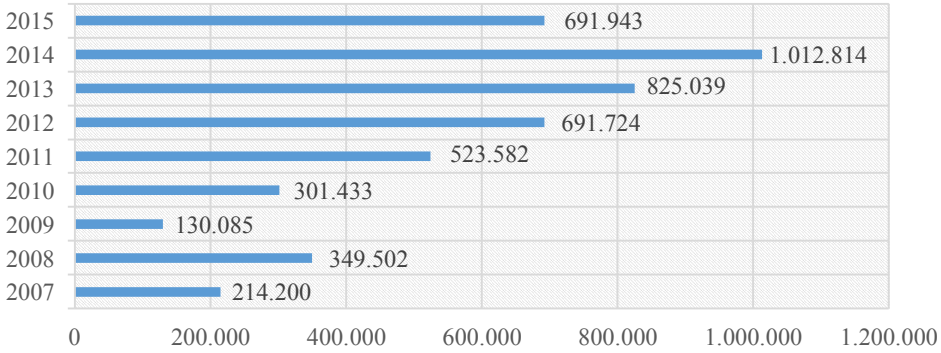
Figure 1 – Dynamics of the volume of mortgage loans and the share of ruble sources of mortgage loans in 2007 – 2015

In the period from 2010 to 2014 an increase in mortgage lending has happened, despite the trend of rising interest rates until the first quarter of 2013. The effects of 2008-2009 crisis have been overcome. In the second quarter of 2013 happened an increase in the number of mortgage loans issued, and the reduction in rates of all major participants in the mortgage market observed. This was facilitated by several factors: a favorable situation with liquidity, high competition among market participants, and reduction in the cost of funding.

In 2014 there were issued 1,012,814 of mortgage loans in the amount of 1,764,126 million rubles that exceeds 3.36 times the level of 2010 in terms of quantity and 4.69 times in monetary terms (see Figures 1, 2). In the context of tensions in financial and currency markets, real estate has become a popular target for investment. Investments in housing began to be perceived as an alternative to bank deposits. Another factor in the growth of the mortgage market is the demand in future periods. The growth rate of issuing loans declined from 52% in January 2014 to 13% in November, because of the increase in rates, while by the end of the year the demand for loans has increased due to devaluation of the ruble and the risk of increase in mortgage rates due to the increase of the key rate to 17 % (RBC 2016).

According to the Bank of Russia, the volume of mortgage loans in 2015 amounted to 1,176,171 million rubles (FRS 2015), with a decline of 40-50%, as evidenced by the number of mortgage loans – 691,943 (1,012,814 by the end of 2014). This is due to the fact that the population has made the choice to save their

money because of the weakening of the ruble and inflation expectations, resulting in decline in demand for mortgage loans. The number of loans in banks' portfolios increased due to falling in real incomes and rising unemployment.



Source: AHML, 2016; CBRF, 2016.

Figure 2 – Dynamics of the number of mortgage loans, 2007 – 2015

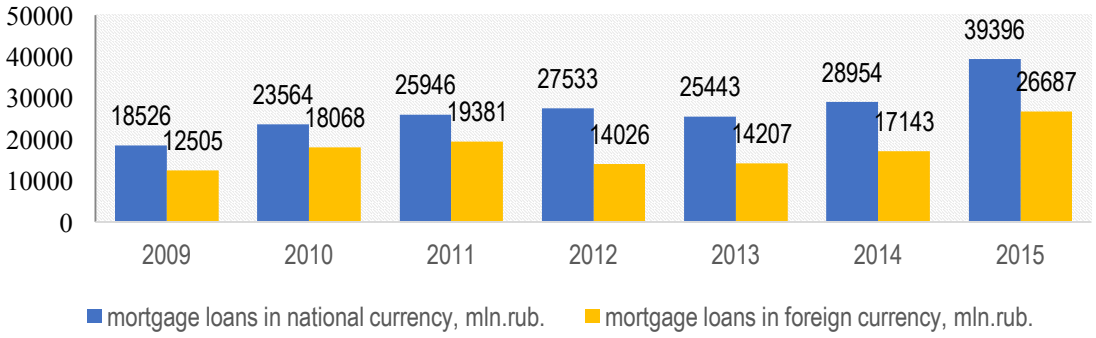
3. State support for the mortgage market

The main cause of negative forecasts in the mortgage market in 2015 was the increase of the key rate to 17% by the Bank of Russia in December 2014. This decision was unexpected and led to virtually a stop in mortgage lending. Credit institutions cannot provide loans to the borrowers at interest rates below the key rate. Accordingly, the interest rate that would allow credit institutions to operate on the verge of profitability should be set at the level of 17-20%. However, the feasibility of such mortgage loans for a period of 15-30 years would remain doubtful enough for borrowers.

Stop in mortgage lending mechanism could lead to negative consequences in the economy. In this regard, in order to support the market of mortgage lending in March 2015 the state support measures were initiated, which was to subsidize discounted rate in mortgages and borrowers no more than 12% per annum. Since the beginning of 2015, the key rate of the Bank of Russia was revised several times, in late January its value has decreased from 17% to 15%, and in mid-March – to 14%. The difference between the bank rate and the program's rate was paid by the state. The program was aimed at the purchase of housing in the primary market, the loan amount must not exceed 8 million rubles. For Moscow, the Moscow region, and St. Petersburg and 3 million rubles for other cities. The amount of the initial contribution must be at least 20%. The state program has issued the mortgage loans in the amount of 400 billion rubles, but in July 2015 the limit was increased to 700 billion rubles (AHML 2016).

By the end of 2015, 211 thousand mortgage loans were issued in the framework of the state program totaling more than 370 billion rubles. Thanks to subsidizing residential real estate, market the decline in mortgage loans decreased.

Throughout this period, from 2009 until 2015, Russia saw an increase in the volume and share of overdue loans in the total amount of mortgage loans (Savchina 2013, 61). During this period, the total amount of debt on ruble and foreign currency loans increased by 21,967 million rubles. The fastest rate in the increase in volume of overdue loans was in rubles, compared with foreign currency loans. In the period from 2009 to 2011, it has increased from 12,505 to 19,381 million rubles. This was due to the fact that the period under review was accompanied by the "old" loans issued before the crisis in such currencies as the Japanese yen and the Swiss franc (Figure 3).



Source: AHML, 2016; CBRF, 2016.

Figure 3 – Dynamics in volumes of issued housing mortgage arrears, 2009 – 2015

4. Dynamics of interest rates on mortgage loans

Analyzing the dynamics of the weighted average interest rate on mortgage loans in the period from 2007 to 2015, it may be noted that from 2007 to 2008 there was a gradual increase in interest rates on loans in rubles and in foreign currency, due to the global financial crisis. The interest rate on foreign currency loans was 12.7%, the rate on ruble loans in 2009 – 14 .3%. The year 2009 has shown a record value rates over subsequent years (Table 1). The limiting factor in the growth of the mortgage market and the reduction of interest rates in 2010 was the high level of risk for lenders in behalf of borrowers and the risk that is associated with a reduction in the value of collateral. After 2009, up until 2011, was marked by a decrease in rates on ruble loans to the level of 11.9% and to 9.7% for foreign currency (CBRF 2016). For the Russian market, such a low interest rate on foreign currency loans was observed for the first time. However, the share of foreign currency loans in the total amount of granted loans was insignificant – just 0.56% (Stobbe 2015, 77). This indicated that the currency mortgage will have no significant impact on the mortgage market in the coming years.

In the period from 2011 to 2015, there was a gradual increase in interest rates on ruble loans from 11.9% to 13%, and a slight change in the level of average interest rates on foreign currency loans (Giannamore and Osach 2007, 124). The lowest rate on foreign currency loans for the period was 9.3% in 2014. This was the first time in the Russian market.

Table 1 – Key indicators of the weighted average loan period and the average weighted interest rate on mortgage loans in 2007 – 2015

Period	Loan term on ruble loans, years	Loan term on foreign currency loans, years	Interest rate on ruble loans, %	Interest rate on foreign currency loans, %
2007	16.58	15.75	12.6	10.9
2008	17.92	17.25	12.9	10.8
2009	16.50	11.67	14.3	12.7
2010	16.33	12.92	13.1	11.0
2011	14.92	12.33	11.9	9.7
2012	15.00	11.25	12.3	9.8
2013	14.67	12.67	12.4	9.6
2014	15.00	12.17	12.5	9.3
2015	14.75	4.00	13	9.8

Source: AHML, 2016; CBRF, 2016.

Throughout the 2007-2015, changes in the dynamics of the average loan term in rubles and in foreign currency is observed (Table 1) (AHML 2016). In the period from 2007 to 2008, there was a gradual increase in the loan term. In 2009, the situation has changed significantly. It should be noted a decrease in the term of loan in foreign currency by an average of 7 years, the cause of which was to lower interest rates on loans with a shorter-term. This, in turn, contributed to the increase in demand from borrowers for foreign currency mortgage, an overall reduction in terms of lending by banks due to the increased risks, and, in addition, a change in the structure of mortgage loans in the direction of reducing the share of loans in foreign currency up to 5%.

From 2009 to 2015, terms of lending for ruble loans remained at a stable level, without sharp fluctuations and changes. At the end of 2015 it was 14.75 years, and the loan term for foreign currency loans – 4 years (Seppinni 2006, 103); the threefold reduction in comparison with the previous year (12.17 years in 2014). This

situation was due to the sharp rise of the euro and the dollar exchange rate against the ruble at the beginning of the year – as a result the loans in foreign currency ceased to attract borrowers because of high risk, thus, their market offer decreased as most banks eliminated such offerings.

However, despite all the difficulties faced by the Russian banking sector and the national economy, the macroeconomic situation in Russia stresses the importance of long-term mortgage lending as a complex system with the direct impact of the state.

Conclusion

The research on the system of the Russian mortgage lending has revealed the factors, which influence the dynamics of the number and structure of mortgage loans in the period 2007-2015. They are the increase in the number of the unemployed, the reduction of production volume, decrease in the share of exports in total foreign trade, high key rate of the Bank of Russia at the beginning of the period, the decline in mortgage lending, and the amount of the decline in oil prices, the decline the national currency, and limited access to credit from abroad. As a result of the global financial crisis, there was a reduction in mortgage loans by 2.7 times in terms of quantity. The average loan size and prices in the housing market have also decreased. Mortgage loans in foreign currency fell to 6.6% due to the macroeconomic situation in the country and the fall of the ruble in late 2008 – the beginning of 2009, which significantly increased the cost of foreign currency debt servicing for borrowers and the risk of defaults on foreign currency loans for banks.

The participation of the state in the credit relationship is done in the form of co-financing via subsidies instrument. The subsidy is used by citizens to buy property, and its function is to increase the solvency of the population as potential borrowers of the residential mortgage loan. The stimulating of the real estate market by means of state support I initiated in order to increase the availability of mortgage lending to the public. State program to support the real estate market was effective and gave impetus to the growth of the missing volumes of mortgage loans. The macroeconomic situation in Russia, in the context of financial crisis, reinforces the importance of long-term mortgage lending as a complex system with the direct impact of the state.

As a result of the analysis of the weighted averages, the interest rate on foreign currency is 12.7% and 14.3% on ruble loans, which is a record in itself and the first time in the Russian residential real estate market due to the global financial crisis. It should be noted that the term of crediting on foreign currency loans and foreign currency rate declined due to several factors: low interest rates on loans with a shorter-term, the growth in exchange rate of the dollar and the euro against the ruble. As a result, the demand for foreign currency loans have stopped to be attractive for the borrowers because of the high risk, whereas loans in rubles remained relatively stable. Russian mortgage lending market will continue to function. However, the mortgage is not included in the list of the most profitable and sought-after product offerings for banks.

The key rate is not the only locomotive of the mortgage market. The level of demand affects the purchasing power of citizens, which decreased significantly in a crisis. The fall of the national currency led to an increase in actual inflation. Prices are rising and wages remain practically at the same level, and this, in turn, does not improve the well-being of citizens. Thus, the sharp growth of the mortgage market demand should not be expected, even if the interest rates on loans will be quite acceptable.

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The Interplay of European Countries' Tax Systems: A Spatial Autocorrelation and Cluster Analysis

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Abstract:

The main aim of this article is to analyse the differences of tax systems across European countries based on 2015 data. The analysis was conducted by means of the application of five diagnostic variables describing tax systems' corporate, individual and indirect tax rates, and employee social security and employer social security rates.

The research was conducted using the hierarchical clustering method to identify a homogenous group of countries, and Exploratory Spatial Data Analysis (ESDA) in order to identify existing spatial interaction. Applying cluster analysis has enabled us to identify seven homogenous clusters with significantly different tax rates, and by applying ESDA, we have identified hot spot and cold spot clusters for diagnostic variables in corporate and individual income tax rates.

Keywords: clusters analysis, Ward's method, exploratory spatial data analysis, spatial autocorrelation.

JEL Classification: C21, C38, H29.

1. Introduction

Tax competition has been widely adopted by European countries over the past decades, but European integration stimulates tax convergence in order to boost international cooperation and fair play. These two opposing tendencies, combined together, form the fiscal environment for natural and legal persons throughout Europe. This research aims at determining which tendency prevails and shapes the future trend of economic development and cooperation across Europe; in addition, tax systems are viewed through the lenses of possible interplay and co-influence between them.

The article is structured into five sections: the first part is the introduction, the second part sheds light on different aspects of European tax systems as they are presented in current scientific literature. The methodology used is explained in detail in the third section. The fourth part presents the hierarchical clustering method to identify homogenous groups of countries and Exploratory Spatial Data Analysis (ESDA) is deployed to identify existing spatial interactions between European countries. The last section comprises the conclusions of the entire article.

2. Brief review of literature

An enormous body of literature exists on European countries' tax systems. For instance, Šimková (2014), using the hierarchical clustering analysis of capital taxation, discovered that the highest total tax burden was attained in the Nordic countries (Denmark, Sweden and Finland), and the lowest taxes were observed in such countries, as Romania, Latvia and Lithuania, while the most volatile countries were Bulgaria, Cyprus and Hungary.

Raczkowski (2015) corroborated that the magnitude of tax burdens is not correlated with analogical or comparative characteristics of the shadow economy occurring in the specific country, which implies that different drivers may determine the level of tax gaps and the shadow economies across countries.

Trandafir and Ristea (2014) postulated that providing tax incentives can be an important element in attracting foreign capital, therefore, providing R&D tax incentives can be considered an element of tax competition among EU Member States.

Biernacki (2014) argued that not only do companies try to utilize tax competition among states, but also that natural persons begin to migrate in order to seek more convenient tax environments, a factor which threatens the fiscal stability of EU member state budgets.

Ordynskaya *et al.* (2016) came to the conclusion that in cases of longstanding systemic economic crises, it is reasonable for post-Soviet countries to decrease the level of taxation of enterprises' profits in the real sector of economy to the level operated in countries that are new members of the EU (on average, down to 18.3%), and to provide stimulating levers of taxes on profits for small and medium-sized enterprises (stimulation of investment and innovations, support for the financial state of enterprises and stimulation of production, and the use of accelerated depreciation in taxation accounting).

Szlęzak-Matusewicz (2014) determined that some changes should be introduced in the tax stimulation of R&D activity in EU member states, including widening the deduction base volume, providing access to tax relief for entrepreneurs operating in a flat rate regime (19%), and simplified forms of taxation, introducing clear interpretations concerning what kinds of expenditure can be deducted within tax relief schemes.

Apergis (2015) showed the negative impact of income marginal tax rates on output in the long-run. This negative impact provides empirical support to the supply-side hypothesis about the negative association between marginal income tax rates and the level of economic activity.

Moldovan (2015) determined that there is very low, or no influence, of financial indicators upon some sustainable development indicators in Romania, Poland, Hungary, Bulgaria, and Czech Republic that could be explained by the underdevelopment of their financial systems.

Senaj and Vyškrabka (2015) found that changes in foreign taxes may cause volatility in small economies, particularly in investment, trade, and the inflation rate. The authors also argued that common tax rates slightly increase the volatility of the euro-area output response to foreign shocks.

Schneider, Raczkowski and Mróz (2015) suggested that the main driving forces of the shadow/black economy are still indirect taxes, followed by self-employment, and unemployment.

Trandafir (2016) determined that in the non-euro zone states, the VAT gap is 6% higher than in the euro-zone states in the period under review. The value of the difference between theoretical income and actual income in VAT is not directly associated with fraud and tax evasion, but VAT fraud continues to be a serious problem for EU member states.

The tax systems of the European countries have been at the centre of scientific research for a significant period of time, but the interplay and interconnection between them still need to be clarified. Thus, the aim of this article is to verify hypotheses of potential tax rate clusters using two different methodological approaches, namely, hierarchical clustering, Ward's method, and selected tools of ESDA. The analyses will be focused on five diagnostic variables describing tax systems: corporate, individual income and indirect tax rates, employee social security, and employer social security rates.

3. Research methodology

This section provides a brief overview of the methods used in the empirical part of this study. Cluster analysis and ESDA were chosen as the main methodological tools.

Cluster analysis is a multivariate statistical technique that entails the division of large groups of objects into smaller and more homogeneous clusters. In general terms, cluster analysis work with *N* statistical objects while *k* statistical characteristics are observed and measured. Clustering methods are based on similarity, respectively dissimilarity of the objects and, based on these objects, data points are divided into clusters which are mutually disjunctive. The objects assigned to every cluster are similar to each other in terms of the level of adopted variables. For the purpose of this paper, agglomerative hierarchical clustering Ward's method (Ward 1963) has been conducted, as it has been the most commonly used method in the literature studied. Ward's method is based on least-squares criteria and minimizes the within-cluster sum of squares, thus maximizing the within-cluster homogeneity (Everitt *et al.* 2011). In this method, in the first stage of clustering, each analysed object is considered as an individual cluster and subsequently, these objects are grouped into superior clusters which are grouped again based on the distance between them, while objects with the smallest distance between are grouped together. After the highest level of clustering, all the statistical objects are joined into one cluster. For measurement of the distance between the objects, the metric of Euclidian distance has been used:

$$d(p,q) = \sqrt{\sum_{i=1}^{k} (q_i - p_i)^2} \tag{1.1}$$

where k represents the number of the statistical characteristics observed in objects, p_i and q_i are two *k*-dimensional data objects.

The process of Ward's method is an iterative process that is repeated until each of the clusters is formed into a single massive cluster. The results of hierarchical clustering can be viewed on the dendogram. The bottom row of the dendogram represents data (individual observations), and the remaining nodes represent the clusters to which the data belong, with the arrows representing the distance (dissimilarity) (Ward 1963, Vaničová and Kalužák 2015).

Spatial association of observations or units can be evaluated by ESDA tools. In general, spatial association corresponds to the situation where observations, or so called spatial units, are non-independent over the space, indicating that nearby spatial units are associated in some way. Spatial association (also called spatial autocorrelation) in a data set collection means that observations at location *i* depend on other observations at locations $j \neq i$, and this can be formally formulated as follows:

$$y_i = f(y_j), \quad j = 1, 2, ..., N, \; j \neq i \tag{1.2}$$

where N is the number of units in the data set.

In general, there are two common reasons why we expect that the data sample observed at one point in space is dependent on values observed at other locations. The first is that the administrative boundaries for collecting information do not accurately reflect the nature of the underlying process generating the data set; a further important reason why we would expect spatial dependence is that the spatial dimension of socio-demographic, economic, or regional activity may actually be an important aspect of a modelling problem (Furková 2016).

Following Anselin (1998), ESDA is a collection of techniques to describe and visualize spatial distributions; identify atypical locations or spatial outliers; discover patterns of spatial association, clusters, or hot spots; suggest spatial regimes or other forms of spatial heterogeneity. A significant element of ESDA is the adoption of a spatial operator denoted as a spatial lag. A spatially lagged variable is expressed as the sum of spatial weights multiplied by the values for observations at neighbouring locations and it is given as:

$$[\mathbf{W}y]_i = \sum_{j=1}^{N} w_{ij} y_j \tag{1.3}$$

where W is a square symmetric $N \times N$ matrix and each element w_{ij} reflects the "spatial influence" of unit *j*, on unit *i*.

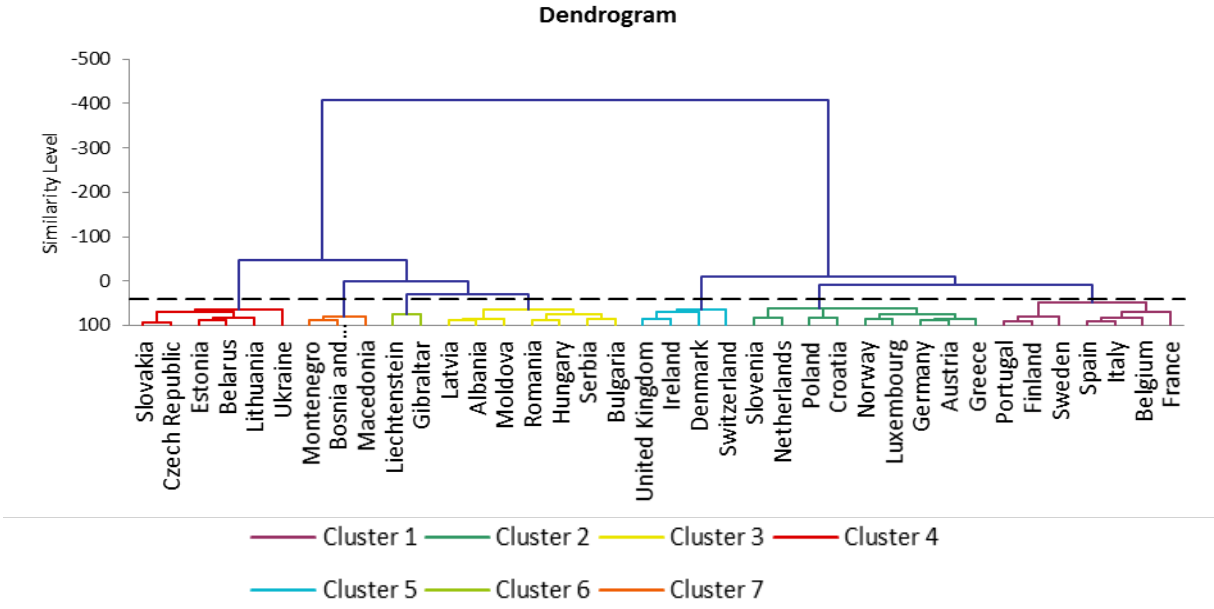
This matrix *W* is called a spatial weight matrix and it is an indicator whether the unit is a spatial neighbour of another or a reversal. There are various possibilities how to specify the spatial weight matrix *W*, weights based on distance, boundaries, or combined distance-boundary weights can be considered (for more details see *e.g.* (Smith 2014, Getis 2010).

Spatial autocorrelation can be identified by means of Global and Local indicators of spatial association such as Moran's *I* (Moran 1950) or the family of Getis-Ord G statistics (Getis and Ord 1992, Ord and Getis 1995). These statistics enable us to test the global spatial autocorrelation of the variable we are interested in, *i.e.* to test for the presence of general spatial trends in the distribution of an underlying variable over an entire space. In addition to the global spatial autocorrelation measurement, local versions of these indicators have been suggested to further analysis of local spatial patterns (form more details and formulas see *e.g.* Furková 2016, Chocholatá 2013).

4. Case studies/experiments/ demonstrations/ application functionality

The characterized methods were applied for comparative research on tax rates in the year 2015. Five diagnostic variables describing tax system corporate, individual and indirect tax rates, employee social security and employer social security rates are analysed. The research was conducted for 38 European states (Gibraltar, even being a part of the UK, has the unique tax system, so it's viewed separately). States and self-governing microstates with no borders, such as Cyprus, Malta, Jersey, Guernsey, and the Isle of Man were excluded from ourresearch. Our research is based on KPMG data ("On its Web Site Tax Rates Online"). The cluster analysis was performed in StatTools 7 and Ward's method, outlined in the previous section, was applied here. Exploratory Spatial Data Analysis was performed in software GeoDa and a corresponding shape (.shp) file was retrieved from

Eurostat web page ("On its Web site GISCO: Geographical Information and maps").and consequently modified in GeoDa.

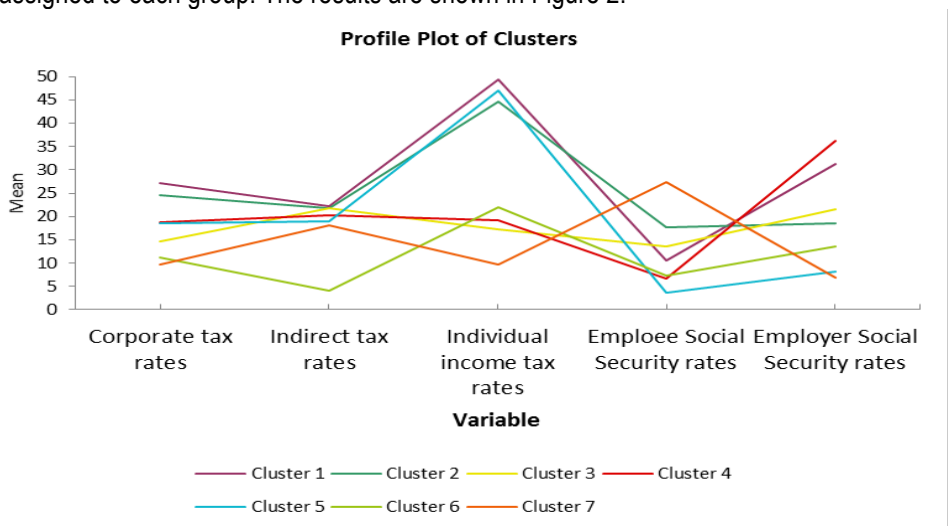


Source: own estimation based on KPMG data.

Figure 1 - Dendogram presenting seven groups

In the cluster analysis stage of the research, seven groups (clusters) of countries were selected based on the dendogram. The results are given in Figure 1. In the first group, one can find Belgium, Finland, France, Italy, Portugal, Spain, and Sweden. In the second group are Austria, Croatia, Germany, Greece, Luxembourg, Netherlands, Norway, Poland, and Slovenia. The following countries were placed in the third group: Albania, Bulgaria, Hungary, Latvia, Moldova, Romania, and Serbia. In the fourth group are Belarus, Czech Republic, Estonia, Lithuania, Slovakia, and Ukraine. In the fifth group, we find Denmark, Ireland, United Kingdom, and Switzerland. The sixth group consists of Liechtenstein and Gibraltar. In the seventh group the following countries can be found: Bosnia and Herzegovina, Macedonia, and Montenegro. The measure of similarity level shown in Figure 1 on the vertical axes of the dendogram for Cluster 1 is 47.98, Cluster 2 -60.45, Cluster 3 - 64.15, Cluster 4 - 64.75, Cluster 5 - 65.53, Cluster 6 - 74.20 and Cluster 7 - 80.98.

Subsequently, average values of the variables used to assess the tax system were calculated for each of seven clusters. The average values for the variables allow us to describe the main determinants of the position of the countries assigned to each group. The results are shown in Figure 2.



Source: own estimation based on KPMG data.

Figure 2 – Distribution of mean values of analysed variables across the clusters

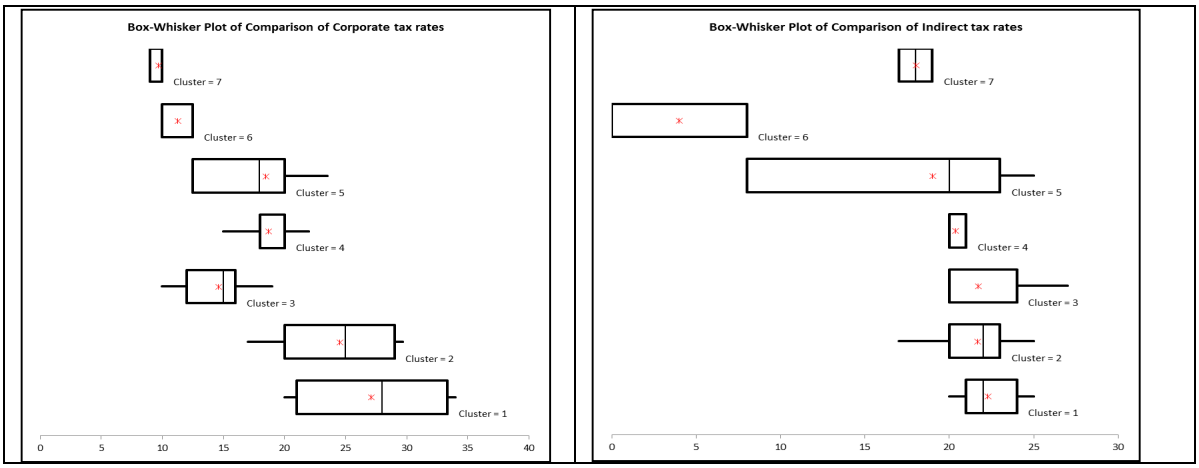
To verify the differences between clusters of evidence, it is appropriate to use methods that reveal these differences. To identify indicators that are of a significantly different level in one group compared to another, the Kruskal-Wallis rank test procedure was used. The Kruskal-Wallis test is a rank-based nonparametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. As the Kruskal-Wallis test does not assume normality in the data, and is much less sensitive to outliers, it can be used when these assumptions have been violated. The Kruskal-Wallis rank test analysis indicates that statistically significant differences among groups 1, 2, …, 7 at the 0,05 level of significance are seen among all the variables analysed. These conclusions are based on the *p*-values listed in Table 1, which were compared with the level of significance (α = 0,05).

Table 1 - Results of Kruskal-Wallis Test, Evidence of significant differences between groups at a level of significance α=0.05

Variable	p-value
Corporate tax rates	0.0001
Indirect tax rates	0.0175
Individual income tax rates	0.0001
Employee Social Security rates	0.0001
Employer Social Security rates	0.0001

Source: own estimation

For variables that have statistically significant differences among clusters 1 to 7, we have plotted Box-Whisker plots in Figures 3-4 in order to show summary statistics and to enable readers to see the results of our comparative analysis. The Box-Whisker plot shows summary statistics as lower and upper whisker, first quartile, median, mean, third quartile and interquartile ranges. Whiskers extend to the furthest observation that are no more than a 1.5 interquartile range from the edges of the box. In Figures 4 we have plotted the mild outlier represented by our observation on Lithuania, with the value of the analysed indicator "Employer Social Security rates" between 1, 5 and 3 interquartile range from the edges of the box. In Figure 4 we have also plotted the extreme outlier, represented by our observation on Ukraine with the values of the analysed indicator "Employer Social Security rates" greater than 3 interquartile range from the edges of the box. The unit of the analysed indicators are percentages and the specific values are displayed on the horizontal axis of the Box-Whisker plot.



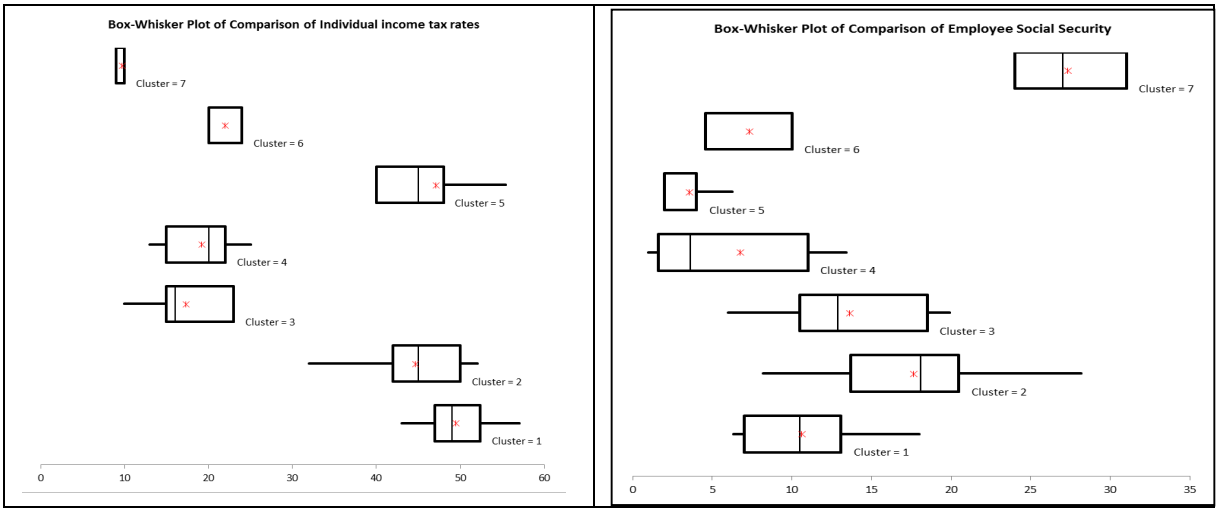


Figure 3 – Box-Whisker Plot

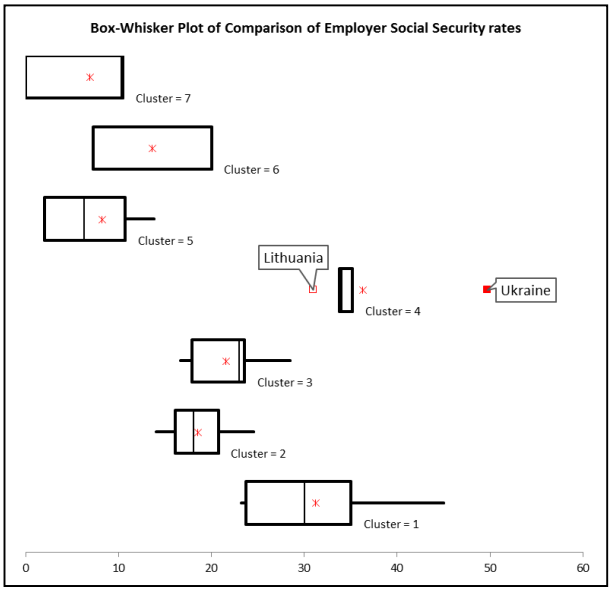
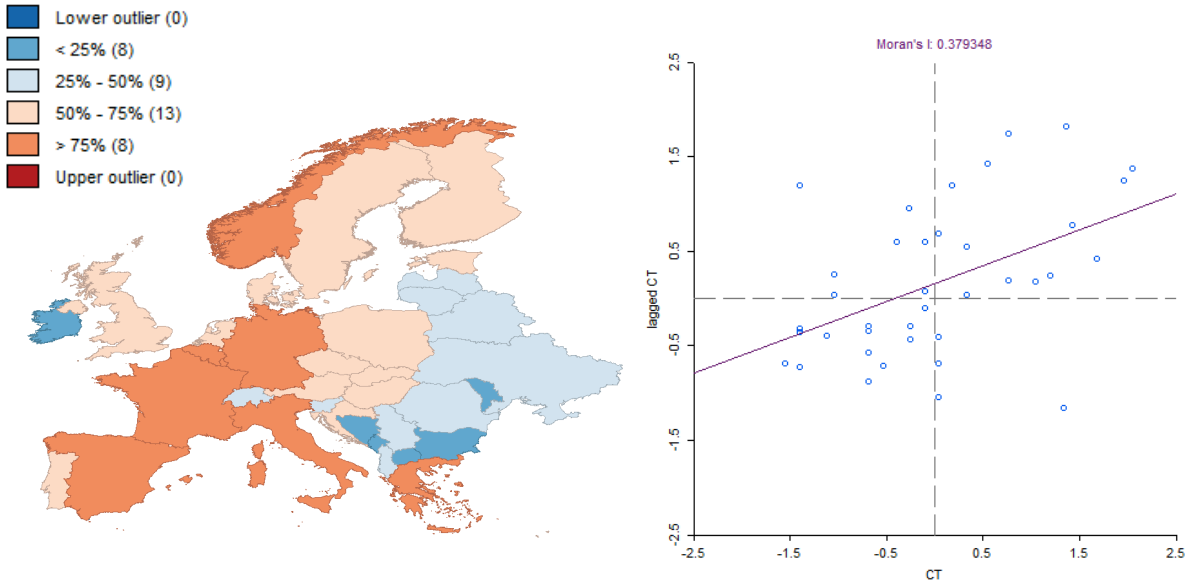


Figure 4 – Box-Whisker Plot

We also adopted ESDA techniques as an additional methodological approach. ESDA techniques help us to detect spatial patterns in data and its numerical and graphical procedures allows us to identify spatial clusters and potential outliers. In contrast to the previous cluster analysis, we will now deal with each tax rate independently, meaning that we will perform numerical and graphical procedures for each tax rate separately. The tax rates the consideration were visually investigated by using box maps, Moran's*I*scatterplots, LISA cluster maps and finally G_i cluster maps. A global version of Moran's*I*statistic is used to test spatial autocorrelation in the data, *i.e.*, to indicate whether the tax rate implemented in one location or state may be associated with tax rates in neighbouring states. Our method of verifying this hypothesis was motivated by the spatial dimension of economic activity among European states and, moreover, by Tobler´s first law of geography according which "everything is related to everything else, but near things are more related than distant things" (Tobler 1970).The results of our spatial analysis on corporate tax rates, indirect tax rates, individual income tax rates, employee social security tax rates and employer social security tax rates are summarized in Figures 5 – 9.

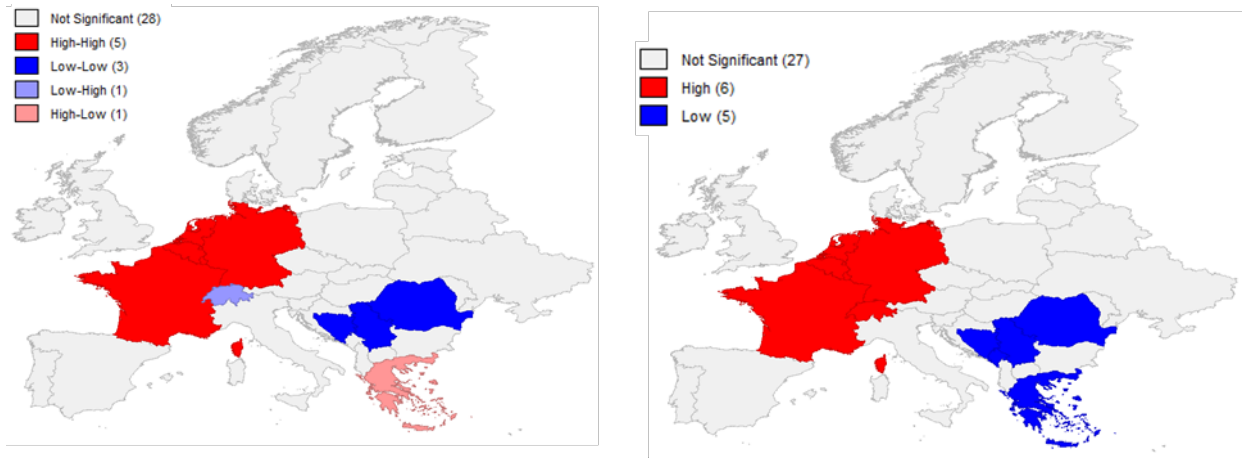
Our spatial analysis for each class of tax rate started with mapping its distribution across European states using a box map. This map is an enhanced version of a quartile map, in which the outliers in the first and fourth quartile are highlighted separately. We can notice no outliers in the fourth quartile for all tax rates, and only three outliers have been identified in the first quartile for indirect tax rates (see Figure 9). These outliers are Switzerland, Lichtenstein and Gibraltar and we can conclude that these locations apply very low indirect tax rates. All box maps locations with low tax rates are displayed in dark blue; as the tax rate increases, the shading

becomes progressively darker and higher values (the third and fourth quartiles) are depicted in orange tones. Based on these box maps, we have identified a clear uneven spatial distribution of corporate tax rates (see Figure 5) and individual income tax rates (see Figure 7) across countries. Therefore, we anticipated that countries would not be independent of each other in the case of corporate tax rates and individual income tax rates, and therefore, we proceeded with spatial autocorrelation testing. Autocorrelation statistics Moran's *I* and Getis-Ord G_i statistics were applied for all classes of tax rates. However, these results and the box map visualizations more or less indicated spatial randomness for indirect tax rates, employee social security tax rates and employer social security tax rates. Due to insufficient space, we provide only box maps for these classes of taxes (see Figure 9). It is necessary to mention that all our calculation was carried out based on the spatial contiguity weight matrix queen´s case definition of neighbours. These weights simply indicate whether spatial units share a boundary or not. The sensitivity analysis of results on spatial weight selection is beyond the scope of this paper.



Source: own illustration and calculation
Note: Box map – Hinge = 1.5

Figure 5 – Box map (on the left), Moran´s *I* statistic and Moran´s *I* scatterplot for corporate tax rates



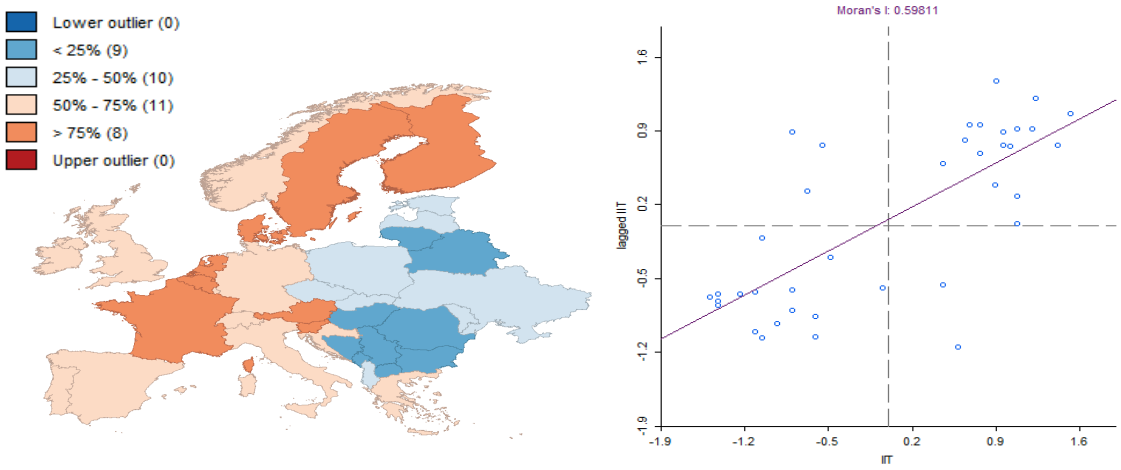
Source: own illustration and calculation

Figure 6 – LISA cluster map (on the left) and G_i cluster map for corporate tax rates

The Moran's*I*statistic is used for the measurement of the correlation between the underlying variable and the spatial lag of this variable in nearby areas. The Moran's*I*statistics and scatterplots for corporate tax rates and individual income tax rates are depicted in Figures 5 and 7, respectively 999 random permutations were run for each Moran's*I*statistic calculated. These random permutations are run to recalculate the statistic many times to generate a reference distribution and pseudo significance level (Anselin 2005). A reference distribution is created

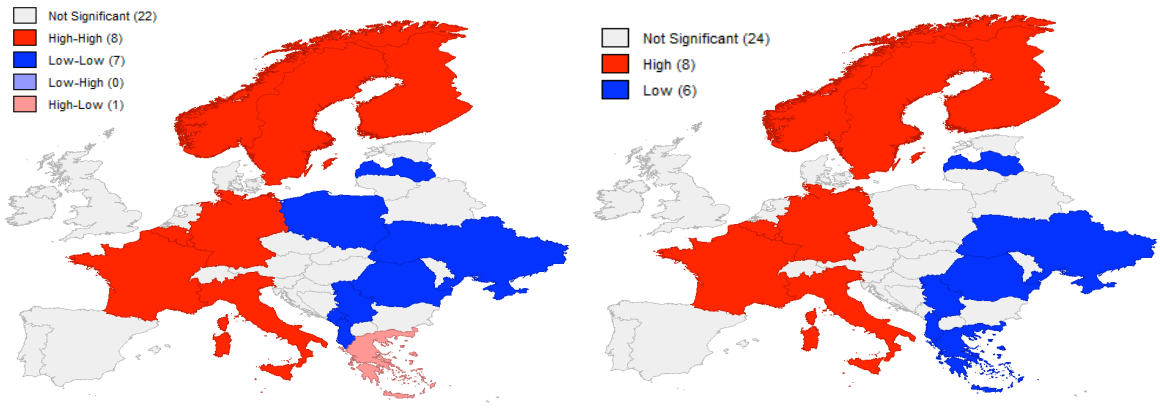
that simulates spatial randomness by randomly rearranging the observed values over the available location and recalculating the statistic for each random arrangement (Anselin *et al.* 2000). Clear evidence of positive spatial autocorrelation was confirmed by examination of the Moran's*I*scatterplots and identifying a significant Moran's*I*statistics (0.379; p–value<0.001 for corporate tax rates, 0.598; p–value<0.001 for individual income tax rates).

The Moran's*I*statistic calculated above only indicated the presence of spatial autocorrelation globally; it does not provide information on the specific locations of spatial patterns (Holt 2007). In order to determine the location and magnitude of spatial autocorrelation, a local version of this statistic, LISA (Local Indicators of Spatial Association), was suggested in order to further analyse local spatial patterns (Anselin 1995). The type of spatial association (high – high values, high – low values, low – high values, low – low values) for corporate tax rates and individual income tax rates in different locations or states have been depicted in LISA cluster maps. As for corporate tax rates (see Figure 6), our analysis indicates a positive spatial association of 8 states (5 regions with high – high association and 3 regions with low – low association). This means that similar values of corporate tax rates tend to cluster in an area, and corporate tax rates in one state are associated with corporate tax rates in neighbouring states. Negative spatial autocorrelations were observed only for two states, *i.e.* low – high values for one state and also one state with a high - low association. The LISA cluster map for individual income tax rates (depicted in Figure 8) implies a positive spatial association of 15 states (8 regions with high – high association and 7 regions with low – low association). Association high-low was detected for one state. (Both LISA cluster maps were created using random a permutation function for 999 random permutations with significance levels from 0.0001 to 0.05).



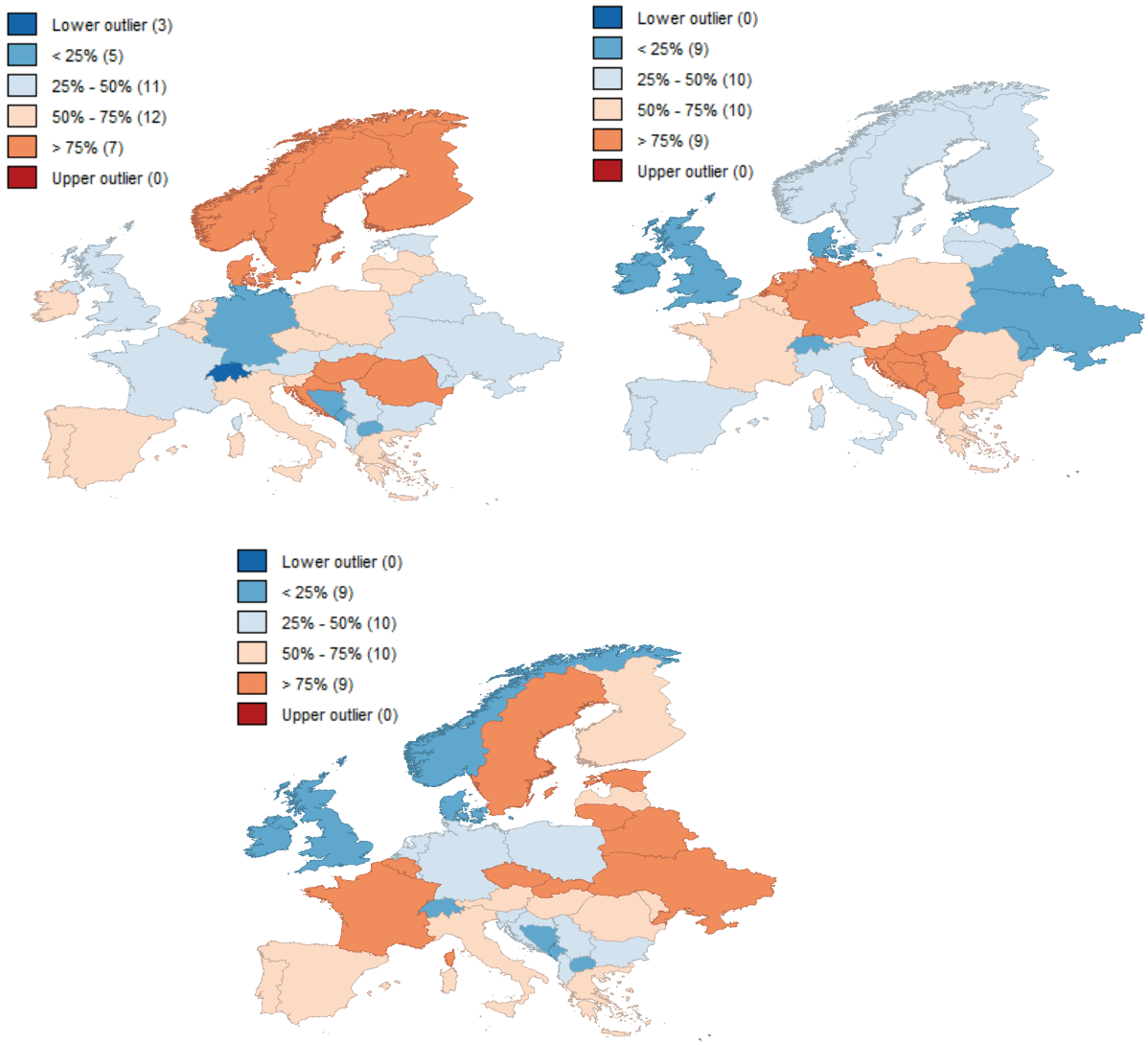
Source: own illustration and calculation
Note: Box map – Hinge = 1.5

Figure 7 – Box map (on the left), Moran´s*I*statistic and Moran´s*I*scatterplot for individual income tax rates



Source: own illustration and calculation

Figure 8 – LISA cluster map (on the left) and G_i cluster map for individual income tax rates



Source: own illustration and calculation *Note:* Hinge = 1.5

Figure 9 – Box maps for indirect tax rates, employee social security tax rates and employer social security tax rates respectively

The high-high and low-low locations are usually referred to as spatial clusters and the high-low and low-high locations are spatial outliers (Anselin 2005). However, Moran's *I* only indicate clustering. Seeing that the outliers are single locations this is not the case of clusters. It should also be kept in mind that the so-called spatial clusters shown on the LISA cluster map only indicate clustering, *i.e.* it refers to the core of the cluster.

Consequently, we decided to perform so called hot spot analysis - Getis-Ord G_i statistic. Getis-Ord G_i statistic is calculated for each feature in a dataset and this tool works by looking at each feature within the context of neighbouring features. A feature with a high value is interesting, but may not be a statistically significant hot spot. To be a statistically significant hot spot, a feature will have a high value and be surrounded by other features with high values as well. The Local Getis-Ord G_i statistic can distinguish between so-called hot spots and cold spots. A hot spot can be defined as a place where high values cluster together and a cold spot as one where low values cluster together. For corporate tax rates and also for individual income tax rates, local G_i statistics have been calculated for each state and the results are presented by means of G_i cluster maps (see Figure 6 and Figure 8 - maps on the right). These maps provide information about which location has a statistically significant relationship with its neighbours, and they show the type of relationship. From the results depicted in Figure 6 and Figure 8, we can notice very similar spatial patterns as with the results shown on the LISA cluster map. G_i cluster maps, in contrast to the LISA cluster map, indicate high and low locations and, in our case, high-low and low-high locations were changed to low or high locations.

Conclusion

In this paper the problem of tax rate clustering was considered. The first part of our empirical analysis was based on the hierarchical cluster method which enabled us to distinguish seven groups (clusters) of countries having similar tax systems. The first group comprises Belgium, Finland, France, Italy, Portugal, Spain, and Sweden. The second group consists of Austria, Croatia, Germany, Greece, Luxembourg, Netherlands, Norway, Poland, and Slovenia. The third cluster is formed by Albania, Bulgaria, Hungary, Latvia, Moldova, Romania, and Serbia. The fourth group is made up of Belarus, Czech Republic, Estonia, Lithuania, Slovakia, and Ukraine. The fifth group is composed of Denmark, Ireland, United Kingdom, and Switzerland. The sixth group is represented only by Liechtenstein and Gibraltar (as tax havens). The last cluster embraces the former Yugoslavian republics: Bosnia and Herzegovina, Macedonia, and Montenegro. The measure of similarity levels are as follows: Cluster 1 is 47.98, Cluster 2 is 60.45, Cluster 3 is 64.15, Cluster 4 is 64.75, Cluster 5 is 65.53, Cluster 6 is 74.20 and Cluster 7 is 80.98.

Next, we carried out a spatial analysis; however, in contrast to the previous hierarchical cluster method, we dealt with each tax rate separately. Our spatial analysis of each class of tax rate started with mapping its distribution across European states using a box map. Countries with high values of tax rates are considered to be a statistically significant hot spot and should have a high value of tax rates and also be surrounded by other countries with high values. Conversely, a cold spot is a place where low values cluster together. This empirical procedure identified significant clusters for corporate tax rates and individual tax rates. Analysing corporate tax rates, we discovered a hot spot cluster comprising six countries, namely, Belgium, France, Germany, Luxembourg, Netherlands, and Switzerland. On the other hand, we observed a cold spot cluster including the following five countries: Bosnia and Herzegovina, Greece, Serbia, Montenegro and Romania. As for individual income tax rates, we also discovered that high and low values tend to cluster in the hot spot cluster consists of Belgium, Finland, France, Germany, Italy, Luxembourg, Norway, and Sweden while individual taxpayers with low tax rates are clustered in Albania, Greece, Latvia, Romania, Serbia, and Ukraine. Following the results of the first and second part of our analysis, the hypothesis of tax rate clustering can be considered to have been verified. If we look more closely at the identified clusters from both parts of the analysis, we can notice the differences in the structure of the clusters. The clusters from the first part of our analysis consist of “Western” countries, as well as less developed, or post-communist, countries. But once only particular tax rates are under consideration, the clusters exclusively include “Western” countries, or less developed (or post-communist) countries.

The major contribution of this paper could be summarized as follows: our empirical evidence has highlighted tax rate clustering and spatial interactions among European states. These facts should be taken into account in the decision-making processes of the EU authorities and individual policy creators in order to manage the economic units more effectively. The empirical evidence dealing with tax rate clustering, with respect to the geographical proximity of countries, is not part of the mainstream analyses of tax problems. From this point of view, this paper can be an asset in the field tax problems.

Acknowledgements:

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Economic Growth in Modern Russia: Problems and Prospects in the Context of Neo-Industrial Paradigm

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Abstract

The article reveals the relationship of the autonomous recession of the Russian economy with an established model of economic growth based on raw material export; the system flaws, distortions and contradictions of the Russian economy have been shown, making the mentioned model of GDP growth unsuitable for solving large-scale problems of the modern age. The authors substantiate the necessity of the transition of the Russian economy to a new type of economic development of the neo-industrial type. An evaluation of the quality of economic growth in Russia of the 2000s from the perspective of the criteria for sustainable and inclusive development has been undertaken. A macro model of the innovation system of a particular subject of the Russian Federation has been built, which allows judging the dynamics and intensity of innovation processes in the regional economy, disparities in the regional innovation system development.

A series of measures is proposed, aimed at creating a neo-industrial model of development of Russia, the key ones being: development of a competitive innovative business environment, widespread and effective use of innovative cluster technologies, a radical transformation of the investment policy of the Russian enterprises, effective regulation of social and labor potential.

Keywords: economic growth, gross domestic product, sustainable development, knowledge economy, the human and intellectual capital, neo-industrial economic paradigm, the concept of inclusive growth.

JEL Classification: O40, O47.

1. Introduction

1.1 Introduce the problem

Against the background of the debate that raged among the leading scientists and experts in the field of economic research about the causes, nature and consequences of the global financial and economic crisis of 2008-2009 (Krugman 2009, Piketty 2015, Soros 2012, Soros 2008, Grinberg 2015, Sukharev 2015, Guriev et al. 2011), interest in the problems of economic growth has been significantly increasing in the scientific community. Today, in the economic literature, issues related to the definition of growth factors that are adequate to the key challenges of modern civilization and the optimum ratio between them (Amosov 2016, Kudrin and Gurvich 2014, Grigoriev 2014), conditions to ensure sustainable innovative development (Shirov and Gusev 2015), major proportions in the economy, including the balance between consumption and savings (Pogosov and Sokolovskaya 2014) are widely discussed.

If we look at the essence of real economic growth as a solution and reproduction at a new level of the main contradiction of the economy (between the limited productive resources and the immensity of social needs), while in the longer time interval, it (growth) is presented, according to Schumpeter (2007) and Keynes (2007), as an essential constituent element of economic development. On the one hand, economic growth induces the cyclic nature of development, and on the other is itself a result of the changes to be prepared during the recession and depression (Hansen 1997). In this regard, the focus of experts in the field of economic research today is focused not so much on economic growth, as global changes (structural, institutional ones) in the economy, stable trends and laws of its transformation into a new quality – the “knowledge economy”. This causes the broader goals of modern economic growth beyond simply increasing GDP and revenue (Ranieri and Ramos 2013).

In these circumstances, the urgent need is obvious to find a new model of economic growth that can respond to the current challenges facing the global and national economies and the society. For Russia, it is also important because of its deepening gap with other countries on a number of sensitive macroeconomic and social parameters (Ryazanov 2014). The neo-industrial concept of socio-economic development, formed in 2007-2014

by the Russian economic school, and the concept of inclusive sustainable growth, having been gained popularity abroad, can be called among the most talked about now possible models of economic growth in the economics. Gubanov (2012) recognized as the founder of the first model, having outlined his fundamental program of new industrialization in a series of articles and monographs "Sovereign Breakthrough. Neo-Industrialization of Russia and Vertical Integration", believes that the current stage of socio-economic development is characterized by the entry into the historically higher epoch, when knowledge workers having higher qualification prevail as part of the total labor force of society; and science acts as a direct productive force. It logically follows that only the neo-industrial society can enjoy the genuine "knowledge economy", in which economic growth acquires a new – innovative – quality.

This approach, in principle, is consistent with the concept of inclusive economic growth, the main provisions of which have been developed by the Commission on Growth and Development, headed by Nobel laureate M. Spence, and are set out in its report "Strategy for Sustainable Growth and Inclusive Development" (Strategies for Sustained Growth and Inclusive Development 2016). It was concluded that there was a significant association between the rate of economic growth and addressing a broad range of social issues, including a more equitable distribution of income generated in the community, with particular attention to the poorest.

With regard to the existing currently socio-economic situation in Russia, the above concepts, in our opinion, should not be construed as alternative; they should complement each other in order to ensure a comprehensive approach to solving problems associated with the transition from model based on raw material export in Russia's GDP growth to a comprehensive (inclusive sustainable) development. Moreover, the need to use these concepts in their relationship and interaction can be regarded as justified also from the perspective of the key challenges to modern civilization, having been reflected in the report of the World Economic Forum (WEF) "Global Risks – 2014", a list of which was formed under the influence of a rethinking of the causes of the global financial-economic crisis in 2008-2009 and the protracted post-crisis period in global economies.

1.2. Explore Importance of the problem

Current difficult socio-economic situation in Russia is caused by both external and internal factors. But if we talk about the main thing, such a situation was the result of model of the national economy development (growth), based on raw material export. A number of system drawbacks (Gubanov 2016) is inherent to the last one, among which are deep de-industrialization of the productive forces and financialization, which is manifested in a higher return on currency and stock exchange capital in comparison with the industrial one; financial-economic and technological dependence on foreign capital and external shocks; import petrodollar inflation; spending, and not the accumulation of national wealth; aggravation of the problem of technological backwardness and impoverishment of the population, etc. Extension of this model does not allow protecting the economy from the ravages of new negative factors, including: the autonomous recession; the growing gap in profitability between the extractive and manufacturing industries; decline in domestic accumulation fund and the negative efficiency of capital investments, and so on.

These factors make the expert and raw-material growth model absolutely unsuitable for solving large-scale problems arising from the key challenges and major trends and patterns of the modern era. In contrast, the new industrialization, as a model of progressive structural diversification of the economy, the accumulation and effective use of highly intellectual human capital, increasing productivity and quality of life, social consolidation of the country includes the internal, fundamental driving forces, sources and factors of economic growth and development in Russia.

The abovementioned leads to the conclusion about the expediency of the presidential instruction on the early development of a new model of economic growth, strategy and the economic neo-industrial development policy. On the one hand, this makes it necessary to consolidate the positions and efforts of economic scientists of different directions; on the other – requires specification of the diagnosis of the situation in Russian economy, as the object of revival. Against this background, evaluation of the quality and prospects of economic growth in Russia is timely and important from the standpoint of the criteria of neo-industrial paradigm and inclusive and sustainable development. The solution to this problem, according to the authors, is of fundamental importance not only to identify the preamble of efficiency and quality of the Russian economy, but also for the subsequent formation of neo-industrial development strategy of the Russian state.

1.3. Background. Literature review

Note that with respect to the essence of the concept of "economic growth" and its interaction with the definition of "economic development", there is a wide range of opinions in the modern economic science. So,

even J. Schumpeter in his famous work "The Theory of Economic Development", published in 1912, wrote: "Nor will the mere growth of the economy as shown by the growth of population and wealth, be designated here as a process of development for it calls forth no qualitatively new phenomena… The form and content development are set ... by the concept of "implementation of new combinations" (production of the new, introduction of a new method (mode) of production; the development of a new market, obtaining a new source of raw materials or semi-finished products, taking an appropriate reorganization (Schumpeter 2007).

In 1970-ies, D. Hartwick formulated a condition for sustainable development of the society, according to which the latter can be achieved by investing the entire resource rent in reproducible capital, education and environmental protection (Hartwich 1997). Since the second half of the twentieth century, the fundamental theories of the relationship of sustainable development and economic growth (post-Keynesian, neoclassical, institutional) were created. Analysis of qualitative changes in the economic growth was conducted by E. Denison (Denison 1971), qualitative factors were reflected in the models of the "new growth theory" by Lucas (1988), Romer (1986), Sharaev (2006), as well as post-Keynesian models of growth by N. Kaldor and J. Robinson.

However, attention is drawn to one nuance. In fact, in these theories, the sense of fair thesis of the limits of growth (introduced into scientific circulation in 1972 in the first report of the Club of Rome) remains unsaid or abstract. Awareness of the need and importance of the theoretical understanding of this aspect of the research problem (insuperable environmental restrictions for quite specific type of economic growth) is due to the recognition of the neo-industrial paradigm of development, which is "conceived as a further, much higher degree of technological renovation of the productive forces", and giving them a neo-industrial nature – high-tech, technotronic (Korneychuk 2014). The latter, among other things, focuses on the functional role of the accumulation of social capital in the movement to neo-industrial development, linking it to the increase in the social responsibility of the state, business and society (including economic responsibility) and the establishment of a system of reproduction of human potential, appropriate to the challenges of modern epoch (Popov 2015, Fesenko 2011).

The foregoing develops certain provisions of social capital theory presented in the works of leading economic scientists (H. Becker, D. Bloom, A. Buzgalin, P. Bourdieu, E. Glaser, J. Copeman, R. Putnam, V. Radayev and others), and is consistent with the concept of inclusive sustainable growth. Recall that the World Bank defines this definition as high and stable (an essential condition for poverty reduction), widely used in all sectors of the economy, involving a considerable part of the labor force and is characterized by equality of opportunity in access to the market and resources (The World Bank 2001).

Based on the mentioned theoretical basis, according to the authors, it seems reasonable to consider economic growth in relation to the present stage of historical development as an expression of the expanded reproduction of the national economy without sacrificing the environment, when not only the final product (in the system of national accounts, GDP and ND correspond to it) grows and improves, but also the economic potential of the country (production assets, tangible working capital, labor force) expands and improves, the level of welfare of the population (measured by the rate of increase of GDP relative to ND per capita) is increased, social inequality is reduced (Kormishkina 2015). In this sense, the growth of the national economy is truly comprehensive, sustainable. It responds to well-known criteria of efficiency and quality of growth, enhances the international competitiveness of the country and the growth of national strength of the state (Kormishkina and Koroleva 2016).

1.4 State Hypotheses and their correspondence to research design

Approved in modern Russian model of economic growth based on raw material export is not able to subdue the existing country resource and economic potential to the prospect of inclusive sustainable socio-economic development of the country and its transition to the advanced, neo-industrial society with a genuine "knowledge economy", in which factors of efficiency and competitiveness play a key role in economic growth. This explains the systemic nature of the observed currently autonomous recession of the Russian economy.

3. Method

3.1 System approach

This research is complex. It is based on objective economic laws and the leading trends in the modern age, develops the provision of the known economic theories and concepts that shape the framework conditions for research and define a system approach as its methodological basis. With respect to the present conditions it is not about the eclectic "synthesis" of various theories and concepts, but clarifying the conditions and limits of

applicability of certain provisions as a precondition of possible fruitful synthesis, helping comprehend reality (Shevelev 1998).

3.2 Methods for indicative analysis

They are predetermined by the content of the general economic security theory. In this case, the diagnosis of the various spheres of economy and life is based on a set of indicators such as criteria (economic security indicators). Comparison of the actual (real) values of these indicators with their threshold (the maximum allowable) values enables to provide an indication of the potential dangers and threats, quantify the sharpness of the crisis situation in the sphere of life under study, form a complex of program-targeted measures to stabilize the economic situation with regard to their fixup.

3.3 The proprietary methodology of estimating the dynamics and intensity of innovation processes in national and regional economies

Its methodological basis are European methods for calculation Growth Competitiveness Index (GCI), European Innovation Scoreboard (EIS), certain developments of Russian scientists in monitoring and indicators system of innovation economic development (Senchagov 2013, Glissin and Kalyuzhny 2011), macro model of innovation system proposed by Chen and Dahlman (2006), including four functional units of parameters (economic, scientific innovation, information, education. Information of official sources of statistics was used to ensure maximum objectivity and comparability of the results. In addition, the aggregation procedure of dimensionless parameters was used, which allow carrying out a comprehensive analysis of a large number of indicators with different dimensions based on the resulting indices.

4. Results

The need for a new industrialization of the national economy of modern Russia has once again been confirmed by the downward trajectory of its economy and signs of the "resource curse". Experts in the field of economic research often point to the subjective and external causes of the designated situation (incomplete use of opportunities and incentives of market relations, weak management, the introduction of sanctions against Russia, the fall in oil prices on world markets). Under these conditions, science should provide the results of a more thorough analysis of the problem, which is dealt with in this article. The authors attributed the current socio-economic situation in Russia, in particular, to system failure of the model of the country's growth and development, which is based on raw material export.

There are serious grounds for such a conclusion. Official Russian statistics data show a trend of steady growth of GDP in the period after 1999 as compared to 1990 (Figure 1). However, when considering the results of each subsequent year, compared with the previous one, it can be seen that since 2004 the rate of Russian GDP began to decline (in Figure 1, it is evidenced by lines indicating trends of GDP curves and GDP growth compared with the previous year). Not with standing the already formed trend of GDP growth, it must be admitted that the designated indicator behaves in a more complicated way (in this case, a trend of GDP change is described by a polynomial function of the third degree). In this case, the emergence of the so-called inflection point is not excluded, the presence of which will indicate a change of trends – the upward curve of GDP is replaced by plateau, beyond which the downward curve is not excluded.

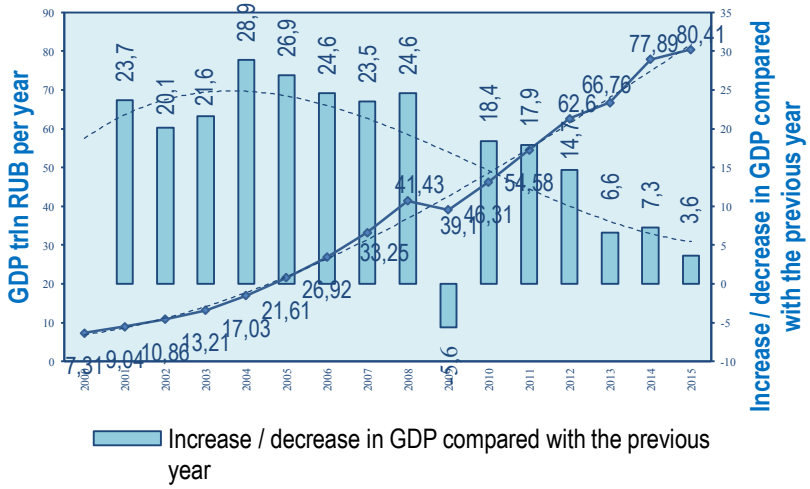

Figure 1 – The dynamics of Russian GDP in 2000-2015 (Russia in Figures 2015, Statistical Yearbook of Russia 2015).

From the standpoint of neo-industrial paradigm, GDP growth rates taken in isolation from other indicators say nothing about the quality of the national economy reproduction. The science is divided into three forms of social reproduction –simple, expanded and contracted. If the economic growth is an expression of the expanded reproduction of the national economy, in this case, not only the final product (in the system of national accounts, GDP and ND correspond to it) grows and improves, but also the economic potential of the country (production assets, tangible working capital, labor force) expands and improves. In turn, the increased economic potential becomes the basis for further GDP growth. In this case, economic growth rests on its own material and technical basis; thus, qualitative parameters (knowledge, technology and process innovations, the development of institutions, etc.) play a crucial role ensuring it.

From this perspective, Russia's GDP growth in 1999-2015 (its obvious sources and factors are known and were largely opportunistic in nature), although created a new situation in the field of currency capacity, it was not accompanied by an innovative upgrade of the country's production of capital based on new technology and efficient use of accumulated human capital (Table 1). This GDP growth does not meet the criteria of efficiency and quality of economic development, and therefore, cannot be considered sustainable and inclusive.

Table 1 - The basic indicators of the quality of Russia's economic development in 1996-2014 (Statistical Yearbook of Russia 2015, Human Development Index 2016).

Years	The index of GDP (growth at market prices),% to the previous year	The GDP deflator,% to the previous year	Quality index of economic growth	Human development index
1996	96.4	145.8	–11.69	N/A
1997	101.4	115.1	–9.79	0.747
1998	94.7	118.6	–4.51	0.771
1999	106.4	172.3	–10.33	0.775
2000	110.0	137.6	–2.76	0.776
2001	105.1	116.5	–2.24	0.779
2002	104.7	115.5	–2.30	0.795
2003	107.3	114.0	–0.92	0.795
2004	107.2	120.1	–1.79	0.779
2005	106.4	119.2	–2.00	0.795
2006	107.4	115.8	–1.14	0.753
2007	108.1	113.5	–0.67	0.797
2008	105.2	118.0	–0.12	0.817
2009	92.2	102.0	–0.11	0.782
2010	104.5	114.2	–0.09	0.817
2011	104.3	115.9	–0.11	0.782
2012	103.4	107.5	–0.04	0.775
2013	101.3	105.0	–0.04	0.784
2014	102.0	107.2	–0.06	0.788
2015	98.3	107.3	–0.09	0.798

From the data presented in Table 1, it is obvious that by the index of the quality of economic growth, adopted in cross-country comparisons (the ratio of the difference of the index of GDP growth and the GDP deflator index to the GDP growth), Russia has failed to achieve positive values. Nor have been reached extremely critical values of a number of other quality indicators, characterizing the movement of the country to the neo-industrial society (Table. 2).

Table 2 – Assessment of some qualitative parameters of the RF, 2013 (Glazyev 2014).

Index	Extremely critical value	Actual value
Indicators of human potential reproduction		
Natural increase, persons per 1000 inhabitants	12.5	0.2
Life expectancy, years	78.0	70.7
The gap between the incomes of the population, 10% of the wealthiest and 10% of the poorest, in times	8.0	16.2
The share of the population with incomes below the subsistence minimum, %	7.0	11.0

Economy competitiveness indicators		
Shipped innovative products, % to the total output	15–20	8.9
Expenditure on research activities, % of GDP	3.0	1.5
Average annual labor productivity growth, %	6.0	3.0
The share of the country's high-tech products on the world market, %	3.0	0.3
Intellectual property share in the value of the business, %	25.0	10.0
The share of public spending on the environment, % of GDP	5.0	0.8

The data presented in Table 2 are the basis for the conclusion that the current state of the Russian economy is not conducive to the effective use of accumulated human capital and hinders its development. For reference: in 1990 the value of the human development index (HDI) in the Russian Federation was 0.817 (Simagina 2007); in 2015 the value of this index (0.798) in the Russian Federation took the 50th place in the ranking of 188 countries in the world and was in the group of countries with high human development index.

In the context of economic growth model based on raw material export, the structure of the GDP used emerged in Russia that does not meet such generalizing, comprehensive indicator of the economic and investment security – a guarantee of inclusive sustainable development of the country – as a share of gross fixed capital accumulation in percentage of GDP. As shown in Figure 2, this indicator value in the 2000s ranged from 16.9 to 22.3%.

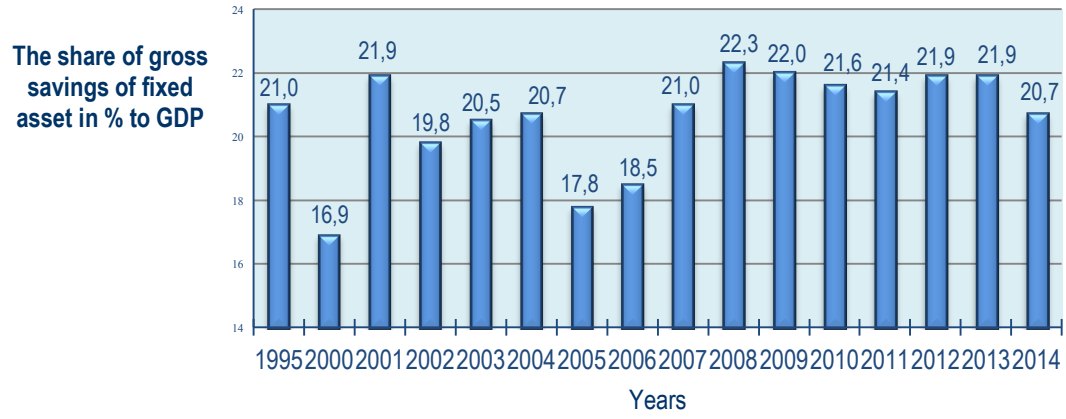

Figure 2 - The dynamics of the share of gross fixed capital accumulation as % to Russia's GDP in 1995-2014 (Russia in Figures 2015, Statistical Yearbook of Russia 2015).

These values of the designated indicator are significantly less than the norm, which was formed in the late Soviet Union (in 1988 it amounted to 30%), and, particularly, the norm characteristic of the stage of technological modernization of the economy, as in post-war Europe and Japan or in China in the second half of the 1980-1990-ies, when the share of fixed capital formation in GDP reached 32-34% at the rate of growth of the latter – 6-10% per year (Senchagov, 2013). And although the current rate of gross fixed capital in Russia is close to the values of this indicator in many countries with developed economies, it remains lower than in the newly industrialized countries of Asia (South Korea, Singapore, Hong Kong, Taiwan), states which are actively developing their technological capacity and competitiveness. According to this indicator the Russian Federation lags behind the CIS countries (Table 3).

Table 3 - The share of gross fixed capital formation in various countries in 1990-2013 (% of GDP) (World Economic Outlook. April 2011).

	Average in 1989–1996	Average in 1997–2004	2005	2006	2007	2008	2009	2010	2011*	2012*	Average in 2013– 2016*
Developed countries	22.5	21.2	21.2	21.6	21.6	20.9	17.8	18.6	19.0	19.6	20.5
including the newly industrialized Asian countries **	32.5	27.3	26.1	26.4	26.1	27.7	23.4	26.2	26.7	26.8	26.7
Developing countries and countries with economies in transition	25.9	25.0	26.8	27.8	29.1	30.1	30.3	31.3	31.6	31.9	32.5

including the countries of Central and Eastern Europe	22.4	21.3	21.4	23.3	24.7	24.9	19.1	21.0	22.3	22.4	22.8
CIS countries	…	20.3	21.2	23.0	26.7	25.2	19.0	21.7	24.9	25.9	26.9
Latin American countries	20.1	20.7	20.5	21.7	22.5	23.8	20.1	21.8	22.4	22.9	23.5

Note: * Prognosis; ** South Korea, Singapore, Hong Kong, Taiwan.

This situation indicates a low investment activity in the country, which is a serious constraint of genuine growth of the Russian economy. Despite the fact that the Russian economy managed to climb over the 1999-2014-ies from the bottom of the investment "pit" in which it appeared in 1998 with the level of funding for core capital of 21.1% to the level of 1990, the backlog by the value of the macroeconomic parameter under consideration compared to 1990 could not be eliminated. In accordance with the data shown in Figure 3, it is now 33.8%.

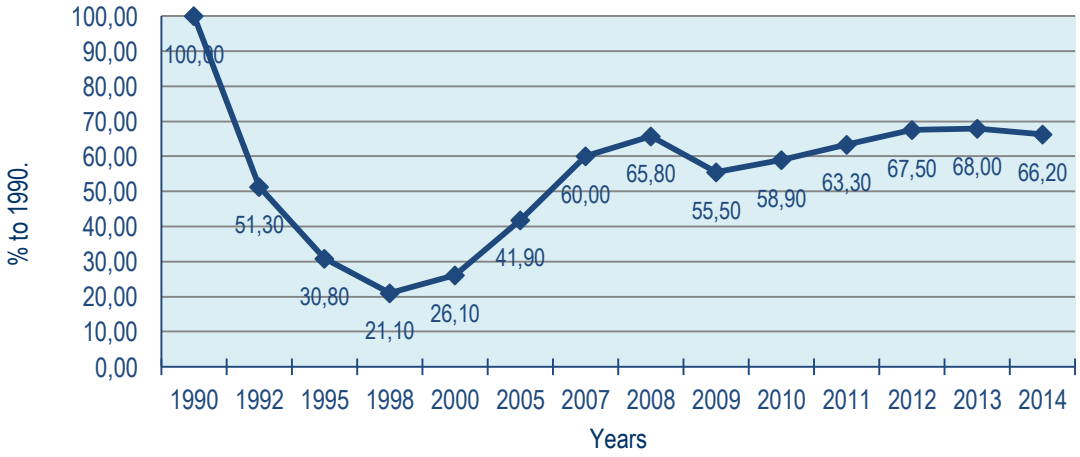

Figure 3. The dynamics of investment in fixed assets in comparable prices in 1990-2014 (Russia in figures 2015, Statistical Yearbook of Russia 2015).

Clearly, the investment needs of the modern economy of Russia are not limited to the financing of fixed capital. In addition to investments in fixed assets, investments in working capital and an increase in human resources related to education, health, finance, social services, and science are required as well. Against this background, monetary policy of savings sterilization pursued by the Central Bank of Russia cannot provoke famine investment in the economy, which has a very negative impact on the state and reproduction of fixed assets – the most important basic factor of economic growth. Table 4 shows some indicators reflecting the main trends in the sphere of condition and reproduction of fixed assets (FA) in the Russian Federation.

Table 4 – Key indices of the condition and reproduction of fixed assets in the Russian economy in 1990-2014 (Russia in figures 2015, Statistical Yearbook of Russia 2015).

INDEX	Years											
	1990	1995	2000	2004	2008	2009	2010	2011	2012	2013	2014	2015
Coefficient of FA renewal %	6.3	1.8	1.8	2.7	4.4	4.1	3.7	4.6	3.9	4.7	4.3	н. д.
Retirement rate of FA, %	2.4	1.9	1.3	1.1	1.0	1.0	0.8	0.8	0.7	0.7	0.8	н. д.
Degree of FA depreciation, %	35.6	38.6	39.4	43.5	45.3	45.3	47.1	47.9	47.7	48.6	49.4	49.5

Data in Table 4 show a negative trend prevailing in the Russian economy in the reproduction of fixed assets. As it is known, the main purpose of investment in fixed assets is the replacement of worn-out machinery and equipment. In the context of growth model based on raw material export, due to the known restrictions on the accumulation of investments to replace worn active part of basic production assets (BPA), Russian companies are forced to exploit the limit-exceeding worn-out equipment (for reference: the BPA wear reached 49.5% in 2015 at extremely critical value of the indicator 40.0%,), while maintaining the trend, the value of this indicator could reach 52.0% in 2020 (Daskovsky and Kiselev 2015).

It is noteworthy that in the industrialized countries annually 12.5% of the active part of fixed assets is updated. During the period from 1968 to 2016, the full cycle of its replacement was performed 6 times

(Daskovsky and Kiselev 2016). Against this background it is discouraging to find that in the Russian economy the reproduction cycle of the active part of basic production assets was carried out during this period only by 15.0% (the share of equipment in operation under the age up to 10 years, which determines the ability of the country to a sustainable innovative development).

Consequently, the retirement rate at the level of 1.0-0.7% (Table 4) suggests a completely insufficient intake of new fixed assets in the economy of the Russian Federation causing degradation of the material and technical base and reducing depreciation. In this regard, it should be noted that even in 1970-1980-ies (the years of "stagnation"), the value of the coefficient of fixed assets disposal was higher than today and amounted to 1.7-1.5% (Gubanov 2016).

To this we add that the negative situation in the field of state and reproduction of fixed assets has social and humanitarian aspects, which have an important impact on the quality of economic development.

It is obvious that there is no other way to improve living standards of the population, in addition to creating conditions for proper remuneration for every worker. It is clear that we can expect no significant increase in productivity and decent remuneration of the latter in the current state of fixed assets. Against this background, labor motivation of employees and the return on their labor is reduced. The contradiction between the still relatively high level of education of the population, on the one hand, and employment deterioration, on the other is gaining strength. The growth of social problems, inevitable under these conditions, is largely due to the increased depreciation and underutilization of human potential.

In addition, the high degree of fixed assets depreciation of the real sector of the economy increases the risk of man-caused emergencies. The most susceptible to them are such industries as electricity, fuel industry, ferrous and nonferrous metallurgy, chemical and petrochemical industry, where continuous technological processes dominate and their emergency stop is fraught with environmental disaster and a fire hazard with a possible loss of staff.

Figure 4 presents a graph showing the dynamics of the indices of state and reproduction of fixed assets in the Russian economy in their relationship with the investment security.

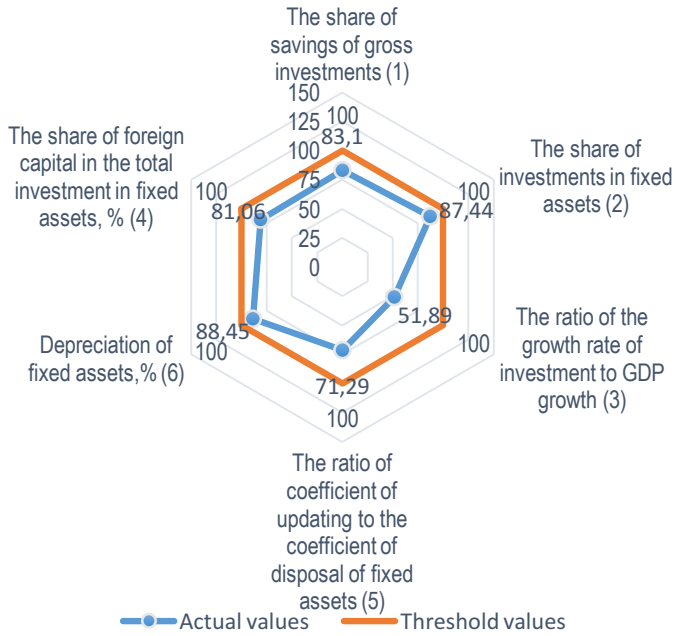

Figure 4 – Evaluation of the Russian economy capability for sustainable economic development on the basis of economic security indicators (the authors' calculations).

These indices were obtained by preliminary normalizing of the mentioned indicators using two features that have the following view (Senchagov 2013):

a) for the ratio of the "no less than" type:

$$y = \begin{cases} 2^{(1-\frac{a}{x})/\ln\frac{10}{3}}, & if\ \frac{x}{a}>1 \\ 2^{-\log_{\frac{10}{3}}\frac{a}{x}}, & if\ \frac{x}{a}\leq 1 \end{cases}, \quad (1)$$

b) for the ratio of the "no more" type:

$$y = \begin{cases} 2^{(1-\frac{x}{a})/\ln\frac{10}{3}}, & if\ \frac{x}{a}<1 \\ 2^{-\log_{\frac{10}{3}}\frac{x}{a}}, & if\ \frac{x}{a}\geq 1 \end{cases}, \quad (2)$$

where x is the real value of the indicator; a – its threshold (very critical) value.

As can be seen from the diagram shown in Figure 4, the real indices for most indicators (1), (2), (4), (5), (6), though located in the "moderate risk" zone, are very close to a "significant risk" area, indicator (3) is simply on its boundary. This situation raises serious concerns, as it reduces the susceptibility of the economy to innovations and hinders sustainable economic growth. This situation is undesirable, as in many cases it cannot be correct, so it is important here to study the trends of changes in the relevant indicators (Senchagov 2013).

Since innovations are still a major source of economic growth and determine its efficiency and quality, in the context of the problem under investigation, analysis of the dynamics and intensity of innovative processes in Russian economy has been carried out. It is gratifying to note that the level of global innovation index and its constituents of the Russian Federation today, are ahead of the country's partners in the group of BRICS and the Eurasian Economic Union. The data of Table 5 show a high patent activity, but the balance of foreign trade in the field of intellectual property services is characterized by a negative trend.

Table 5 - Comparing countries by the value of the global innovation index (by selected indicators of innovation development) (Dutta *et al.* 2015).

INDEX	Kazakhstan		Russia		China		Germany		USA	
	Index	Place in the world ranking	Index	Place in the world ranking	Index	Place in the world ranking	Index	Place in the world ranking	Index	Place in the world ranking
World innovative index	31.2	82	39.3	48	47.5	29	57.1	12	60.1	5
Human potential and research	29.6	66	47.5	26	43.1	31	56.6	10	54.0	14
Production of knowledge and technologies	21.9	96	36.6	33	58.0	3	53.4	10	58.0	4
Residents' patents	4.6	24	8.2	9	43.6	1	13.1	1	17.2	1
High- and medium-technology enterprises	6.8	87	26.0	45	43.1	15	55.5	5	43.3	14
Creation of new knowledge	8.7	80	39.9	21	64.1	6	64.7	5	68.5	4
High-tech exports	4.1	36	1.7	53	28.4	1	12.0	17	6.8	26
Exports of communication, computer and information services	0.2	111	0.8	82	0.7	86	2.2	35	1.3	67
Production of creative goods and services	13.6	86	17.0	78	33.0	35	28.1	43	39.7	18
Creative goods exports	0.3	70	0.4	62	14.0	1	1.8	25	1.7	29

In this context, we would like to pay a special attention to the results of the analysis of the effectiveness of regional innovation systems in a particular entity of the Russian Federation – the Republic of Mordovia, undertaken by the authors. Mordovia is a region with a relatively high scientific, technical and human potential, the modern innovation infrastructure but limited resource-base. Imbalances and distortions caused by the current model of GDP growth are inherent to its economy.

The results have been obtained by the method described (in paragraph 2.3) and are shown in Table 6 and Figure 5.

Table 6 - Efficiency of the Republic of Mordovia innovation system, 2011-2014

INDEX	Knowledge economy index		Economy index rank		Index	Knowledge economy index		Economy index rank	
	2011	2014	2011	2014		2011	2014	2011	2014
Financial and Economic Unit									
GRP per capita	0.080	0.070	60	66	Solvency of legal entities	0.298	0.315	61	54
Index of industrial production	0.402	0.150	69	68	Resource usage efficiency	0.500	0.688	70	69
Return on assets of extractive industries enterprises	0.632	0.351	26	76	Return on assets of manufacturing industries enterprises	0.194	0.389	67	60
Return on assets of electricity, gas and water supply enterprises	0.888	0.836	12	22	Profitability of sold goods of producing industries	0.138	0.174	70	72
Profitability of sold goods of manufacturing industries	0.436	0.538	69	60	Profitability of sold goods of electricity, gas and water supply enterprises	0.699	0.800	50	46
Ratio of goods shipped of manufacturing and extractive industries	0.335	0.758	5	2	The level of material security by the main employment	0.440	0.441	43	23
The level of consumer security	0.239	0.326	12	17	The level of public confidence in credit institutions	0.222	0.153	18	19
The number of credit institutions	0.008	0.008	38	49	The level of banking activity	0.213	0.065	66	55
The efficiency of banking activity	0.213	0.314	35	34	Productivity	0.024	0.036	69	69
Average index and rank in the financial and economic unit						0.331	0.356	47	48
Research and innovation unit									
Efficiency of scientific training	0.146	0.431	30	12	The effectiveness of organizations engaged in post-graduate training	0.540	1.000	8	1
The number of organizations engaged in research and projects	0.020	0.018	52	55	The average number of employees in research organizations	0.108	0.076	49	51
The share of researchers in research organizations	0.660	0.442	16	25	The level of scientific qualifications of researchers	0.123	0.129	71	67
Targeted distribution of intramural current expenditure on research and projects	0.907	0.033	49	43	The ration of expenditure on projects and internal current expenditure on research and development	0.123	0.641	71	29
The share of internal current expenditures on wages	0.365	0.308	56	69	The share of internal current expenditures on the purchase of equipment	0.577	0.028	4	69
Quality of inventive activity	0.491	0.624	5	27	The effectiveness of inventive activity of researchers	0.146	0.117	21	31
Effectiveness of research organizations	0.018	0.025	38	47	Innovative activity of organizations	0.354	0.645	19	9
Payback of new technologies	0.061	0.487	47	7	The effectiveness of new technology costs	0.127	0.155	9	16
Average index and rank according to research and innovation unit						0.298	0.322	34	35
Information and communication unit									
The number of personal computers per 100	0.244	0.156	49	64	ICT per capita costs	0.076	0.011	57	77

INDEX	Knowledge economy index		Economy index rank		Index	Knowledge economy index		Economy index rank	
	2011	2014	2011	2014		2011	2014	2011	2014
employees									
Ratio of domestic and current expenditures on research and ICT costs	0.117	0.221	44	21	Ratio of the costs on ICT and the net result of the activity of organizations	0.889	0.642	14	31
The share of organizations using personal computers	0.365	0.531	77	67	The share of organizations using other types of computers	0.085	0.177	79	75
The share of organizations using special software tools for research	0.098	0.036	62	74	The share of organizations using special software for design	0.152	0.150	66	66
The share of organizations using special software for control the automated manufacturing process or separate technical means	0.379	0.259	59	56	The share of organizations using special software for address the organizational, administrative or economic tasks	0.098	0.540	62	11
Average index and rank of information and communication unit						0.250	0.272	57	54
Educational unit									
Increase in level of education	0.509	0.631	35	25	The number of professionals graduated with the higher education institution	0.425	0.033	33	48
Ratio of the total number of professionals with initial and secondary vocational education and specialists with higher education	0.302	0.159	37	49	The number of educational institutions' students per 10000 population	0.514	0.532	20	14
Average index and rank according to educational unit						0.438	0.339	31	34

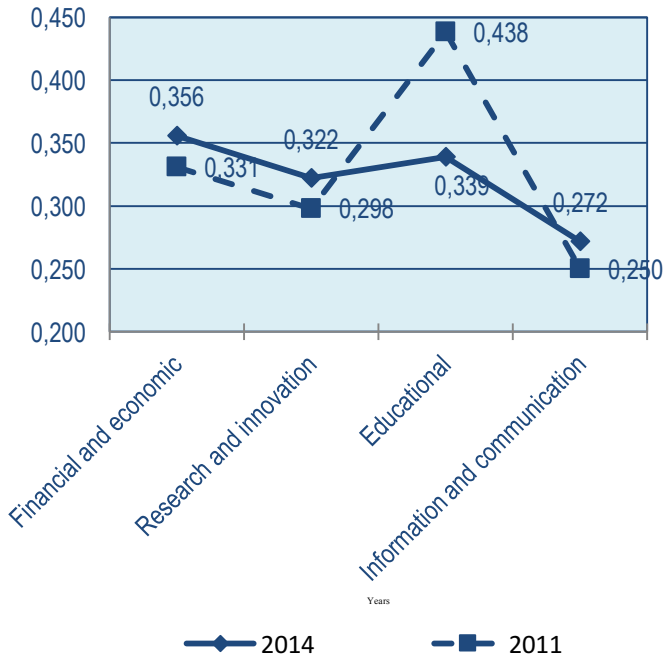

Figure 5 – The structure and dynamics of the indices of major indicators of the knowledge economy in the Republic of Mordovia from 2011 to 2014

The effectiveness of the innovation system in the region as a whole can be estimated on the basis of the index "knowledge economy in the region", which is defined as the arithmetic mean of the indices of functional blocks Yi (i = 1, ..., 4).

As the dynamics of the index of "knowledge economy" in the Republic of Mordovia illustrates, in 2014 it fell slightly (from 0.329 to 0.322) under the influence of the autonomous recession in the Russian economy. The index value in the entire investigated range of time remained below the maximum critical value (0.5). It indicates an insufficiently high level of innovative development of the economy, which is a limiting factor for sustainable inclusive development.

5. Discussion

With regard to contemporary Russian realities, sustainable overcoming of the autonomous recession in the country and de-industrialization of the productive forces is not possible without abandoning the economic growth model based on raw material export and change of the economic development paradigm. According to the authors, the solution to this complex problem involves:

1. Clarifying the priorities for the reconstruction and development of knowledge-based industries and technologies, premised on the best of Russia's major competitive advantages or prospects of their creation in the medium term. Currently, the following high-tech sectors of the economy have been formed in the Russian Federation: the aviation and aerospace industry, nuclear power sector, shipbuilding, electronic industry, power engineering, information and communication technologies., According to the authors, long-term federal government programs should be directed at their development, as well as the measures supported by the necessary financial and organizational resources.

2. The development of a competitive innovative business environment. It should be remembered that the existence of a competitive market is an important condition of motivation for innovation in firms and companies. In this regard, carrying out legally supported economic policies is necessary and is aimed at increasing the innovative activity of the business environment through the development of competitive advantages; reducing administrative and institutional barriers; formation of a favorable investment and tax climate; infrastructure (production, credit and financial) development to promote the economic and innovation processes; stimulating enterprises to improve the skills of personnel and its innovative literacy and culture, etc.

3. The widespread and effective use of innovative cluster technologies which allow creating the so-called "poles of competitiveness" in the Russian economy on the basis of tools of public-private partnership. It requires a unified state policy aimed at the creation and development of the relevant state and public institutions that promote a cooperative relationship (cooperation) between the parties of cluster innovation networks – large-scale high-tech enterprises, small innovative enterprises, scientific and educational organizations, financial institutions, innovative companies and authorities. Its legal framework should be part of the federal targeted program for the development of innovation clusters.

4. The widespread use of economic mechanisms stimulating development of innovations in production. To a certain extent, a favorable investment climate, the possibility of manufacturing of innovative products and the transfer of innovative technologies depend on the following conditions: providing enterprises with state subsidies for the purchase and development of innovations; tax incentives for research and development; improving the pricing mechanism and support of high-tech product export; the introduction of intellectual property into economic circulation; training of professional innovation management, and others.

5. Radical transformation of the investment policy of the Russian enterprises. It is obvious that an effective investment policy should be aimed at achieving the following key objectives: the use of the country's own savings towards sustainable development; an increase in technical and technological level of production; the development of human and intellectual potential. It should be noted that innovation and investment development strategy of Russia cannot be built only on the basis of the current criteria of efficiency and on the basis of the current supply and demand situation. It involves the elimination of the imbalance between current and long-term activities; long-term scientific and technical and innovative projects should become an object of the national public strategy.

6. Effective regulation of social and labor potential. Neo-industrial development requires the creation of not only certain economic and technological conditions for the modernization of a number of lost basic sectors of the national economy and the creation of new high-tech industries. It is largely determined by the ability of the active part of the population to participate in the formation of a new model of economic growth. This requires the development of a fundamentally new strategy of state policy: firstly, improvement of the attractiveness of work and training of high-quality labor force, capable of operating within the framework of new technologies; secondly, the creation of conditions to ensure working efficiency, a dignified life and free personal development.

In other words, we are talking about the need for effective regulation of social and labor potential, which includes labor, social, intellectual potentials as the whole. In collaboration, they provide additional synergistic opportunities for economic growth. Without regard to these components, in our opinion, qualitative changes of economic growth cannot be provided, especially in a country where there are "population reduction and the strengthening of negative processes in education, health, science", and so on (Amosov 2016). In this regard, in order to form the economic growth of neo-industrial type, measures related to the provision of professional skill level, updating and creating the conditions for the social development of man, his self-realization should be included in the content of social policy.

Conclusion

These are the considerations which lead to the conclusion about the change of the model of GDP growth based on raw material export and the development of Russia to a new, progressive model of economic growth of neo-industrial type, adequate to key challenges and leading trends and patterns of the modern era. The latter meets the criteria of efficiency and quality of growth and combines the features of an innovative, sustainable and inclusive growth. The economic model of the new industrialization of Russia is now conceptually developed. The main problem is connected not so much with a theory as with the formation of a long-term strategy of neo-industrial development of the country.

Acknowledgments

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The Financial Services Satisfaction Analysis of the Customers in Slovakia and France

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Abstract:

The competition in banking industry is nowadays very high. A model one bank for all life is no longer applicable and the clients are more informed, but also more demanding regarding their needs and satisfaction. The aim of the paper is to analyze customer satisfaction with financial services in Slovakia; theoretically define the basic concepts related to the topic of paper, to quantify the overall customer satisfaction, to identify the clue factors that have a significant influence on the satisfaction and the trust in banks, to better understand customer preferences and to compare this situation with the current situation in France. The analysis is completed by descriptive statistics and statistical test chi-square. The final part of paper is dedicated to conclusions and suggestions for banks to improve the customer satisfaction.

Keywords: bank communication, customer satisfaction, dimensions of trust, loyalty, quality of services.

JEL Classification: C51, C52, G12, G32.

1. Introduction

Marketing is the current scientific discipline, which is the part of economy. While the economy is mainly focused on a production and the producers, marketing is based on a consumer. There may be a question: why does the financial institution need the marketing? Bank as a financial institution is dependent on a public. The behaviour of a specific population is directly reflected in its profitability. Marketing helps to easily identify and further specify the target customers and their needs. The role of marketing is to understand the customer at a level that the provided service is satisfactory to him therefor he will require and expect this service again. (Gebai 2005) To evaluate clients' expectations towards their banks has never been easy. There are many factors that affect the relationship between a client and a bank. The customers are the ones who are more demanding and they require more; they expect benefits from their banks.

To have successful marketing orientation, the financial entities should focus not only on the products and the services, but it is crucial to have a business-oriented policy on the market, and focus on clients as well as on their preferences, needs and potential problems related with usage of the services. Financial institutions have to constantly adapt to changes in preferences and expectations of their clients, which should be associated with an increase in market share and profitability of financial institutions. (Auther and Kreutzmann 2012, Mateides and Ďaďo 2002)

The banking model widely used in the second half of the twentieth century, one bank for all life, is in the past. Clients used to accept the traditional offers of their banks and they trusted them without doubting, because they did not have enough information about the products and services of other banks and possessed only the limited financial knowledge. They were simply managed by their banks. One of the consequences was that the children became the clients of the same banks as their parents, grandparents. The bank was in the centre of client's life. Today the situation has changed in favour of the client. Financial knowledge of the clients is on a higher level; they are more informed about the products in various banks mainly due to large variety of communication channels. This means that a client who is interested in a new banking product or service will almost always compare the several options offered by the different banks. In other words, banks have become suppliers of services that can be easily replaced by competitors. In addition, the appearance of Internet and social networks, the bank may increase but also lose its reputation literally overnight. It is therefore clear that the model one bank for all life is becoming more and rarer (Auther and Kreutzmann 2012).

2. Theoretical background

During the last decades, marketing did not pay enough attention to a phenomenon called customer satisfaction. However, recently almost all commercial entities and banks have realized that the clue for acquiring and maintaining their own market share is mostly customer and his opinion. Although the status of clients and

their satisfaction has recently become important in marketing theory, there is no unified definition which could define this phenomenon (Korauš 2011).

Korauš (2011, 149) considers the customer satisfaction as an emotional response towards the product and the company itself, following the fulfilment of customer's vision, aspirations and needs and the fact that customer inclines to realization of another purchase of such a similar product in the same company in the future. Standard ISO 9000: 2000 (Mateides and Dado 2002, 618) defines customer satisfaction as a reflection of perceived level of satisfaction to which his requirements were fulfilled. Jones (1995, in Mateides and Dado 2002, 618) in his book defined customer satisfaction as a condition where the needs and expectations are satisfied constantly during the life of the product or service. Without that it would not be possible to obtain the confidence of customer.

Customer satisfaction explains the extent of meeting the customers' requirements; it is a response to using a service. Consumers' feelings are expressed relatively to how the expectations were met. The essential of customer's buying process is to overcome the customers' expectations. Consumer's enthusiasm creates emotions which produce emotional bound to service and this helps to start by building the confidence. Consequently, he will also recommend that service to his friends and family. (Mateides 1999, 11)

As Mateides (1999) and Jones (1995, in Mateides and Dado 2002), Korauš (2011, 474) also mentioned confidence in his book. If the financial institution builds a relationship of trust with clients, they will be more amenable to buying other products and services from the same institution as well; they will be less price-sensitive and will show greater loyalty to this institution. Confidence is a widely-discussed topic in the marketing literature and it is part of several behavioural models including the model of the relationship between sellers and buyers in the consumer market as a key element between the institution and the customer. Trust is also often seen as the willingness of one party become vulnerable. Previous studies suggest that the complexity of transactions and their costs can be significantly reduced if the buyer trusts the seller. Customer's perception of confidence affects their satisfaction, the assessment of the seller and repurchase. (Chen *et al.* 2012)

Customer satisfaction can be seen by Oliver (1997) as a response to customer experience with his consumption. Oliver (1997, in Kumar Rai, Medha, 143) defined it as an assessment of whether a product or service provides a sufficient degree of satisfaction of needs. One of the fundamental problems of this phenomenon is to determine whether satisfaction is seen as a rating based on the one-time transaction or as an overall assessment of a series of transactions. Traditionally it is considered as the immediate after purchase satisfaction, perhaps any emotional reaction. (Gupta and Zeithaml 2006) In the recent studies focused on the relationship between customer satisfaction and performance of financial institution the centre of attention is often directed towards long-term relationship with the institution, not just for one service separately consumed neither only one contact with financial institution. Anderson, Fornell, Lehmann (1994) considered the overall satisfaction rating based on all purchases and consumer experience with a product or service for the entire duration of its use; which means that customer satisfaction is caused by any of his experience with financial institution. In the literature (Hallowell 1996, Jahanshah 2011) it is often cited that customer satisfaction is the result of the customer's perception of value obtained from transactions or relationships with financial institution - this value is equal to the acquired quality of services linked to the price and the purchase cost of the client.

Geyskens, Steenkamp, and Kumar (1998) regarded customer satisfaction as a key factor responsible for long-lasting union of the supplier and the buyer. Simultaneously, it is very often claimed that a satisfied customer is stimulated to retain your service provider.

Yi (1993, in López-Alarcón 2003) noticed that the definitions of customer satisfaction vary depends on the level of specification. As various levels of specifications it is understand f.e. satisfaction with product, satisfaction with consumer experience, satisfaction with institution. Due to his study, customer satisfaction can be understood in two different ways:

Satisfaction as a result. Howard and Sheth (1969) define satisfaction as a buyer cognitive status realized that he has been adequately or inadequately rewarded for the sacrifice he made. Westbrook and Reilly (1983) highlight the existence of emotional response to the experience associated with a particular product or service and behavioural pattern of the buyer. (López-Alarcón 2003, 31-32). The result is thus understood as a state of mind when a consumer realizes the effect of consumption of a particular product or service which is produced in response to the purchasing process.

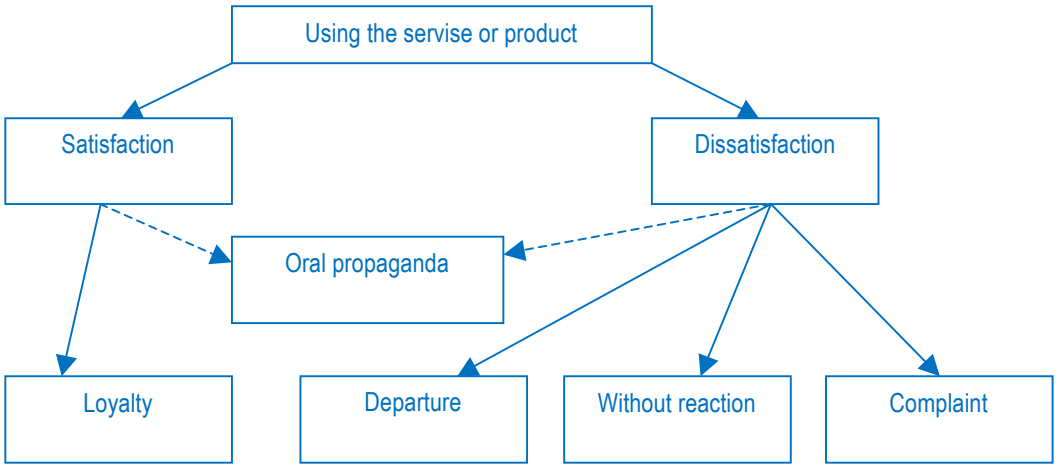
Satisfaction as a process. Hunt (1977) considers satisfaction as a process and defines it as the evaluation of the experience which should be at least as good as expected. Engel and Blackwell (1982) express satisfaction as rating of selected alternative, which is consistent with previous conviction on the service and its alternatives.

(López-Alarcón 2003, 32). Under the process, we understand the comparison of expected and actually provided, indeed subjective assessment of the consumer.

Although the literature provides various definitions of customer satisfaction, Giese and Cote (2002) emphasize that all of them embrace three basic features:

- Customer satisfaction is the answer.
- His response refers to a specific variable (expectations, product and consumption experience etc.)
- Answer will take place at a particular time (after consumption, after the election; is based on accumulated experience).

Nevertheless, satisfaction represents an emotional or cognitive response to the consumption of a particular service in his after purchase phase (at a particular time). The relationship between customer satisfaction and loyalty is also examined in the banking sector; *e.g.* Hallowell (1996) confirms the existence of positive link between satisfaction and oral propaganda; Brooms and Nysveen (1999) and Veloutsou et al. (2004) confirm the positive relationship between satisfaction and behavioural stimuli. (Baumann *et al.* 2012). Lately, the client has the opportunity to express the satisfaction or dissatisfaction in these ways (Korauš 2011, 473): No response, loyalty, departure or complaint, as it is shown in Figure 1.



Source: Mateides, 1999, s. 29

Figure 1 - Alternative forms of customer behavior

Customer satisfaction needs to be highlighted for several reasons. The present days are showing us that the financial institutions or businesses lose their customers; but instead of trying to seek the way how to retain their current customers, they are trying to attract new ones. The question is why customers are leaving and they are not faithful (Mateides 2000). It is estimated that about 35% of customers who changed their financial institution did so from external reasons that are not controllable by the bank. The remaining 65% were stimulated by internally controllable factors related to behaviour towards their clients as price, low quality of services, inability to solve problems, location. Studies dealing with this issue consider the dissatisfaction as the main factor affecting the departure of customers in the insurance sector and very low quality of services in banking industry. (Kaur, Sharma and Mahajan 2014) In any case Kaur, Sharma and Mahajan (2014) in their study confirmed that:

- Most of the respondents do not wish to replace their main bank, but at the same time these respondents may not be classified as loyal.
- There are two types of respondents, loyal and false.
- Direct relationship exists between the customers' initiatives to change bank on one side and fast and efficient response to failure of service, reasonable prices, switching costs and barriers to change on the other.

Theoretical foundations for modelling and measurement of customer satisfaction according to Oliver (1980, 1997 in Rust and Chung 2006), arises primarily from its psychology. The difference between what the customer expects and what actually gets is a major determinant of satisfaction. The early models of the measurement of the service quality (Parasuraman *et al.* 1988, Rust and Chung 2006) are based on this principle. Since satisfaction is highly dependent on expectations, the understanding and modelling the nature of these expectations is very important. Expectations can be investigated on an individual basis as demonstrated Tse and

Wilton (1988), but there are also studies *e.g.* Johnson and collective (1995), where the expectations are aggregated (Rust and Chung 2006).

3. Methodology, research goal, questions and hypotheses

Research goal of this paper is to quantify the overall satisfaction of Slovak banking clients, together with identifying and underlying factors and variables affecting customer satisfaction and loyalty. At the same time, the paper aims to provide a comparison with the situation in France.

Research questions

1. Which values and variables are considered by Slovak banks' clients as a key to meet their needs?
2. Do the clients change the way of communication with a bank due to the complexity of the issue and problem they actually have?
3. Are there any common features (or important differences of opinion) in the preferences of Slovak and French banking clientele?

Research hypotheses

H_1: There are not significant differences in satisfaction of Slovak and French banking clientele.

H_2: There are not significant differences in customer satisfaction by gender.

H_3: There are not significant differences in customer satisfaction depending on the residence.

3.1. Quantitative research

The quantitative research was chosen to achieve answers to research questions, namely questionnaire method that is able to reach different segments of customers willing to express their points of view and help to improve the current situation in banking industry. For the purpose of this paper two questionnaires are created, one for the Slovak and one for the French market. The questionnaires are not identical but adapted to the habits of the domestic population. One of the expected conclusion that is going to be confirmed is the assertion mentioned in the theoretical part, the clients are not afraid to change their banks and their commitment to a single bank may be threatened, since the current trend is to be a client of several banks simultaneously.

Research conducted by questionnaire method is used in the studies presented in the second chapter of the paper as Deloitte (2013) and Ernst & Young (2014). Slovakia and the Czech Republic have also implemented a research on the bank customer satisfaction through a questionnaire, led by Belás and Kotásková (2013).

For the creation of two electronic questionnaires the online platform survio.com is used. Data were collected during three weeks in Slovakia and in France. Questionnaires were given to respondents via Internet, addressed directly through social networks or via e-mail. The target segment in both surveys is mainly young generation, students and employees who are in the process of building their relationship with the bank. Students are seen as a key segment for banks. They want to retain these clients and to convince them of the quality of the provided services. On the other hand, working population uses more complex services offered by banks, whether loans or instruments to assess their investments.

Questionnaires begin with a brief introduction which explains why, for what purpose and by whom the research is conducted, followed by the core with general questions about the respondent and questions investigating the banking market (Slovak or French). At the end there is a brief acknowledgement for expressing their opinion, time and their willingness.

Questions that have been asked are closed, partially closed with the possibility of writing a short comment and open with possibility to express their full opinions. Before the end respondents are invited to express their views, experiences or observations relating to financial institutions or services. Data are processed by programs as MS Excel, SPSS Clementine and SPSS, and the descriptive statistics is mainly used to test hypotheses, but also chi-square test with Yates correction is used.

Questionnaire method has its limits with which we have already detected before the start of research and which could distort the obtained results. Such restrictions include systematic and non-systematic errors such as misunderstanding the questions in the questionnaire, failure to complete the questionnaire because of its length, errors in the compilation of a questionnaire or misinterpretation of the obtained data.

4. Findings

4.1 General data about respondents

To examine the research questions and to test the hypothesis two surveys were conducted - the first one on the sample of 157 respondents; randomly chosen students and working people in Slovakia, 66.2% of women and 33.8% of men. In terms of age, we can conclude that most important group of respondents is in the age between 19 and 25 years (60.5%), while this group is supposed to choose their life-partner bank after graduation. The second major group is aged between 26 and 45 years (22.3%). Therefor the current situation of the respondents in terms of employment is as follows: 58.6% of students and fresh graduates and 33.1% of working people. Regarding the completed level of education, respondent's education is mainly focused into two categories: 37.6% have completed secondary education, 62.4% have obtained a university degree.

The second survey was conducted on the sample of 113 respondents living in France, 61.5% of women and 38.5% of men. 46.9% of respondents belong to the age group 26 - 45. The majority of respondents are employed 69.2% and 68.03% successfully obtained a master's degree.

4.2 Differences and similarities between Slovak and French population

In this part of the paper the results of both surveys, concerning Slovak and French banking market, are presented mostly in the form of a comparison between these countries.

As shown in the Table 1, the differences are remarkable. The different values according to *quality of service* are recorded. For French customers, the most important values are performance, innovative creativity and simplicity. On the other hand, for Slovak customers the key values are human approach, followed by knowledge and practicality.

Table 1 - Core values to achieve quality of services in Slovakia and in France

Range	Slovakia	France
1.	Human approach	Performance
2.	Knowledge	Innovations
3.	Practicality	Simplicity
4.	Responsibility	Transparency
5.	Innovations	Practicality

Source: own source

Furthermore, the respondents had the possibility to evaluate the significance of the various factors that are according to them important while choosing a bank. Firstly, the importance of *communication with customers and listening to their needs* (98.08%) is highly expected from both nations. Secondly, *the interest rates and fees* and *the promptness of services in branch* (both 96.15%) play also an important role. Thirdly, there are *simple and transparent offer of financial services* and *professional staff* (both 92.31%). The rest of significant factors are *regular innovations* and *improvements of offered services and products* (80.77%) and *good reputation of the bank* (76.92%).

In the Table 2 we do not observe any special differences. Except for the fact that Slovaks mentioned *internet banking* while French preferred *visit the local branch*. The least important factors are colors and decoration in branches, staff clothing and loyal programs or discounts.

Table 2 - Core factors, while choosing a bank in Slovakia and in France

Range	Slovakia	France
1.	Communication with customers and listening to their needs	Communication with customers and listening to their needs
2.	Interest rates and fees	Interest rates and fees
3.	Internet banking	Promptness of services in branch
4.	Simple and transparent offer of financial services	Qualification of staff
5.	Qualification of staff	Simple and transparent offer of financial services

Source: own source

If we concentrate on the five dimensions of trust in each case, the positive feedback is higher than the negative. French clients particularly appreciated *the reliability* (92.31%) and *the credibility of banks* (88.46 %), they also recorded relatively high *interest of the client* (80.77%). Dimension with which French clients do not agree is primarily *the transparency of bank* (30.77%).

However, the Slovaks trust their banks mostly in the first dimension, *the interest of the client* (84.08 %), *the credibility* (77.07%) and *the reliability of the bank* (75.16%).

The lack of satisfaction is observable in the dimension of listening. Banks should therefore focus their attention mainly to two dimensions (listening and transparency) so that the trust and satisfaction can enhance or eventually restore. The comparison is shown in Table 3.

Table 3 - Dimensions of trust in Slovakia and in France

Dimensions	Slovakia	France
Interest of the client	84.08%	80.77%
Credibility	77.07%	88.46%
Listening	68.15%	76.92%
Reliability	75.16%	92.31%
Transparency	71.97%	69.23%

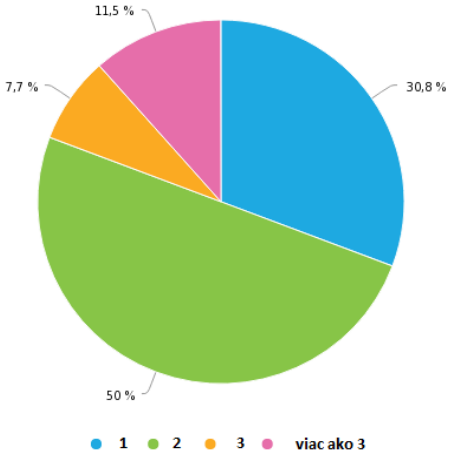
Source: own source

Customers had to reply to the question which was linked with loyalty; *Have you ever changed the bank?* However, nobody from French customers chose the option that he has not changed bank yet but wants to do that in the future. Clients have either changed their bank already (26.9%) or remain faithful to their bank (73.1%).

Changing the bank in France was caused mainly for these reasons: insufficient number of ATMs, bank without innovation, dissatisfaction with financial services, failure to provide credit, moving abroad. In Slovakia, the bank was changed because of fees and interests, better quality of services in different bank, bad approach in solving the clients' problems or even the requirement of the employer.

Customers have also indicated in how many banks they have opened accounts or they use financial products (Figure 4). The results are surprising. Only 30.8% of respondents use the services of one bank. Many more clients profit from the offers of two banks at the same time (50%). A significant proportion of respondents (11.5%) are clients of three or more banks. Therefore, the trend of remaining faithful to a single bank is on the decline.

Loyalty to one bank does not have such an important role in the awareness of clients. They do not count with only one financial institution anymore, but as it often occurs in France the accounts are established in several banks simultaneously. French are not afraid to take advantage of available information and customize their portfolio as it suits them and how it directly meets their satisfaction.

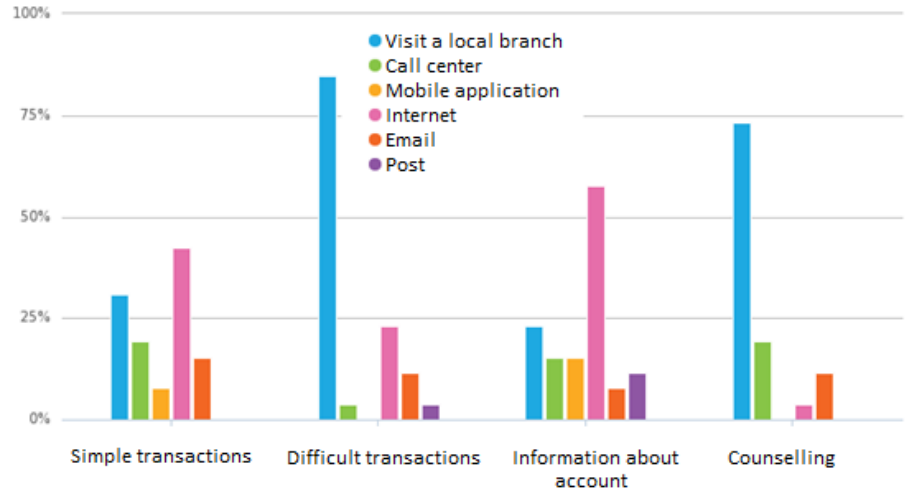


Source: own source

Figure 2 - In how many French banks are you

The way how the client communicates with his bank differs depending on the complexity of a problem that has to be solved and how much he cares about it. However, we do not observe any specific differences between the nations. As it is shown in the Figure 5, among the replies of French respondents there is mentioned even an ability to use post as a way of communication, while the Slovak do not prefer this style at all. If French clients

need to deal with the simple operations, internet is the winner. Although Internet is most frequently mentioned as a way to deal with problems, the difference between internet and visiting the branch is not very significant. On the contrary, while dealing with complex transactions a clear preference for personal contact is noticeable, as they would be solved by personal contact by 84.62% clients, meanwhile internet would be used by 23.08% of respondents. If customers want to be informed about their accounts, they usually search for this information on internet (57.69%), but some of them are also ready to visit a branch (23.08%), or to use the service of a call centre or mobile applications (15.38%). In order to advise as it is in Slovakia as well, the established approach is face to face (73.07%), because the communication is clearer while noticing indirect speech and gestures of the body as well. In personal contacts customers, can easily and quickly explain their problems, their demands or even to signal to the bank staff the importance they ascribe to resolve their situation. Therefore, this is the reason why the visit of the branch is the leader in this regard. An interesting fact is that after a visit to the branch clients prefer to use call centre (19.23%) instead of internet (3.85%), which is in this case clearly underused.



Source: own source

Figure 3 - Way of communication with French bank

Overall satisfaction with banks of French customers is not very diverse from Slovak. In both cases, the satisfaction level exceeds 7 out of 10 stars, looking on France, the satisfaction reached level of 7.4 stars. For Slovaks, the overall satisfaction was 7.7 stars. Most respondents are concentrated around the point 8 out of 10, only few of them chose their satisfaction lower than 5 stars out of 10.

At the end of the survey French customers expressed their recommendation that clients should always compare the possibilities of competitive commercial banks and they should not be afraid to negotiate about fees or other contractual conditions. It is necessary to be careful and to find out other options which can be advantageous for the customers so that their satisfaction can be increased.

4.3. Answers to research questions and testing the hypotheses

According to the realized survey and the conducted data, it is possible to find out the answers to research questions and to test the hypotheses established in the paragraph 3.

Answers to research questions

1. Which values and variables are considered by Slovak bank clients as a key to meet their needs?

Respondents had the opportunity to assess the significance of these values in relation to the provided quality of services. Values which explain the quality the most are according to them: responsibility, knowledge, human approach, transparency.

Knowledge and human approach are the core values that affect interpersonal relationships and are related directly to the service providers. Clients expect service providers to possess an adequate knowledge, as this can be reflected in an expertise advised to clients as a response to their needs. Whether a bank employee is qualified or is able to understand the client's needs is really crucial as it can generate a sense of dissatisfaction. With human attitude and pleasant demeanour clients are more willing to give the bank a second chance or to prove their trust.

As variables influencing customer satisfaction in financial services are considered: communication, internet banking, competent staff.

Communication includes a variety of distribution channels and thus covers a number of areas in the eyes of clients. When the communication is provided correctly, clients are aware of the interest rates and fees, and the current offer of financial services is considered as simple and transparent. The importance of internet is undeniable, mainly because information communication technologies have become part of everyday life of mostly young people. Possibility of carrying out bank transactions comfortably from home in today's fast-paced life is an alleviation (a convenience) which is rewarded. However, also other, older clients, have access to internet banking. They are not experts in information technology, thus they cannot understand the used interface excellently. Therefore, simplicity and clarity of the virtual environment of the bank is also crucial.

2. Do the clients change the way of communication with a bank due to the complexity of the issue and the problem they actually have?

Way of communication with the bank varies and depends on what kind of information the client needs or what the problem which needs to be solved is. Generally, two approaches exist; personal and virtual. Personal contact is frequent in case of difficult problem solving and giving the advice. Internet (virtual approach) is preferred for simple routine operations and obtaining information about account.

3. Are there any common features (or important differences of opinion) in the preferences of Slovak and French banking clientele?

The significant difference that occurs between these two nations is connected with understanding of quality of service. Not only at the first three places were performance, transparency, and simplicity, but at the last place there was human approach. In conclusion, French customers are more focused on the position of the bank as a financial institution, its administrative performance, transparency and providing accurate information as to the service provider (bank staff) and interpersonal contact. Regarding the factors influencing the selection of banks, significant differences are not observed. Way of communication with the bank is also transferred to two main options; personal or virtual. Moreover, the respondents also mentioned using the post. When comparing the dimensions of trust French agree first of all with the reliability of their banks and they do not agree with transparency, while Slovaks agree that banks are interested in the client and they do not have confidence in listening to the client and his needs.

Testing of hypotheses

To verify the hypotheses Chi-square test of independence is performed by SPSS software. Because of very small expected values at the beginning (values less than five) a correction must be performed according to which the results could be interpreted. Precisely for such a situation Yates correction of Chi-square test of independence is available. It represents an improvement of chi-square test for 2x2 tables if the final table contains very low expected values. If we want to include the variable „customer satisfaction“ the response „I do not know“ has to be excluded. Therefore, the second and the third hypothesis are considered with a sample of 138 people, however for the first hypothesis there are only 102 representative French respondents. In all cases, a binary variable is used (gender - male, female; residence - towns, villages; contentment - satisfied, dissatisfied). After these adjustments, the test is ready to be used.

According to p-value it is possible to decide which hypothesis is true. In the case where the p-value is greater than the alpha, H_0 is not rejected; therefore, the original hypothesis is true. If the p-value is less or equal to alpha, H_0 is rejected and the alternative hypothesis H_1 is true.

Hypothesis 1 - We test the null hypothesis (H_0) versus the alternative hypothesis (H_1) at a significance level of alpha (0.05).

H_0: There are not significant differences in satisfaction of Slovak and French banking clientele.

H_1: There are significant differences in satisfaction of Slovak and French banking clientele.

P-value (0.076) is greater than alpha (0.05) fot that reason *H_0 is not rejected.* (Table 4)

Table 4 - The results of Chi-square tests, Hypothesis 1

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.825[a]	1	.028		
Continuity Correction[b]	3.153	1	.076		
Likelihood Ratio	7.056	1	.008		
Fisher's Exact Test				.036	.030
N of Valid Cases	102				

Note: a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2.61.
b. Computed only for a 2x2 table
Source: own source, SPSS

Hypothesis 2 - We test the null hypothesis (H_0) versus the alternative hypothesis (H_1) at a significance level of alpha (0.05).

H_0: There are not significant differences in customer satisfaction by gender.

H_1: There are significant differences in customer satisfaction by gender.

P-value (0.632) is higher than the alpha (0.05) for that reason *H_0 is not rejected.* (Table 5)

Table 5 - The results of Chi-square tests, Hypothesis 2

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.845[a]	1	.358		
Continuity Correction[b]	.229	1	.632		
Likelihood Ratio	.948	1	.330		
Fisher's Exact Test				.664	.332
N of Valid Cases	138				

Note: a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2.04.
b. Computed only for a 2x2 table
Source: own source, SPSS

Hypothesis 3 - We test the null hypothesis (H0) versus the alternative hypothesis (H_1) at a significance level of alpha (0.05).

H_0: There are not significant differences in customer satisfaction depending on the residence.

H_1: There are significant differences in customer satisfaction depending on the residence.

P-value (0.249) is higher than the alpha (0.05) for that reason *H_0 is not rejected.* (Table 6)

Table 6 - The results of Chi-square tests, Hypothesis 3

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.515[a]	1	.113		
Continuity Correction[b]	1.326	1	.249		
Likelihood Ratio	2.393	1	.122		
Fisher's Exact Test				.189	.126
N of Valid Cases	138				

Note: a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2.17.
b. Computed only for a 2x2 table
Source: own source, SPSS

Conclusion: In all three situations, the null hypothesis is not rejected, so the original claim is true. The result of the hypotheses is that there are *no significant differences in customer satisfaction depending on their gender, residence or nationality.*

5.Results

Global researches, which are processed in the second chapter of the paper and own questionnaire survey in Slovakia and France, serve as a valuable source of information for banking entities mainly in Slovak Republic. Completed researches (Deloitte 2013, Ernst & Young 2014, KPMG 2014) deal with the issue of customer satisfaction and trust in the financial institution, whereby attention is paid to various factors that the customer's behaviour and beliefs can influence the customer satisfaction. In own survey the actual situation of current preferences and factors affecting potential customers while choosing abbank is mapped, also the current level of satisfaction and the possibilities of how to maintain the relationship with the bank are discussed. In this part of paper the findings as a result are further described and also there are suggested key areas for banks. According to them the satisfaction of bank customers can increase.

Results derived from the paper:

- *quality of service.* In the analytical part of the paper we clearly see two approaches to the understanding of quality. The first approach is the approach of Slovaks, who construed quality mainly as satisfaction with the provider of services (they are focused on personal contact), in contrast to the French, who consider quality firstly as a performance of the bank, regular innovations and technological progress.
- The software SPSS Clementine revealed a significant link between three values regarding the Slovak population: responsibility, knowledge and human approach; this means that there is a strong link between these values in the quality of services.
- *Important factors in relation with the bank.* In relation client vs. bank many factors play a role at the same time. In order to have a satisfied and loyal client, it has to be a long-term relationship between the bank and the client and there should be also emotional affection. Loyalty is a condition that banking entities would wish to achieve with their customers. For a client to be satisfied, there must be met certain basic pre-anticipated requirements. The most important factors for the Slovak and French banking clients in this relationship are: *communication with the bank, simplicity and clarity of financial services offer, internet banking, professional staff, speed of service at the branch.*
- *Dimensions of trust.* In the study of relations between banks and clients; Bankers, what in fact you do for your clients? (Deloitte 2013) the trust and satisfaction of clients depends on five basic dimensions: *interest in the client, credibility, listening, reliability, transparency*. The results of the questionnaire survey in the analytical part show that the Slovak and French customers suffer mainly in two dimensions, the transparency and listening. They would like their banks to listen more, to respect them as partners and to express banks ideas and rules clearly in medias.
- *Client satisfaction*. The most important finding work is that customers experience relatively high level of satisfaction with the provider of financial services (clients of Slovak banks 77% satisfaction, clients of French banks 74% satisfaction). This was confirmed in more variables with an impact on satisfaction. One manifestation of loyalty and satisfaction from the customers is that around 80% of clients will remain the client of the same bank also in the future, while 66% of respondents would recommend their bank to their friends and families. The question is how many of them are really or falsely loyal. Although clients may not have an interest of changing the bank, this does not prove their long-term relationship. Loyalty and fidelity to one bank are now very brittle. 40% of customers say that switching costs are not high. This means that they realize how easy it is to change a bank and that they are replaceable in every moment. Even more than half of respondents said that if they knew how to save on lower fees and interests in another bank, they would change the bank to save more money. Among the most important reasons to change banks are: *fees and interest, insufficient number of ATMs and branches, bad attitude to customers and their requests, no innovation and technological progress.*
- *Communication.* There are two main communication channels that are based on the results of the analysis: personal contact and using the internet. Personal contact is even today quite frequent, especially if clients solve complex situations and problems and need advice on their finances. Internet is preferred when clients need to find out simple information about accounts or solve simple transactions.

6.Discussion and possible adjustments

Based on the conclusions from the analytical work there are *suggested key areas* for banking entities to increase customer satisfaction:

Customer's experience

Customers need to feel their uniqueness; they want to be in the centre of banking culture through all available communication channels. Therefore, it is necessary to show the customer that the bank has a real

interest in him and undertakes special measures to make him satisfied. Those with higher standards require personalization, differentiation from other customers, while lower standards' customers prefer little plus everyday, for example in communication with the bank as a friendly staff. Nevertheless, both groups would like to wish the appropriate advice on their needs and requirements.

Thanks to an interactive communication channel, banks can access a lot of data about their customers and better understand their choices and preferences. Customers must first be analysed in details and divided into segments, to help banks better understand where, when and how they should communicate with their clients. Sufficient knowledge of the customers enables banks to adjust financial service and to become full partners of their clients.

Trust

Bank clients would appreciate if their loyalty was suitably rewarded. Many of them have negative experience with attention that was given to them by the bank. They observe very high level of attention while they are in a good position and situation, but on the contrary, if they need help the only thing which waits for them is rejection. If there is such a conflict, it would be the best to try to find an appropriate solution by the bank even if it is not possible to help the client 100%. When a bank offers the alternative solutions to the problem (although not to the extent as was demanded), it reflects an interest in the client and solicitude. This can create an emotion that ultimately may be a sign of satisfaction or even loyalty in the future. It is therefore important for banks to better understand the individual customer, his needs and preferences.

Considering the fact that banks have still more and more information about customers, they can focus more on one target group and its specific needs. This information can serve them to implement various programs managed by banks or their business partners, to reward customer's loyalty - for example offer them preferential interest rate discounts on banking products and reward their card payments. Loyalty programs can be dynamic and interactive, depending on the capabilities and creativity of the bank. Such a program could be updated on a daily basis to keep up with any changes in the financial situation of the client or his habits.

Communication

A very important factor, which can always be improved, is communication. It is necessary to pay sufficient attention mainly to communication about charges and interests and set them based on specific quality of service. The bank should strengthen the information sources that can influence the opinion of future clients. These information sources have a high impact on decision-making clients. According to a study conducted by Ernst & Young (2014), this information can even achieve greater weight than recommendations from friends and family.

Although more and more clients are used to access the banking services via internet and other modern channels, some of them always prefer the classic interaction, such as personal contact and telephone. Therefore, banks should not forget, in addition to innovation and the development, the role of these traditional channels.

Even the support of families and local firms presents special opportunities to build a good reputation and retain the market share. What is really important for the bank is to represent their name and the measures in the way to use the image in an appropriate manner through all available channels. Clients will not be satisfied with anonymous relationship. They want to be discovered and to receive enough attention, to be supported and to acquire personalized services.

Customer satisfaction

In Slovak Republic, there are some banks that realize banking customer satisfaction surveys regularly by external agencies, particularly by telephone questionnaire, with a purpose to determine the level and quality of services provided by a particular bank. There is also an interbank benchmarking satisfaction survey conducted by GfK Eurisko. (VUB 2015, UniCredit 2015)

As an example of the Slovak banks, VUB is chosen, because on its website there is a whole section dedicated to customer care. VUB performs satisfaction surveys on a regular basis with a random sample of their clients. The aim is thereby to better understand the needs of clients. The website has also a space for input from customers - feedback, suggestions and comments, questions or any complaints. Every year in September, Day of clients is organized; during which clients of VUB get a surprise in the form of small gifts at bank branches. (VUB 2015) Thus, such an interest in the client is certainly positive for the bank, which can be transformed to future customer loyalty.

Innovation and technological development

Innovation is one of the most important factors for the satisfaction and loyalty of existing customers to achieve a higher willingness to pay more for services. They also make the bank more attractive for potential future clients. Internet banking and banks are the breakthrough in the banking industry and from that moment not only the interest rates and fees are important, but improving services and quality as well. Bank admitted that in recent years, most of their investments were used mainly to improve services and products, and to extend all possible and available communication channels (Tvardzik 2013). An important innovation which was mentioned by clients in the questionnaire survey was VIAMO application, which makes possible to pay based on phone number.

Dominant innovators in the market must not only possess their own laboratory for innovation, but also collaborate with other companies to run or start-up software to accelerate the process of innovation.

Simplicity

Nowadays clients appreciate the simplicity of bank, which leads to a deeper trust and greater customer loyalty. (Siegel and Gale 2013 in Ernst & Young 2014) Today banks provide a wide and complicated offer which has to be simplified. Customers would appreciate easy access to branches and ATMs, simple and transparent internet banking (which plays an important role in relations with the bank), simple execution of transactions, transparency in respect of fees and interests.

Counselling

At this point, what should be emphasized is specially to help customers to make the right financial decisions. They need to feel that the bank is interested in listening to them and advise them accordingly. This requires highly trained personnel of the banks with the main character traits such as empathy and understanding. For counselling, physical contact is mainly searched, and therefore it would be good to strengthen the bank channels to improve troubleshooting. Any complaints concern mainly bank charges and unexpected disputed tariffs.

After the financial crisis, clients are again ready to trust their banks and entrust them with their funds. An important step for the banks now will become a trustworthy partner for their clients, for example strengthening security measures so that they can manage their expenditure and their portfolio. Banks that are strengthening their security systems and all possibilities for combating fraud, are more appreciated by customers.

Following the conclusions of the suggested areas to increase customer satisfaction, which have been described above, banks should undergo the following steps:

- rebuild the institution around customer,
- simplify offer of financial services and increase transparency,
- reward the trust of customers and their loyalty,
- strengthen not only new communication channels, but the traditional ones as well,
- devote sufficient attention to regular review of the quality of service and satisfaction,
- concentrate on promoting innovations,
- provide clients with expert advice appropriate to their needs and requirements.

Conclusion

Considering today's global situation in banking industry, it is crucial for financial institutions to pay more attention to the customer. But it is not enough to reach the customer through the available communication channels, but the bank must evoke the feeling that the customer means something more and the bank finds him very valuable. The banking industry is currently in a situation where a competition between banks increases and simultaneously the barriers are reduced. Clients do not have a problem to complain, to switch a bank, to use the financial services of several banks. They try to customize their portfolio according to their own preferences. If the banks can better understand these preferences, it would help them to increase the current customer satisfaction.

This paper helps to identify these preferences and factors, quantifies the overall customer satisfaction and compares the situation in Slovakia and France, thus fulfils the research goal set up in the methodology of this paper and also provides the suggested areas in the form of recommendation for the banks. The recommendations are related to the following areas: customer experience, loyalty, communication, customer satisfaction, innovation and technological development, simplicity, counselling. The paper reveals that there are no significant differences in satisfaction of Slovak and French banking clients; that satisfaction does not depend either on gender or on the residence of the clients. The current customer satisfaction, as it is described in the analytical part of the paper, is 77% for Slovak and 74% for French respondents. Apparently, the banks can still

improve. The paper managed to test the hypotheses and to find answers to research questions based on the own questionnaire and global customer satisfaction surveys.

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Place Management: Decoding the Visual Image of a Siberian City

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Abstract

The paper is dedicated to the process of visual perception of city representation and to the method of decoding, devised by Vayna Ch., enabling identification of those signs of urban environment to which people of different groups turn to in the process of perception of visual representation of the city and its further reproduction in their memory. Within the framework of semiotic structuralism, the city is represented as a text, which is read by city residents and visitors. Perception of city visual representation by city residents and visitors are envisaged as a process of individual decoding of signs important for the subject, expressed in objects, basing on which a person forms his or her impression of the city. The article reports the results of empirical research of perception of visual representation of Krasnoyarsk city by the decoding method, on the basis of which application features of this method for the local specificity have been revealed.

Keywords: place-management, Krasnoyarsk city, Siberia.

JEL Classification: A13, O53, R12.

1. Introduction

Contemporary place management implies qualitative improvement of civic space where public and private sectors' efforts are well-coordinated. Current expansion to the Siberian Arctic has to do with a new turn in the development of Siberian and northern towns. The city of Krasnoyarsk is located in Central Siberia. Between the 1940s and the 1990s it was a large industrial centre with non-ferrous and ferrous metallurgies, and defence industry. Right now, Krasnoyarsk is undergoing significant changes due to the crisis in the manufacturing industry and its remoteness from large financial and logistics centres located in the west and east. Today, Krasnoyarsk needs dramatic improvement of its civic space, which requires more advanced place management. At the same time, high-quality place management for Krasnoyarsk means that a series of scientific studies looking into the city's relevant position and its image shared by its residents and tourists needs to be conducted. Decoding the visual image of Krasnoyarsk will reveal the content of this Siberian city's image and indicate the locations in its civic space which will have to be addressed by means of contemporary place management.

[1] Krasnoyarsk, pr. Svobodny, 79

2. Literature review

The city, as a scientific object of knowledge, is viewed by some researchers as a spatial and structural form of socialization with its own signature, for instance, by Berking (2012). A similar point of view is that of Kaymaz (2013), who singles out urban landscape as a complex structure, which is constituted in the interaction between a person and their environment. The same idea of interaction is highlighted in the studies of Rapoport (2013). The city is defined in various studies also as a space, or a cluster of spaces and places. Winter (2012) and Freksa (1992) approach the notion of place and its meaning while looking at city image through the concept of cognition, as well as linguistic analysis of the vocabulary, used by residents to describe particular places and build patterns of how they are related.

At the moment, a number of scientists, such as Riza, Doratli and Fasli (2012), Kaymaz (2013), Khirfan and Momani (2013), Hunter (2012), Johansson (2012), Weina (2009), are carrying out numerous studies in the field of marketing to see how brands (in particular, their visual component) and identity are linked to the city image. Khirfan and Momani (2013) draw attention to the impact of a brand on the city image and point out the values ascribed to the given city image. They state that brands and images are basically visual symbols that render the encoded status of the city. Hunter (2012) compares the way a city is presented in travel brochures aimed at attracting customers and its real physical look. The interrelation of branding and image is tackled by Johansson (2012) and Weina (2009).

The emphasis on the process of transformation of the city image and its changes is made by Dembski (2013), Khirfan and Momani (2013), Weina (2009), Hunter (2012), Smith (2005). In the course of globalisation, some megalopolises are changing their status from that of industrial company cities to post-industrial cultural and tourist centres. The interrelation of city transformation and globalisation processes is stressed by Weina (2009). Smith (2005) looks at how the process of its image and brand modelling influences its various parts and components, both tangible and intangible, in terms of the city image transformation. The studies performed by Weina (2009) postulate that undergoing transformation, the visual image of the city, anchored in a particular picture, tends to evolve into the impression of the city which is to a greater extent related to emotions and feelings, perceived through the city atmosphere.

Papers dedicated to city branding often address the issue of how a new image of the city should be formed and designed. Ch. Weina (2009) notes that the city image can be created and transformed both by city officials, who impose it top-down, and by immediate users, residents and visitors, who shape it bottom-up at grass roots level. The same way the brand, imposed by officials, is compared to that based on the city community public opinion polls in the work by Khirfan and Momani (2013).

Perception of the city image per se is viewed by Dolnicar and Grabler (2014), Burgmanis, Krišjane and Šķilters (2014), Mijatović (2014), Weina (2009), Papadimitriou, Kaplanidou and Apostolopoulou (2015), Atik, Çakir and Benian (2009), Khirfan and Momani (2013), Rapoport (2013), Tomko and Winter (2013). The city image is interpreted as an impression formed as a result of perception of the city's tangible and intangible characteristics. According to K. Lynch, it is a person who "builds" the city in their imagination, drawing on various details of the city landscape. Burgmanis, Krišjane and Šķilters (2014) talk about perception in terms of reception of spatial knowledge, accentuating perception of geographical environment and analysis of mechanisms, that hamper retrieval of spatial information. They emphasize the importance of interaction between person and environment at the moment of perception, as well as the fact that the number of functionally significant spaces in a particular area constitutes an important factor in delivering the city image to its resident. Atik, Çakir and Benian (2009) highlight that people and their environment are interrelated through perception, which enables them to recognize and accept the city. These researchers point out that most cities are perceived visually, so their image is based on significant or attractive features of the city, kept in a person's memory. Therefore, it is through the impression, which its features make on people that the city image is supposed to be brought to awareness. Similar ideas are expressed by Weina (2009) in her methodological study of city perception, which rests on signs and symbols of the city environment, retained in a person's memory. Papadimitriou, and Apostolopoulou (2015) turn to studying collective impact of the city identity as a travel destination, as well its emotional image and how it influences formation of the general city image to see its consequent effect on tourists' behaviour and attitude. Tomko and Winter (2013) state that perception of a city depends on ways of getting about, since the city image is directly related to accessibility of its parts and physical experience thereof. Rapoport (2013) turns his attention to the way people interact with the arranged environment, as it is how he tackles the city and its perception in his man-environment studies.

Distinctions in terms of how the city environment and the city image are perceived by various groups

depends on their sex, age, education, scope of activity, or nationality, as well as whether they belong to its residents or different groups of tourists, who have visited or are only going to visit the city. The visual image of a city comprises both objective and subjective characteristics. Nevertheless, the image, different people have, proves to be nowhere near the same. The issue is addressed by works of Stylidis and Shani (2015), Zenker and Beckmann (2013), Weina (2009), Riza, Doratli and Fasli (2012), Dolnicar and Grabler (2014), Papadimitriou, Apostolopoulou (2015), Atik, Çakir and Benian (2009). Dolnicar and Grabler (2014) stress, however, that there are archetypal ideas of cities. Due to globalization and increased mobility of people, more and more scientists concentrate on how the city image is perceived by locals and various groups of tourists, for instance, in the study of Riza, Doratli and Fasli (2012).

Researchers Tomko and Winter (2013), Lynch (1990), Weina (2009), Nas (2011), Mijatović (2014), Riza, Doratli and Fasli (2012), Smith and Burch (2012), Krase and Shortell (2011), Johansson (2012), Golan (2015), Ilbeykina, Kolesnik, Libakova, Sertakova and Sitnikova (2015), Kolesnik and Mirkes (2011), Foxall (2013), Rapoport (2013), Utaberta, Jalali, Johar, Surat and Che-Ani (2012) while tackling the city image, its perception and identity, focus their attention on the tangible components of the image: architectural landmarks and their fragments, monuments and the city landscape in general with all its integral details. Foxall (2013) speaks about how tangible objects embody collective memory, which consequently translates into the city environment with all its monuments. Smith and Burch (2012) highlight the inclusive nature of the local city space in the residents' daily routines.

Many researchers look into the tangible foundation of the city image in terms of architectural landmarks, prevailing in the city environment. Riza, Doratli and Fasli (2012) stress in their study that monumental and iconic buildings contribute greatly to the city image, as well as the perceived standard of living in locals and tourists. Ilbeykina, Kolesnik, Libakova, Sertakova, Sitnikova (2015) have carried out a semiotic analysis of remarkable architecture. Sertakova (2014) analyses the social and cultural space of the city through architectural monuments.

Utaberta, Jalali, Johar, Surat and Che-Ani (2012) point out that buildings comprise a significant part of a city, as they perform a crucial role in organization and arrangement of the city appearance. The façades are particularly important for the city appearance, since they carry its identity and are appreciated by people from the perspective of how "rich" or "poor" their image is, basing on visual architectural and city (urban) elements that are found in the façades. Apart from architecture, scientists analyse yet other tangible components of the city image. Golan (2015) views a street as an example of a particular city symbol, a somewhat extended mark that is registered while getting around the city. Krase and Shortell (2011) look at the semiotics of local spaces (widely used) and state that their city spaces are filled with signs of collective identity, that can be represented by physical environment, various architectural elements, commercial symbols, billboards, or graffiti. They studied and compared visual images of public places in different world-class cities. The topic issue of city violence is raised by Aluko Opeyemi Idowu (2016).

Being representative of the Siberian urbanized space, Krasnoyarsk is seen in the context of ethnic and cultural identity in the Siberian Arctic (Koptseva 2014, Koprseva and Kirko 2014, Koptseva and Kirko 2015, Libakova *et al.* 2014, Mirkes and Sergeeva 2011, Petrov 2012). There have also been studies into the impact of urbanization on the indigenous peoples of Siberian Arctic (Kistova *et al.* 2014, Zamarayeva, Kistova, Pimenova, Seredkina 2015). Kolesnik and Mirkes (2011) consider city squares, the symmetry effect and its influence on the city residents and also search for visual signs in spaces of those squares. The key theory of visual perception of a city through its tangible nature, which referred to most often in various studies, is that of Lynch (1990). Lynch (1990) identified five basic elements that serve as a sort of mental "frame" for a city in a person's mind's eye. Such elements are paths, edges, districts, nodes, and landmarks. Later, the classification was extended by Tomko and Winter (2013), who also made an analysis of the local functional relations between the mentioned elements. Weina (2009) studies decoding of publicly accepted key elements of the city, which are retained in the memory of its residents and visitors and reproduced when recalled.

When the city image is studied in terms of its visual components, researchers often turn to photographs, as was the case with Krase and Shortell (2011) in their study of various cities of the world. Urban photographs are analysed to gain understanding of how local population accepts or rejects identities that could be imposed on them by the elite or outsiders (Smith and Burch 2012). Using photographs is especially relevant for identification of explicit and hidden messages that they promote (Hunter 2012). Salesses, Schechtner and Hidalgo (2013) approached the city analysis through photographs with location-based marks to construct the way the city is perceived by photographers.

3. Methods and materials

The city image can be approached from different perspectives. The most relevant today is urban symbolism and the concept of cultural memory.

Urban symbolism looks at how city symbols reveal themselves in architecture, statues, events and festivals, brochures and newspapers, outstanding personalities and historic events. Symbolism of urban environment is studied in the whole range of topics by Dembski (2014), Mijatović (2014), Ilbeykina, Kolesnik, Libakova, Sertakova and Sitnikova (2015), Khirfan and Momani (2013). Mijatović (2014) studies how cultural memory gets activated through various carriers of symbols, both tangible and intangible.

Researchers apply the concept of cultural memory and its interrelation with the city identity while looking into the city image and its perception. Mijatović (2014) and Foxall (2013) investigate how memory, space, urban symbols, city landscape and identity correlate with one another. Mijatović (2014) puts stress on the interrelation of identity and memory. D.J. Smith and S. Burch (2012) point out that various categories of identity (local, national, meso-regional and supranational) are integral to city monuments.

The method that can be considered contemporary is the one that analyses urban architecture from the point of view of philosophy and art history; in this way the visual image of a city and its perception can be tackled by means of analysing works of art. This approach is used by Ilbeykina, Kolesnik, Libakova, Sertakova and Sitnikova (2015).

Among specialized methods, there is one that decodes the city, which was developed by Weina (2009). This method enables city environment signs to be identified in order to single out those which people of various groups refer to when they perceive the visual image of a city and retrieve it later from their memory. The method can be applied to post-industrial cities, and it helps define "city impression" by revealing its signature as it is seen by the public in the form of symbols to accentuate those objects in the city continuum that are used by people to construct their visual image of the city.

The method of decoding the city implies drawing on polls with elements of photo survey. The collected materials are analysed by grouping the key elements indicated by the respondents into categories and aspects, which is followed by calculation of Identification Ratio and Presenting Ratio, as well as P-value. Besides, the elements are analysed considering the groups respondents belong to. Application of the decoding method to analyse surroundings of Krasnoyarsk stems from the city's special features. The civic space of Krasnoyarsk is varied and contains both standard and unique buildings. Stylistically, the buildings can be divided into three types: pre-revolutionary, Soviet and contemporary. The main feature of the city is its closeness and interaction with the natural background of the Yenisei River, its main waterway. It is worth noting that the city is changing in terms of its industrial facilities evolving into post-industrial ones, or emergence of new relevant facilities.

The purpose of the study is to investigate the process of visual perception of the city using the method of decoding, suggested by Weina (2009). The city of Krasnoyarsk is studied as a case to develop an effective strategy of place management for other Siberian cities.

4. Results

The historic centre of Krasnoyarsk was chosen as representative of the visual image as in most cases city image is represented in its residents' minds as its centre. It is the core of the city, a stable mental structure. Besides, it is one of the most frequently visited parts of the city and is apparently better known by its residents and visitors.

For the purposes of the study there were 156 pictures taken of the three main streets of Krasnoyarsk (Mira Prospect, Karl Marks Street and Lenin Street) and those intersecting them, as well as of the views of the rivers Yenisei and Kacha. Of those photographs, 32 were selected for the survey. The photos were selected in accordance with the requirements of methodology.

To administer the poll, a questionnaire was designed to collect the data from the respondents (Questions 1-6) and questions for photo recognition (Questions 8.1 - 8.32). The questionnaire also asked (Question 7) to give a brief description of their impression of Krasnoyarsk.

The survey involved 118 respondents. The main platforms for survey were the Krasnoyarsk Economic Forum, which was held in Krasnoyarsk between February 26 and February 28, 2015; Krasnoyarsk Cosplay Convent "AVector" held on May 1st, 2015; and the Siberian Federal University. Apart from these, those who come from other cities but regularly visit Krasnoyarsk were also surveyed, as well as passengers of trains, arriving to the city. Not only were those spots selected because of their high pedestrian traffic but also due to a bigger probability of visitors to the city to know them.

In the place identification task, the respondents used 198 words that were generalized into 87 elements.

Further those words were grouped into 12 following categories: "Landmark building" (church, theatre, museum, library, etc.), "Building detail" (gates, columns, roofs, etc.), "Building characteristics" (styles, materials, sizes, etc.), "Road" (width, route, driving direction, etc.), "Street furniture" (lamp, fence, decoration, etc.), "Feeling" (illumination, condition of buildings), "Business and signs" (business sign, restaurant, shop, etc.), "Activity" (university, Ministry of Emergency Situations, post office, etc.), "Neighbourhood" (surroundings), "Green" (park, trees, flowerbeds, etc.), "Water" (bridge, river, embankment, etc.), "Terrain" (hill, skyline of buildings, view, etc.).

The most frequently mentioned category is the category "Business and signs" (Figure 1). It accounts for 20% of the word total. The next frequently indicated category is "Activity", accounting for 18%. It can be concluded that in the daily contacts with the visual image of the city the brightest impressions boil down to those city elements that have something to do with some sort of activity. It may be explained by the fact that for a long time the historic centre of Krasnoyarsk was also its business and trading centre as opposed to its outskirts. Over time, the situation changed, and although the business centre moved to a more recently developed part of the city (Vzletka) and large department stores appeared elsewhere in the periphery, the memory is still strong. Such indications can show that the centre of Krasnoyarsk is associated with active pastime: shopping, entertainment, business visits to various organisations, work and studying.

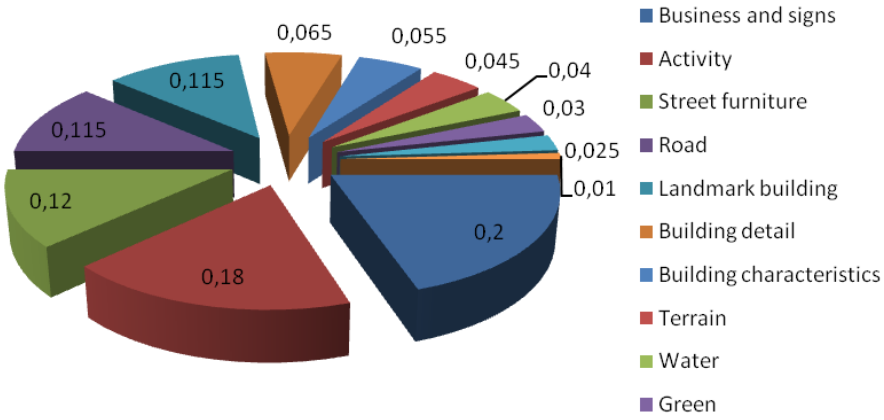

Figure 1 - Categories in proportion to the word total

Other important categories are "Street furniture", "Landmark building" and "Road". Popularity of the categories "Street furniture" (12%) and "Road" (11.5%) can be interpreted as a sign of large pedestrian traffic in the centre, since all the three main streets are located there. Besides, it speaks to the fact that the appearance of the central streets of the city is easy to remember.

Despite the fact that a fair number of architectural monuments and landmark buildings concentrate in the centre of Krasnoyarsk, the category "Landmark building" (11.5%) came fourth in the list of the most frequently mentioned words. The reason for this is that buildings in the centre of Krasnoyarsk, apart from being important monuments of architecture, can also have a notable functional application. A good example is the building of Shmandin's trade house (N.G. Gadalov's) that is now associated with the shop "Detsky Mir" which is located there, or another building, formerly used as a girls' high school, which is currently the seat of the Primary School Faculty of Krasnoyarsk State Pedagogical University named after V. Astafyev. Moreover, most buildings in the city centre are overloaded with bright billboards, which is why it is associated more with the category of business. It also explains the importance of the categories "Business and signs" and "Activity".

In order to get a bigger overview, the categories were further grouped into 4 aspects:

- "Building" ("Landmark building", "Building detail" and "Building characteristics");
- "Road" ("Road" and "Street furniture");
- "Function" ("Feeling", "Business and signs", "Activity", "Neighbourhood");
- "Nature" ("Green", "Water", "Terrain").

Out of these four aspects, the most prominent one is "Function" (Figure 2). The percentage of words related to this aspect equals 41%. It was mentioned 997 times by the respondents and appeared 191 times in the comments of the 32 selected photographs. Within this aspect, nearly half of the words (48%) refer to the category "Business and signs" (Figure 3). It was mentioned 586 times in 118 interviews and appeared 89 times in the comments on the 32 selected photographs. The category "Activity" also comprises the biggest number of words - 43%. It was mentioned by respondents 398 times and appeared in the photograph identification 30 times.

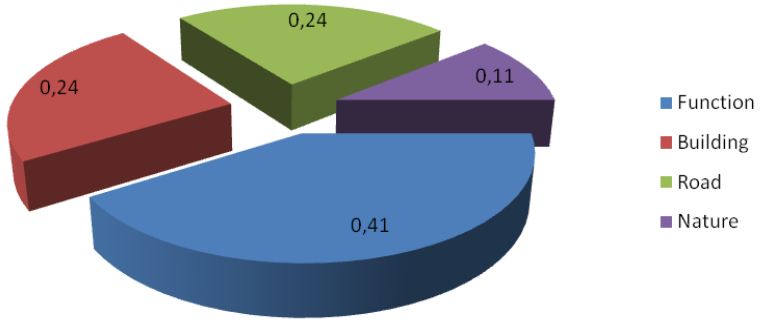

Figure 2 – Aspects in proportion to the word total

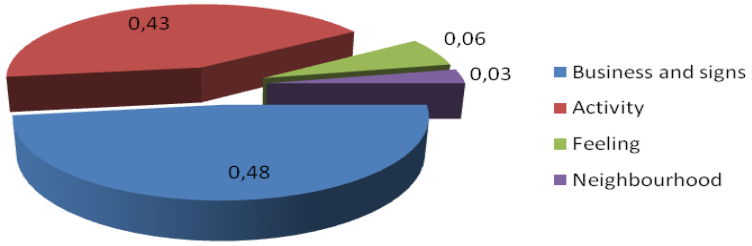

Figure 3 – Categories in proportion to the word total for the aspect "Function"

It is followed by the aspects of "Building" and "Road", which account for 24% of the word total. These figures are in complete conformity with the results obtained in the category analysis.

Calculation of Identification Ratio (IR) and Presenting Ratio (PR) for the aspects showed that the highest IR characterises the aspects "Function" and "Building". On average, in the course of the interview every respondent mentioned some words relating to the aspect "Building" at the rate of about 8 times, whereas those relating to the aspect "Function" were mentioned more than 8 times (Figure 4). At the same time, the aspect "Building" prevailed in the photograph-based survey at the average rate of over 13 times per photo. The aspect "Function" appeared at the rate of 6 times per photo.

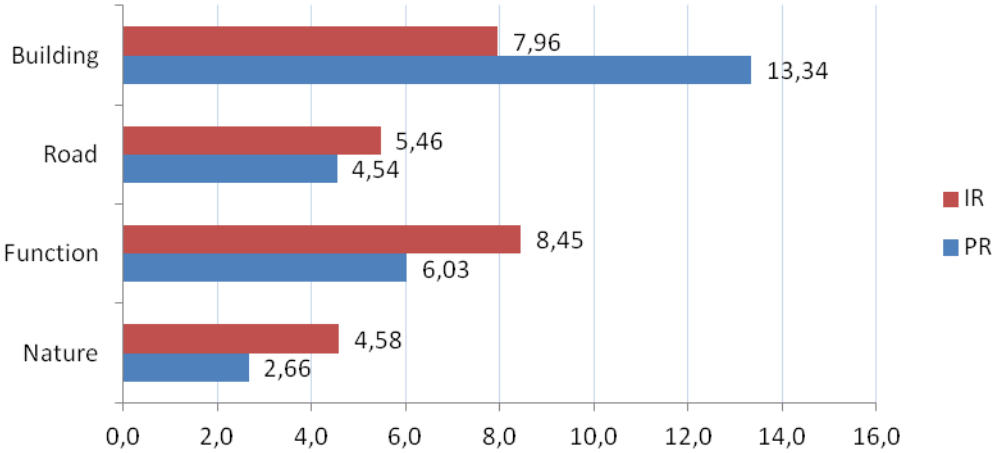

Figure 4 – Identification ratio and presenting ratio for the aspects

When viewed at the level of categories, the ratios showed that the most frequently named categories are "Landmark building", "Business and signs" and "Road". "Landmark building" was mentioned at the rate of about 7 times per interview, whereas "Business and signs" - about 5 times, and "Road" - 4 times (Figure 5). Similarly, high enough is IR for the categories of "Activity" and "Water" (3.37 and 3.6 correspondingly). The categories "Landmark building", "Building detail" and "Building characteristics" have the biggest Presenting Ratio. "Landmark building" was mentioned at the rate of about 6 times per photograph, the rate of other two is higher than 3. Similarly, high is PR for the categories "Business and signs" and "Street furniture" (2.78 and 2.66 correspondingly).

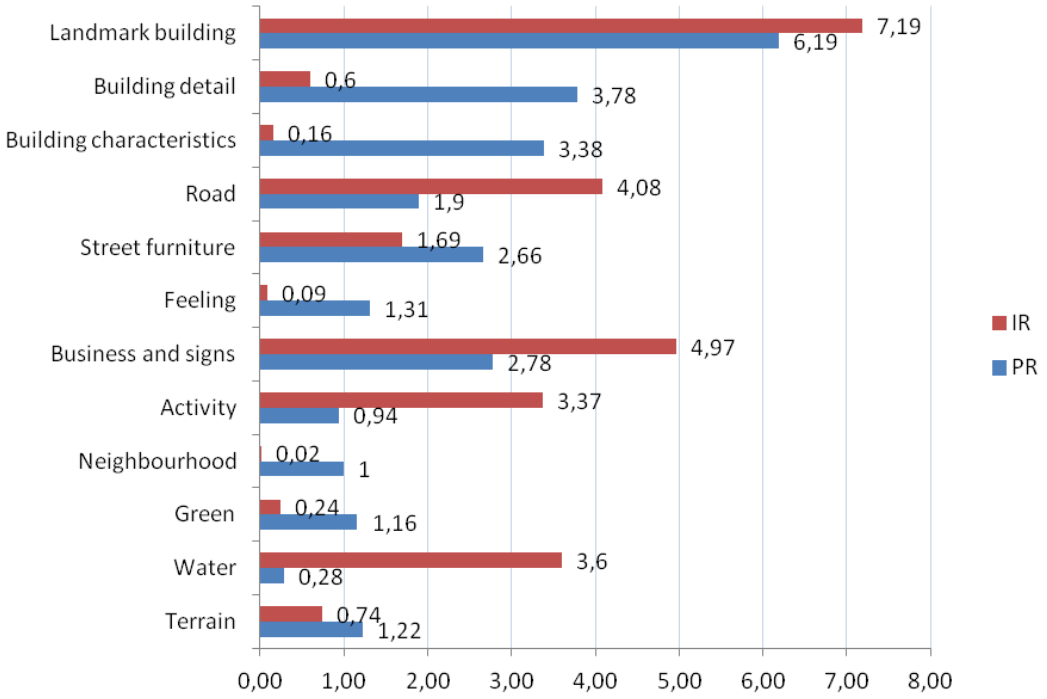

Figure 5 – Identification and Presenting Ratios for the categories

The most vivid visual image of Krasnoyarsk is concentrated in the buildings with unique details and characteristics. The city centre is full of landmark buildings and people tend to pick them as points on the plan of the place. Residents and visitors often refer to billboards and functions of those buildings as orientation cues, since such signs are plentiful in the city visual environment. P-value revealed the aspects and categories that are most recognizable signature elements when they appear in a photograph. These aspects and categories can represent the city identity as they are most often perceived by people as cues.

The aspect "Nature" has the highest P-value - 1.7 (Figure 6). It means that of all the aspects in photographs, "Nature" has a greater chance of being recognized and used as a cue in identification of a place, as well as forming an impression thereof. Although the aspect "Nature" has the smallest PR, which means it appears least of all in the photographs, it is still the most characteristic and recognizable feature of Krasnoyarsk.

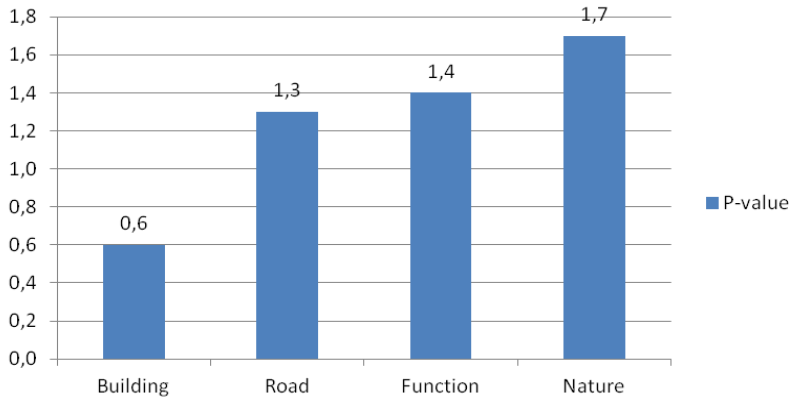

Figure 6 – P-value for Aspects

On the other hand, the aspect "Building" that has the highest PR, on the contrary, shows the smallest P-value. It can indicate that despite the big number of historic and landmark buildings, they cannot express the unique signature of Krasnoyarsk and create its individual impression. The reason may be found in a big number of shops, cafés, restaurants, various organisations and billboards that drown the visual and emotional impact of the buildings, their details or characteristics per se.

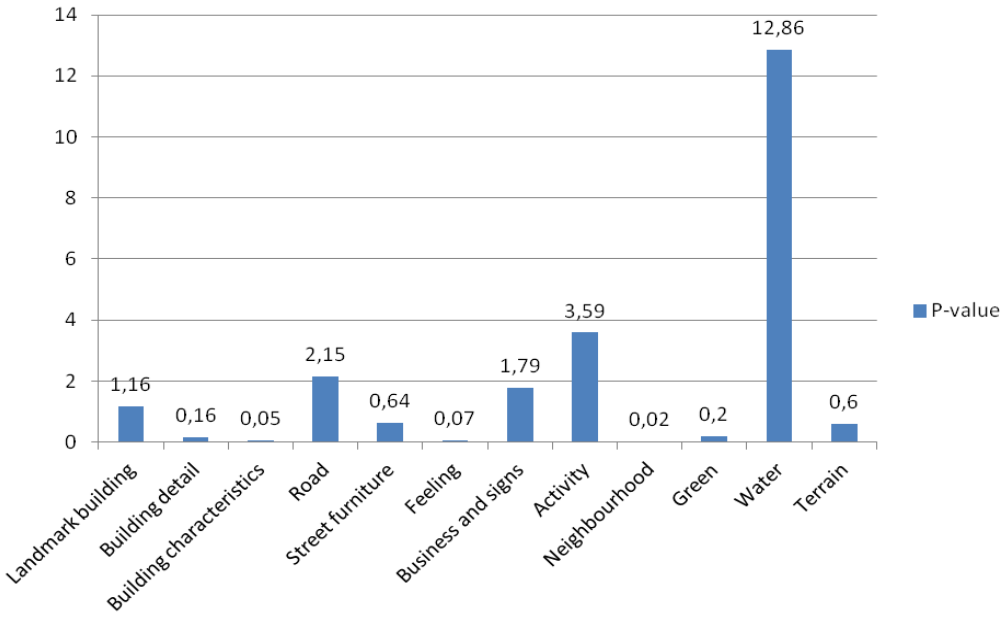

Figure 7 – P-value for Categories

At the level of categories, the absolute leader in recognisability is "Water". P-value for this category equals 12.86 (Figure 7). However, of all the categories "Water" has the smallest PR, which means that it appears least frequently in the photographs. Such a high indication can be explained by the fact that Krasnoyarsk is located on the banks of the affluent Yenisei River that is closely tied to the city visual image. It can be seen in the 10-rouble banknote, which places the image of the Communal Bridge and the Yenisei as clear and recognizable visual images of Krasnoyarsk. Besides, Krasnoyarsk is considered a city of fountains, which also refers to the category "Water".

P-value of the following important categories "Activity" and "Road" equal 3.59 and 2.15 respectively, which does not contradict the overall results obtained earlier and, indeed, indicates that the elements that have to do with activity in the city apart from being recognizable also fit well for creating a unique impression of the city.

In the course of the study there were elements that were mentioned in the survey over 100 times (Table 1). Out of these nine elements, three are related to the aspect "Building" and the other three to "Function". However, the elements with the biggest number of counts is "Trade", words that are related to it were mentioned 311 times in the surveys. The indications highlight the importance of the city centre functional role for residents and visitors of Krasnoyarsk, as well as users' attention to the buildings.

Table 1 – Presenting counts of elements mentioned more than 100 times, words

Element	Number of counts
Trade	311
Street	225
Bridge	196
Building	195
University	181
Church	144
Bus stop	144
Concert hall	140
State	105

The element "Street" was mentioned in the survey 225 times. It indicates the fact that residents refer to the travel space, the main arteries of the city environment. The element "Bridge" was mentioned fairly often, 196 times, since it is related to the element "Water", which is representative of the city visual image and impression it makes.

In order to distinguish differences in perception of the city visual image and formation of impression in

various people, the frequency of categories mentioned by different population groups was analysed. The responses were sorted according to the following criteria: sex, age and duration of stay in the city. IR was taken as a control value. The obtained results apparently indicate which categories have bigger impacts on different groups of population.

The survey approached 46 men and 70 women, which constitutes 39% and 59% of the total number of respondents.

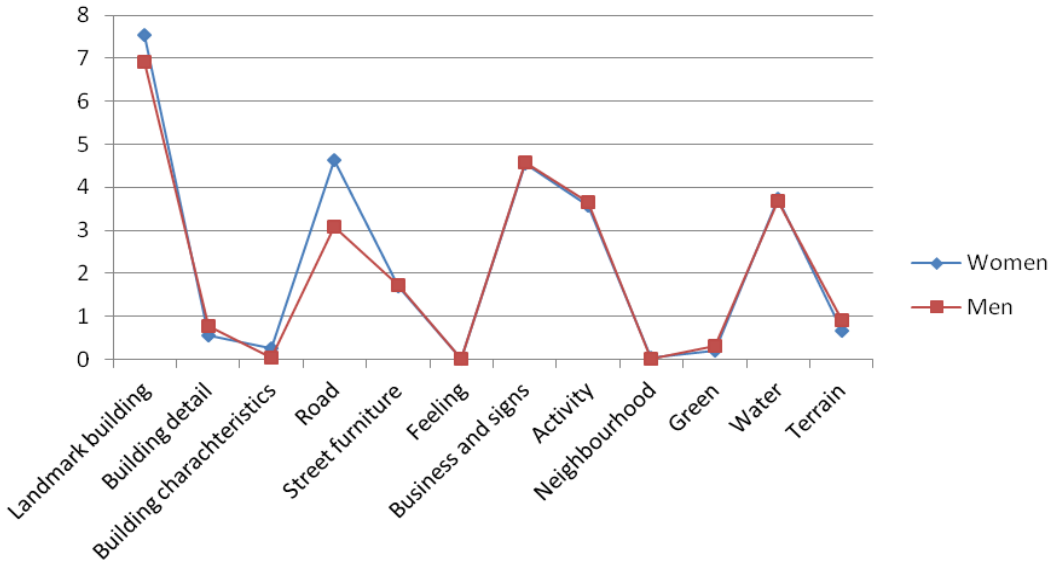

Figure 8 – Gender differences in category IR

Overall, the pattern of city perception for men and women is similar. Noticeable differences are seen in the categories "Landmark building" and "Road" (Figure 8). Women tend to pay more attention to these categories for identifying a place than men. It may suggest that women are more susceptible to visual cues included in these categories and react more vividly to their signals. Therefore, women should react to images of buildings to a greater extent than men.

The five prevalent categories here coincide with those indicated earlier. It can be noted that men view the category "Road" as less important than others, though it occupied the third place in the overall analysis of categories.

The survey encompassed people of all ages. The largest group of respondents are people of 18 to 31 years of age (79%) (Figure 9).

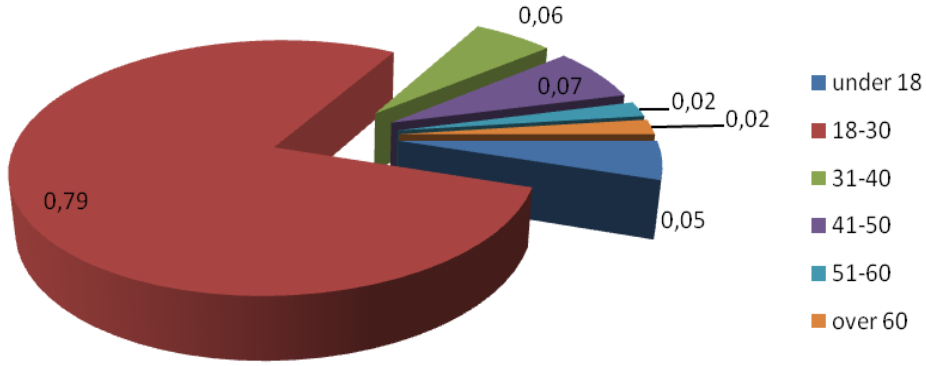

Figure 9 – Age groups

Similar patterns of city perception are registered in the age groups of 18-30 and 41-50 (Figure 10). The results in both of these groups confirm the overall pattern of the study. It can be noted though that the age group of 41 to 50 needs more visual cues to locate themselves. In general, in the categories prevailing in the study (namely, "Landmark building", "Business and signs", "Road", "Activity" and "Water") they mentioned more words than other participants.

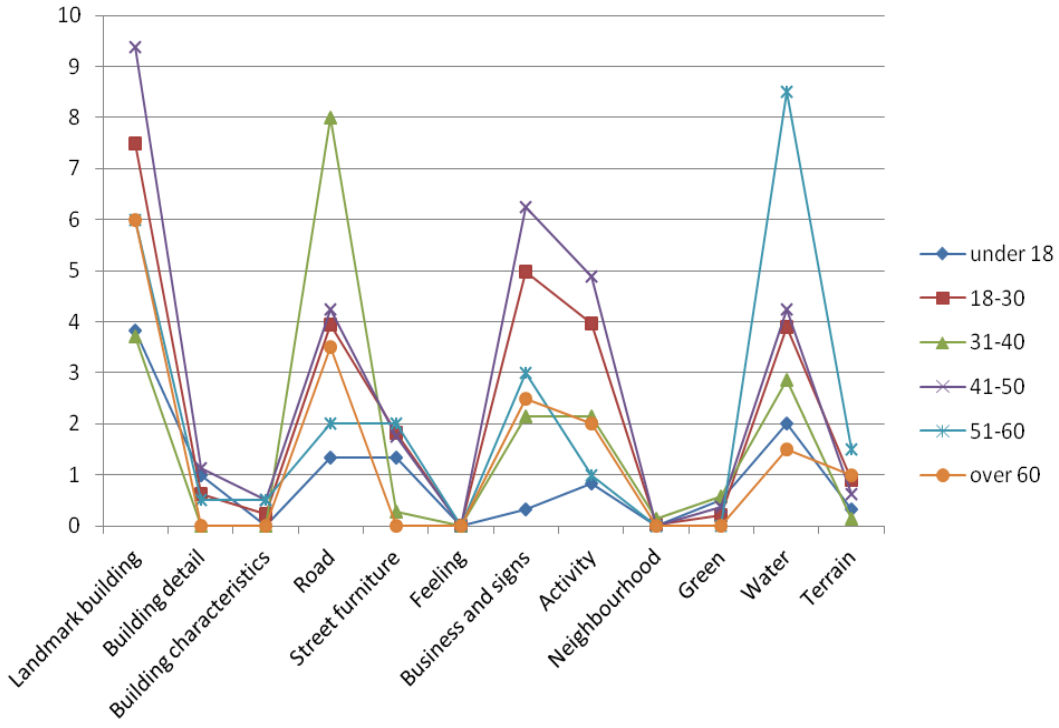

Figure 10 – Differences in category IR in relation to age

For people from the age group of over 60 it is characteristic to refer to the same prevailing categories as in the previous groups. It is worth noting that the category "Road" is more significant for them than "Business and signs".

The age group of under 18 stands out from the rest because of the lowest IR for the category "Business and signs". The reason can be the fact that people of this age may be financially constrained and show little interest in the facilities of this category. However, the most probable explanation is that due to their age these people do not associate the historic centre of the city with trade or business. People in this category live in newly transformed Krasnoyarsk, whose shopping and business centres are located elsewhere in the periphery, whereas the city centre is more of historic importance. Besides, they highlight the category "Water" as more significant, here it appears to be second. Also, this group pays more attention to such elements as street furniture or building details.

The age group of 31 to 40 proved to be mostly sensitive to the category "Road". This category has the highest IR in here. On average, people in this group mentioned the elements contained in the category "Road" 8 times each. It can indicate the high mobility of the group in the city. Moreover, another important category for them is "Water". People in the age group of 51 to 60 turned out to be more sensitive than others to the category "Water" (8.5). Also, they pay more attention to the street arrangement.

Respondents were divided into five groups according to how long they have stayed in the city. Residents comprise those who have lived in the city for 5 years and more, *i.e.* 5 to 10 years (6%) and more than 10 years (47%) (Figure 11). In total, residents make up a half of all respondents. Other groups can be considered visitors of the city.

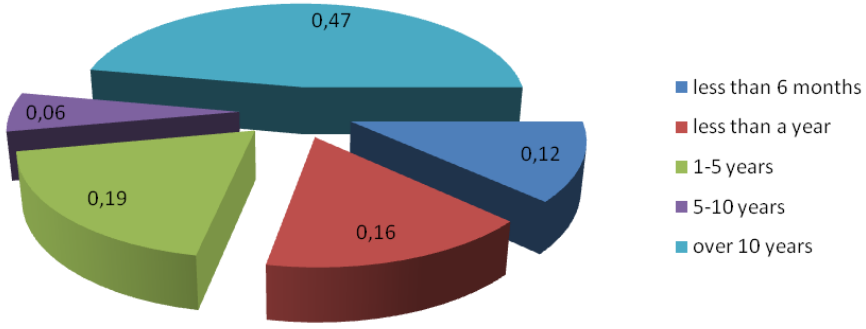

Figure 11 – Percentages of groups according to period of stay

The pattern across all the groups confirms the overall results of the study (Figure 12). Almost all of the groups indicate all the five elements as key, *i.e.* "Landmark building", "Business and sign", "Road", "Activity" and "Water".

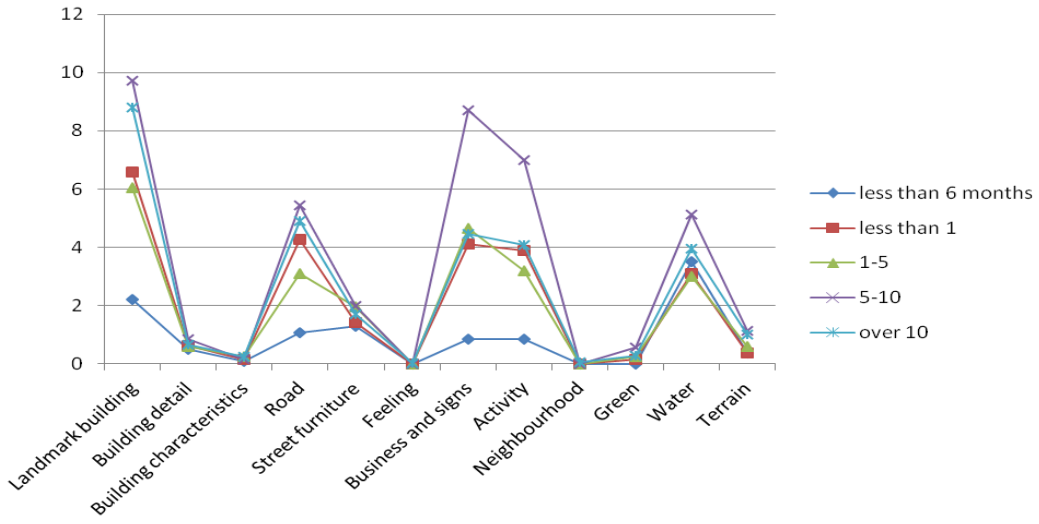

Figure 12 – Differences in category IR in relation to period of stay in the city

Among all the groups, those who have been there less than half a year and actual visitors of the city stand out. For these people, the most memorable and identifiable is the category "Water", followed by "Landmark building". It can be explained by the fact that Krasnoyarsk has a clear visual image, related to the Communal bridge, the Yenisei River and its embankment. Being depicted on a banknote, the image is expanding across the whole country and even abroad. Regardless of the fact that many Russian cities are located on river banks, and bridges of similar type can be seen elsewhere, this visual image refers specifically to Krasnoyarsk. What is more, like other frequently mentioned categories, this group is characterised by high IR for street furniture. It can be interpreted as closer attention to the details of the main arteries of the city.

It is especially interesting to note those who have lived in Krasnoyarsk for 5-10 years. They are most sensitive to the details and state a larger number of elements. It can be said that the city is quite familiar and easy to get around for them, but it has not yet bored them, so they are still attentive to its surroundings.

Conclusion

The study of the visual image of Krasnoyarsk by way of decoding shows that when identifying a place in Krasnoyarsk people tend to turn to cues and objects that are related to numerous activities. In day to day interaction with the city image, its elements leave their most vivid impressions. When perceived, the city image of Krasnoyarsk is often associated with some landmark building. The impression rests on the functional component of the city centre. Impression of Krasnoyarsk presents the city as a place where events and interactions take place at any given moment. Perhaps, this is why the city was selected as a platform for business and cultural cooperation of Russia and the Asian region, as well as the city-host of Universiade 2019. Most vividly, Krasnoyarsk city centre identity can be expressed through objects of nature. The Yenisei is one of such element, together with the embankment and the bridge. Krasnoyarsk city centre has a clear visual image created by the river, its bridges and embankments. This image is wide spread in numerous printed materials and, as a result, becomes recognizable not only by its residents, but also by its visitors.

Impression of Krasnoyarsk can be based on the functional component of the city and its nature. The unique natural objects (the Yenisei) are capable of creating a powerful and memorable impression of the city. A large number of cafés, restaurants and shops, as well as numerous events of all kinds held in the city can also contribute to the bright and exclusive impression of Krasnoyarsk.

The prospects of a further scientific research into the impression of Krasnoyarsk lie in relation to other areas of the city, as well as their comparative analysis. In the further study, the number of respondents in some of the categories can be increased, namely in the age group of people under 18 and over 30. The series of local studies will provide for a comprehensive analysis of the whole civic space of Krasnoyarsk and its impression in the context of extending place management to cities and towns of the North and the rest of Siberia.

Acknowledgment

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The Drivers of Real Sector Growth in Malawi: An Empirical Investigation

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Abstract:

The paper empirically investigates the key macroeconomic determinants of growth in Malawi using the recently developed ARDL bounds-testing approach during the period 1970-2013. The paper is motivated by the social and economic challenges that Malawi has been facing in recent years. The study reveals that the key macroeconomic determinants that are significantly associated with economic growth include investment, human capital development, population growth, real exchange rate depreciation, inflation, and international trade. We find that, in the short-run, investment, population growth, real exchange rate depreciation, and international trade are positively associated with economic growth, while inflation is negatively associated with economic growth. However, the long-run results reveal that investment, human capital development, and international trade are positively associated with economic growth, while population growth and inflation are negatively associated with economic growth. These results have significant policy implications; since the economic strategies needed to increase economic growth in Malawi should focus on promoting incentives that attract investment, improve the quality of education, reduce population growth, ensure currency and inflation stability, and promote export diversification.

Keywords: Malawi, autoregressive distributed lag model, economic growth.

JEL Classification: F43, N17, O47, O55

1. Introduction

Since attaining independence in 1964, the Malawian economy has enjoyed a brief moment of high rates of economic growth, averaging 6.0% p.a. in the 1960s. From the 1970s onwards, the economy faced numerous social, economic and political challenges – resulting in low rates of both real GDP and per capita income. In spite of undertaking numerous political and economic reforms, the consequences of such low economic performance resulted in high poverty levels, averaging 71% in 2010, and the lowest per capita income in the Southern African region, averaging $274 per capita in 2014 (World Bank 2015b).

If this continues, the low growth performance that Malawi still experiences will lead to more social, economic and political hardships – if unchecked. For the economy to recover, it is important to understand the key macro-economic determinants of economic growth. This includes understanding the major factors that drive high economic growth, as well as those that have caused the economy to lag behind. In addition, it is important for Malawi to understand what policy directions the economy can adopt in order to alleviate poverty and achieve a sustainable high growth rate. This study intends to address these specific issues.

In many African economies, the economic strategies adopted are aimed at achieving high and sustainable economic growth rates, with a primary focus on achieving broader development objectives and shared prosperity. Achieving sustainable economic growth rates, either to move from low- to middle-income economies, or middle- to high-income economies, is a necessary condition: however, this is not necessarily sufficient. Easterly and Wetzel (1989) argued that the efficiency of savings and investment are equally important factors, in addition to their accumulation. Thus, policies that both attract savings and investment and make them more efficient by improving their resource allocation can further lead to a higher and more sustainable economic growth rates.

However, in order for savings and investment to be efficient, there is a need for a stable macro-economic environment that provides incentives to reduce capital flight. This would include ensuring stable macroeconomic conditions such as low inflation, real interest rate stability, real exchange rate stability, productive or non-distortionary government spending and a productive trade policy. It would also include maintaining an efficient price mechanism and regulatory environment, and efficient and effective institutions (both public and private).

These factors have been empirically investigated and they are capable of turning savings into productive investment (World Bank 1990, Fischer 1993).

The behaviour of these macroeconomic conditions is, however, unique to each economy and dependent on its stage of development. In order for policy makers to understand the key determinants of economic growth that are specific to their country, country-based growth studies are therefore important. As argued by Anyanwu (2014), generating sustained economic growth rates is one of the pressing challenges that Africa faces today.

The aim of this study is to identify the key macroeconomic determinants of growth in Malawi using the available annual time-series data covering the period 1970-2013. In order to study these relationships, the paper employs the recently developed Autoregressive Distributed Lag (ARDL)-bounds testing approach to cointegration, introduced by Pesaran and Shin (1999) and Pesaran *et al*. (2001). The empirical results of this study are of importance especially to the Malawian economy for two reasons. Firstly, the study by employing country-specific econometric techniques identifies the key macroeconomic determinants that would drive economic growth and hence inform the relevant policy makers on which macroeconomic factors need attention. Secondly, despite a wide array of studies that have been conducted on the determinants of economic growth worldwide, to the best of our knowledge, no study has been conducted for Malawi that investigates the relationship between the key macro-economic determinants and economic growth.

The rest of this paper is organized as follows: Section 2 discusses the key macroeconomic drivers of economic growth in Malawi during the study period. Section 3 reviews the relevant empirical literature of the study. Section 4 discusses the empirical model specification, data sources, as well as the estimation techniques used in the study. Section 5 presents the empirical analysis results of the Malawian growth equation. Lastly, section 6 concludes the study and discuss some policy recommendations.

2. The Macroeconomic factors of growth in Malawi

Malawi's economic and development policy planning since 1964 has been guided by the availability of natural resources and a labour-intensive agricultural system. The stage of development at independence, as well as the institutional framework, were the two most important factors defining the structure and content of future development policies. During the study period, Malawi followed a mixed economic system that was dominated by state-led development planning. The agricultural sector was the centrepiece of such development planning, with significant investments being supported by public investments and foreign aid (Chirwa and Odhiambo, 2016). During the 1971-1980 period, the level of gross domestic savings was low, averaging 14.4% p.a. of real GDP and Malawi had to rely on foreign aid averaging 21.6% p.a. of real GDP – during the same period to support its economy. The Malawian economy blossomed, growing at an average rate of 6.2% p.a. This was approximately twice the population growth rate at that time, which averaged 3.2% p.a. (World Bank 2015b).

In the 1970s, the Government machinery created State Owned Enterprises in commerce and industry, agricultural production, transport and communications, tourism and social services. However, towards the end of the 1970s, the Malawian economy faced a number of economic challenges that affected the country's future economic growth. Some of the challenges were slow growth and low quality of traditional exports from smallholder farmers; low terms of trade; high population growth that put pressure on the land available for agriculture; low performance of State-Owned Enterprises; increasing government budget deficits; and inadequate human capital development (Chirwa and Odhiambo 2016). To address these challenges, the Government embarked on a series of structural adjustment reforms to realign the economy.

In 1980, a five-year Medium-Term Plan covering the fiscal years of 1981/82 to 1985/86 was formulated in consultation with the World Bank and International Monetary Fund. The objective of the Medium-Term Plan was to tackle the structural and economic shocks faced by Malawi during the period 1979-1981. This was followed by the development of a comprehensive development strategy in 1987 that focused on poverty reduction, promotion of education and health, income distribution and welfare stability for Malawians (Government of Malawi 1987). Three structural adjustment loans funded by the World Bank in June 1981, November 1983 and November 1985 were approved to support the implementation of the Medium-Term Plan (World Bank 1981, 1983, 1985). The principal objective of these loans was to assist the Government to address its balance of payment problems. In addition, the balance of payment support came with conditions that aimed at influencing fiscal and monetary policies targeting high fiscal deficits, which were instrumental in triggering price increases (inflation) and exchange rate misalignment (World Bank 1988).

Despite these interventions, the Malawian economy did not perform as expected during the implementation of the Medium-Term Plan of 1981-1986 and the Development Plan of 1987-1996. During the

period 1981-1990, the Malawian economy grew at an average rate of 2.2% p.a. versus a target of 4.8% p.a. Gross domestic savings continued to decline, averaging 12.9% p.a. of real GDP, which meant that Malawi continued to rely on foreign aid inflow that averaged 30.7% p.a. of real GDP during the same period (World Bank 2015b). Although there were some improvements in Malawi's balance of payments position through cash injection from the World Bank and the IMF, the key macroeconomic drivers of economic growth deteriorated sharply. During the same period, inflation averaged 16.3% p.a., followed by a real exchange rate growth (real currency depreciation) that grew at an average rate of 3.3% p.a. At the same time, real GDP per capita in the 1980s declined at an average rate of - 1.9% p.a. On the international market, Malawi's global position deteriorated, with the terms of trade index by volume averaging 0.69 p.a. and a trade deficit averaging 6.3% p.a. of real GDP (World Bank 2015b).

Although Malawi continued to implement a number of structural reforms in the 1990s, many macroeconomic parameters remained unsatisfactory. During the period 1991-2000, the economy grew at an average growth rate of 3.7% p.a., which equalled the rate of population growth while the projected real GDP growth rate was 4.4% p.a. Gross domestic savings continued to decline sharply, averaging 2.5% p.a. of real GDP, and this meant that all investment support was through foreign aid that averaged 32.2% p.a. of real GDP. The inflation rate increased sharply, averaging 32.8% p.a. against a target of 5%. Meanwhile the trade deficit continued to deteriorate, averaging -14.3% p.a. of real GDP and leading to rising import bills, while the real currency depreciated at an average rate of 8.5% p.a. (World Bank 2015b). A number of government development policies were formulated towards the end of the 1990s and in the 2000s, examples being the Malawi Vision 2020, the Malawi Poverty Reduction Strategy Paper of 2002-2005, the Malawi Economic Growth Strategy of 2004, and the Malawi Growth and Development Strategy of 2006-2010; however the Malawian economy continued to face economic challenges and weak performance such as crowding out of private sector investment and regulatory arbitrage (Chirwa and Odhiambo 2016).

During the period 2001-2013, real GDP grew at an average growth rate of 4.4% p.a. against a target of 7-9% p.a. propounded by the Malawi Vision 2020 (Government of Malawi, 1998; World Bank, 2015b). Although this was a slight improvement, the level of gross domestic savings was still very low, averaging 4.3% of real GDP p.a. during the same period. This meant that the Government continued to rely on foreign aid from development partners averaging 25.5% p.a. of real GDP during the same period. The trade deficit continued to weaken, averaging -16.7% p.a. of real GDP, while the inflation rate still remained high, averaging 13.6% p.a., despite a policy of single-digit inflation rate with a target of 5% p.a. Furthermore, the local currency continued to depreciate at an annual rate of 1.5% p.a. (Government of Malawi 1998, 2006, World Bank 2015b).

In terms of human capital development, the Malawian authorities realized the need to address severe human capital constraints that the economy inherited in the 1960s. Since 1970, gross enrolment rates for primary education increased significantly from an average of 22.1% in 1970 to 80.1% in 2010. The Government policy on education supported the promotion of basic skills to support smallholder agriculture, and this was implemented through the promotion of basic primary education. Gross enrolment rates have significantly improved since independence. However, the focus has been more on primary education and less on secondary and tertiary education (Chirwa and Odhiambo 2015).

3. A review of empirical literature

In the economic growth literature, the accumulation of physical capital (investment) is one of the important key determinants of economic growth (Solow 1956, Frankel 1962). Investment is positively associated with the rate of growth through the savings ratio (Keynes 1936). Regardless of the type of physical capital used, many empirical studies have found a positive relationship between investment and economic growth (Dollar 1992, Fischer 1992, Most and Vann de Berg 1996, Anyanwu 2014). In this study, the accumulation of the physical capital stock is represented by the ratio of gross fixed capital formation to real GDP and is expected to have a positive and statistically significant impact on economic growth.

The theory on human capital development states that investment in human capital contributes towards economic growth by investing in people through education and health (Becker 1962). However, many studies that have investigated the impact of human capital on economic growth have found mixed results. Some studies have found a positive relationship between human capital and economic growth (Easterly and Levine 1997, Chen and Feng 2000, Radelet *et al*. 2001). In some cases, the relationship between human capital and economic growth has been negative (Barro 2003). In this study, human capital development is proxied by total enrolment at all

levels. We expect threshold effects to this measure and a priori expectation is, therefore, either a positive or negative association between human capital development and economic growth.

The third variable used is population growth. The relationship between population and economic growth is mixed and varies between countries (Warr 2004). Some empirical studies on the relationship between population and economic growth have found a negative and insignificant relationship with economic growth (Levine and Renelt 1992) In other cases a negative and significant association with economic growth was found (Mankiw *et al*. 1992, Most and Vann de Berg 1996), and in others there was a positive association with economic growth (Sachs and Warner 1997, Radelet *et al*. 2001). The population growth rate is, therefore, expected to exhibit threshold effects and either a positive or negative relationship with economic growth.

The impact of government expenditure on economic growth is one of the important factors studied in the empirical growth literature. The empirical work on the relationship between government expenditure and economic growth has also provided mixed results. Some empirical studies have found that fiscal policy impacts the efficiency of investment in the medium - and long-term through the crowding out of private investment, especially when government deficits finance public consumption, subsidies or transfers. These studies found that a higher ratio of government spending to GDP is, on average, associated with a lower rate of growth for a given level of investment, thereby reducing the efficiency of investment (Easterly and Wetzel 1989, World Bank 1990, Barro 2003). Other studies have found that small to moderate government sizes are positively associated with economic growth, while large government sizes impede economic growth (Anaman 2004). A priori expectation, therefore, is that the level of government consumption will exhibit threshold effects; either a positive or negative relationship with economic growth is expected in the study countries.

The fifth macroeconomic driver of growth in Malawi is the real exchange rate as a measure of capital market stability (Rodrik 2008). The stability of any economy's real exchange rate regime is one of the key macroeconomic policies that many developing countries in the world follow. It is argued that higher levels of real exchange rate instability can suppress economic growth especially in countries with underdeveloped capital markets. In such countries, real exchange rate variability has a negative impact on long-run economic growth (Dollar 1992). In other cases, a stable exchange rate environment is conducive for trade and economic growth and a real exchange rate stability either by eliminating any overvaluation or undervaluation of the local currency is a necessary condition if long-run economic growth is to be sustained (Elbadawi *et al*. 2012). In such cases, the exchange rate is positively associated with economic growth (Gluzmann *et al*. 2014). A priori expectation on the relationship between the real exchange rate and economic growth is expected to be either positive or negative and will depend on the stability of the exchange rate (threshold effects).

The sixth factor that may have influenced economic growth in Malawi is the inflation rate. It is argued that inflation is a good macroeconomic indicator of how the government manages the economy (Fischer 1992, 1993, Barro 2003). It has also been argued that low inflation brings about economic efficiency as economies, through the price mechanism, are able to allocate scarce resources to their best economic use (World Bank, 1990). Though the empirical evidence has strongly supported a negative relationship between inflation and growth especially through its impact on capital intensity or the efficiency of physical capital (Fischer 1983; Bruno and Easterly 1998); inflation exhibits threshold effects on economic growth (Bruno and Easterly 1998). Therefore, a priori expectations are either a positive or negative association between inflation and economic growth.

International trade has also been influential and a key macroeconomic driver of growth in Malawi (Chirwa and Odhiambo 2015). Knight *et al*. (1993) argued that the inclusion of trade policies is based on the premise that the export and import sectors promote a country's openness and facilitate the transfer of technology of advanced capital goods. Furthermore, trade act as a catalyst for the diffusion of knowledge and skills. In addition, the export sector is important as it brings about foreign exchange inflows which are used to import the needed capital goods (Knight *et al*. 1993). A priori expectation, therefore, is that trade is expected to have a positive and statistically significant impact on economic growth in the study countries. Foreign aid act as an alternative source of finance that supplements domestic investment and their inflow is seen to fill in the savings gap especially in developing economies (Chenery and Strout 1966, Riddell 1987). As a priori expectation, the relationship between foreign aid and economic growth is expected to be positive and significantly associated with economic growth.

4. Empirical model specification and estimation techniques

a. Empirical model specification

Based on the preceding discussion the empirical model for this study is based on an extended augmented growth model specified as follows:

$$Y = f\left(INV, HC, POPG, GC, RER, INF, TRD, AID\right) \quad (1)$$

The multivariate framework in equation (1) is an extension to similar models used in the empirical growth literature to investigate the impact of selected macroeconomic determinants on economic growth (see, among others, Fischer 1993, Chen and Feng 2000, Anyanwu 2014). The selected key macroeconomic determinants included in equation (1) are as follows: INV represents investments or gross fixed capital formation as a share of real GDP; HC represents human capital proxied by total enrolment; $POPG$ is population growth; GC represents government consumption share in real GDP; RER is the real exchange rate; INF is the inflation rate; TRD is international trade; and AID represents foreign aid.

b. Data sources

The study uses annual time series data covering the period 1970-2013 and has a sample size of 44 observations. This data is obtained from the World Bank Development Indicators (World Bank, 2015b) and UNESCO Institute of Statistics (UNESCO, 2015). The variables included are real GDP per capita (expressed in 2005 constant USD prices); investment (gross fixed capital formation as a share of real GDP in 2005 constant prices); human capital (proxied by total enrolment – primary, secondary and tertiary); population growth; government consumption share in real GDP; the real exchange rate (ratio of the nominal exchange rate and PPP conversion factor for GDP); inflation rate (growth of consumer price index); foreign aid (net official development assistance and official aid received as a share of real GDP expressed in 2005 constant USD prices); and international trade (proxied by the ratio of exports and imports as a share of real GDP expressed in 2005 constant USD prices). The ARDL model estimation results are computed using Microfit 5.0, while unit root tests are reported based on Eviews 9 software.

c. Estimation techniques

The Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran *et al*. (2001) is employed to investigate the key macroeconomic determinants of growth in Malawi. The reasons for adopting the ARDL bounds testing procedure are fivefold. First, the ARDL model include lags of both the dependent and explanatory variables and it is a powerful tool in investigating short- and long-run cointegrating relationships between variables of interest (Pesaran and Shin 1999, Collier and Goderis 2012). Second, the bounds test based on the unrestricted error correction model proposed by Pesaran *et al*. (2001) can be applied regardless of whether the study variables are integrated of order zero or one (Odhiambo 2013). Third, the two-stage ARDL approach effectively corrects for any possible endogeneity in the regressors (Pesaran and Shin 1999, Acikgoz and Mert 2014). Fourth, the ARDL model can take up a sufficient number of lags that captures the data generating process in a general to specific modelling framework (Hirnissa *et al*. 2009). Lastly, given the sample size of the present study which covers the period 1970-2013 (44 observations), the ARDL approach provides robust results in studies affected by small sample sizes (Narayan 2005).

The ARDL representation of the empirical model can be expressed as follows:

$$\Delta lnY_t = \beta_0 + \beta_1 T_t + \sum_{i=1}^{n} \beta_{2i} \Delta lnY_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta lnINV_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta lnHC_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta lnPOPG_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta lnGC_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta lnRER_{t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \beta_{9i} \Delta lnTRD_{t-i} + \sum_{i=0}^{n} \beta_{10i} \Delta lnAID_{t-i} + \alpha_1 lnY_{t-1} + \alpha_2 lnINV_{t-1} + \alpha_3 lnHC_{t-1} + \alpha_4 lnPOPG_{t-1} + \alpha_5 lnGC_{t-1} + \alpha_6 lnRER_{t-1} + \alpha_7 lnINF_{t-1} + \alpha_8 lnTRD_{t-1} + \alpha_9 lnAID_{t-1} + \varepsilon_t \quad (2)$$

In equation (2) the parameters $\beta_2, \ldots, \beta_{10}$ are the short-run multipliers (elasticities) and $\alpha_1, \ldots, \alpha_9$ are the long-run multipliers (elasticities). The white noise residual term is assumed to be independent and identically distributed and is denoted by ε_t.

The error correction model associated with equation (2) is expressed as follows:

$$\Delta lnY_t = \beta_0 \Delta T_t + \sum_{i=1}^{n} \beta_{1i} \Delta lnY_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta lnINV_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta lnHC_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta lnPOPG_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta lnGC_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta lnRER_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta lnTRD_{t-i} + \sum_{i=0}^{n} \beta_{9i} \Delta lnAID_{t-i} + \rho ECM_{t-1} + \varepsilon_t \quad (3)$$

In equation (3), the error correction term (ECM) measures the short-run speed of adjustment towards the long-run equilibrium path of the estimated growth model. In the short-run, real output responds to deviations from the long-run equilibrium path and is captured by ECM which gradually brings the economy back to its steady state

level (Collier and Goderis 2012). This implies that the coefficient of the error correction term should be negative and statistically significant and the magnitude of this coefficient should be less than one.

Although the ARDL bounds testing approach does not require pre-testing of variables for stationarity, variables that are integrated of order two or higher make the bounds testing approach irrelevant (Odhiambo 2013). It is therefore important to determine whether the variables of interest are integrated of order not more than one. The study investigates the order of integration of each variable of interest by using three units root tests. The first is the Augmented Dickey-Fuller (1979) unit root test that takes into account the presence of serial correlation in the time series data. The second unit root test used is the Elliott, Rothenberg and Stock (1996) Dickey Fuller Generalized Least Squares (DF-GLS) unit root test that detrends the time series data. The third test investigates the presence of a structural break in the time series data using the Perron (1990) innovation outlier model.

5. Empirical estimation results

a. Stationarity tests

Table 1 reports the stationarity test results for the time series used in this study based on the Augmented Dickey-Fuller (1979); Elliot, Rothenberg and Stock (1996) Dickey Fuller Generalized Least Squares (DF-GLS); and Perron (1990) structural break unit root tests. In order to determine which unit root test to conduct, it is important to know whether the data generating process of the time series is autoregressive or trended.

Table 1 - Stationarity tests for all variables

VARIABLE	Stationarity of all Variables in Levels						Stationarity of all Variables in 1st Difference					
	ADF		DFGLS		Perron		ADF		DFGLS		Perron	
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
Log(GDPPC)		-2.02		-1.85		-3.78		-7.42***		-2.91*		-8.00***
Log(INV)	-3.32**		-3.08***		-4.55						-9.18***	
Log(HC)		-1.34		-1.38		-2.39		-6.32***		-5.99***		-6.43***
Log(POPG)	-2.67*		-2.71***		-7.32***		-4.82***					
Log(GC)	-3.57***		-3.60***		-4.36*						-9.75***	
Log(RER)		-3.08		-3.17*		-4.35*		-6.19***		-6.32***		-6.69***
Log(INF)	-4.19***		-4.20***		-5.73***							
Log(TRD)	-4.13***		-4.05***		-4.96***							
Log(AID)	-1.69		-1.66*		-3.59		-11.28***		-1.75*		-12.44***	

*Note: for all p-values: *** 1% significance level; ** 5% significance level; * 10% significance level.*

A preliminary graphical analysis of the time-series analysis showed that when testing for unit roots, the test equations for real GDP per capita, human capital and real exchange rate are trend stationary and should include both an intercept and a trend, while population growth, government consumption, inflation, investment, foreign aid and trade should include an intercept only. The stationarity results for Malawi conclusively showed that real GDP per capita, human capital development, real exchange rate depreciation, and foreign aid were integrated of order one, while inflation and the trade variables were integrated of order zero, regardless of the unit root test used. The investment and government consumption variables were integrated of order zero when the ADF and DF-GLS tests were used, and integrated of order one when subjected to Perron (1990) structural break unit root test. The population growth variable was integrated of order one when the ADF test was used, and integrated of order zero when the DF-GLS and structural break test were used. The unit root test results showed that all variables are integrated of order one or zero. Therefore, the Bounds testing procedure for cointegrating relationships suggested by Pesaran *et al*. (2001) can be employed.

b. ARDL Bounds Test for Cointegration

In this section, the Akaike Information Criteria is employed to determine the appropriate lag-length for the estimated ARDL equation. This method is chosen as it tends to over-fit the model of interest, given that the

optimal lag length for the growth model is up to 2 lags. The optimal lag length is chosen based on the number of regressors included in the growth model. The optimal lag-length selection criteria are based on the lowest AIC obtained. For the Malawi growth equation, the optimal ARDL model selected was a $ARDL(1, 2, 2, 2, 1, 2, 2, 2, 0)$ model with a restricted intercept and no trend. Table 2 reports the Pesaran *et al.* (2001) bounds test for level relationships for the selected equation.

Table 2 - ARDL Bounds Test Results

Dependent Variable	FUNCTION			Value (F-statistic)	Cointegration Status
Real GDP per capita	(*GDPPC* | INV, HC, POPG, GC, RER, INF, TRD, AID)			5.99***	Cointegrated
Null Hypothesis: No long-run relationships exist Asymptotic Critical Values for $k = 8$ (Pesaran *et al.*, 2001; Case II, p. 300)					
1%		5%		10%	
$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
2.62	3.77	2.11	3.15	1.85	2.85

*Note: *** 1% significance level; ** 5% significance level; * 10% significance level.*

As illustrated in table 2, the computed F – statistic is 5.99 and is statistically significant at the 1% upper critical bound. In summary, the bounds test to cointegrating relationships using the Pesaran *et al.* (2001) approach confirms the existence of long-run level relationships between the dependent variable, real GDP per capita, and the set of covariates.

c. *Empirical Analysis of ARDL-Based Error Correction Model*

Table 3 below presents the short- and long-run multipliers for the Malawi growth equation.

Table 3 - Estimated Results (Short- and Long-run Coefficients)

Malawi: Panel 1 – Estimated Long-Run Coefficients (Elasticities) [Dependent Variable: Log of Real GDP per capita $\log(GDPPC)_t$]				
Regressor	Coefficient	Standard Error	t-statistic	Probability
$\log(INV)_t$	0.2972***	0.07	3.99	0.001
$\log(HC)_t$	0.1371**	0.05	2.68	0.015
$\log(POPG)_t$	-0.1216**	0.05	-2.61	0.017
$\log(GC)_t$	0.0771	0.09	0.78	0.445
$\log(RER)_t$	-0.0607	0.15	-0.39	0.698
$\log(INF)_t$	-0.0569**	0.02	-2.29	0.033
$\log(TRD)_t$	0.4278**	0.15	2.79	0.012
$\log(AID)_t$	-0.0867	0.05	-1.69	0.107
C_t	3.5947***	0.78	4.59	0.000
Malawi: Panel 2 – Estimated Short-Run Coefficients (Elasticities) [Dependent Variable: change in log of Real GDP per capita $\Delta\log(GDPPC)_t$]				
Regressor	Coefficient	Standard Error	t-statistic	Probability
$\Delta\log(INV)_t$	0.0892**	0.04	2.33	0.028
$\Delta\log(INV)_{t-1}$	-0.0479	0.04	-1.26	0.220
$\Delta\log(HC)_t$	-0.0683	0.15	-0.46	0.649
$\Delta\log(HC)_{t-1}$	-0.1511	0.11	-1.43	0.165
$\Delta\log(POPG)_t$	-0.1355*	0.08	-1.79	0.086
$\Delta\log(POPG)_{t-1}$	0.1979***	0.07	2.98	0.006
$\Delta\log(GC)_t$	-0.0045	0.06	-0.08	0.939
$\Delta\log(RER)_t$	0.0268	0.09	0.29	0.771
$\Delta\log(RER)_{t-1}$	0.1149*	0.06	1.91	0.068

Regressor	Coefficient	Standard Error	t-statistic	Probability
$\Delta\log(INF)_t$	-0.0195**	0.01	-2.36	0.026
$\Delta\log(INF)_{t-1}$	0.0123	0.01	1.61	0.120
$\Delta\log(TRD)_t$	0.1432**	0.06	2.42	0.023
$\Delta\log(TRD)_{t-1}$	-0.1113*	0.06	-2.00	0.056
$\Delta\log(AID)_t$	-0.0564	0.04	-1.48	0.152
ECM_{t-1}	-0.6504***	0.15	-4.24	0.000
R-Squared	0.8564	R-Bar Squared		0.6900
S.E. of Regression	0.0267	F-Stat (15,26)		7.55[0.000]
Residual Sum of Squares	0.0136	DW-statistic		2.3211
Akaike Info. Criterion	-86.195	Schwarz-Bayesian Criterion		-66.212

*Note: *** 1% significance level; ** 5% significance level; * 10% significance level.*

Panel 1 reports the estimated long-run coefficients; while Panel 2 reports the estimated short-run coefficients. As shown in panel 2, the short-run dynamics and the adjustment towards the long-run equilibrium path is measured by the error correction term (ECM). The result shows that a 1% deviation from the equilibrium path is corrected in the next period at a rate of -0.65% and is statistically significant at the 1% significance level. This confirms the presence of a long-run level equilibrium path between real GDP and the selected regressors (investment, human capital, population growth, government consumption, the real exchange rate, inflation, international trade, and foreign aid). The regression results for the ARDL model reveals a good fit represented by an estimated R −squared value of 0.86 and an adjusted R −squared value of 0.69.

Panel 1 of Table 3 presents the long-run coefficient estimates. The results reveal that the key macroeconomic determinants that are significantly associated with long-run economic growth in Malawi include the accumulation of physical capital (investment), human capital development, population growth, inflation and international trade. The relationship between investment and the long-run level of real GDP per capita is positive and statistically significant at the 1% significance level. The results reveal that the accumulation of physical capital is positively and significantly associated with the level of real GDP per capita in the long-run. The results show that a 1% increase in the level of investment results in a 0.30% increase in the level of real GDP per capita and they are statistically significant at the 1% significance level. These results are supported by similar studies that found a positive relationship between investment and economic growth in the long-run (see Anyanwu 2014).

The study results reveal that human capital development is positively and significantly associated with the long-run level of real GDP per capita and the results are statistically significant at the 5% significance level. They show that a 1% increase in total enrolment leads to a 0.13% increase in the level of real GDP per capita in the long-run. These results are supported by similar studies that have found that an educated society is good for economic growth in developing economies (see Mankiw *et al*. 1992, Fischer 1992, Chen and Feng 2000, Radelet *et al*. 2001 among others).

The study results also show a negative relationship between population growth and long-run level of real GDP per capita. The results show that a 1% increase in population growth results in a -0.12% decline in the level of real GDP per capita and they are statistically significant at the 5% significance level. These results are similar to other empirical growth studies that found a negative relationship between population and economic growth in developing countries (Anyanwu 2014).

The relationship between inflation and the long-run level of real GDP per capita is revealed to be negative and significantly associated at the 5% significance level. The results reveal that a 1% increase in inflation in the long-run leads to a -0.06% decline in the level of real GDP per capita. These results conform to similar studies that found a negative relationship between inflation and economic growth in developing countries (see Fischer 1992, Burnside and Dollar 2000, Chen and Feng 2000, Bayraktar 2006, Bhaskara-Rao and Hassan 2011 among others).

The study results also reveal that international trade is positively and significantly associated with the long-run level of real GDP per capita at the 5% significance level. They show that a 1% increase in international trade leads to a 0.43% increase in the level of long-run real GDP per capita. These results are supported by similar studies that found a significant association between international trade and economic growth in developing countries (see, among others, Chen and Feng 2000, Burnside and Dollar 2000, Radelet *et al*. 2001, Barro 1999, 2003, Chang and Mendy 2012, Anyanwu 2014). The study results did not find a significant association between

government consumption, real exchange rate depreciation, foreign aid and the long-run level of real GDP per capita.

The short-run results are presented in panel 2 of table 3. The results reveal that the key macroeconomic determinants that are significantly associated with the growth of real GDP per capita in the short-run include the growth of investment, population growth, depreciation of the real exchange rate, inflation and international trade. The results show that the growth of investment in the current period is positively and significantly associated with the growth of real GDP per capita and is statistically significant at the 5% significance level. A 1% change in the growth of investment in the current period leads to a 0.09% increase in the growth rate of real GDP per capita. The positive relationship found between investment and economic growth is supported by similar studies in the empirical growth literature (Mankiw *et al*. 1992, Acikgoz and Mert 2014).

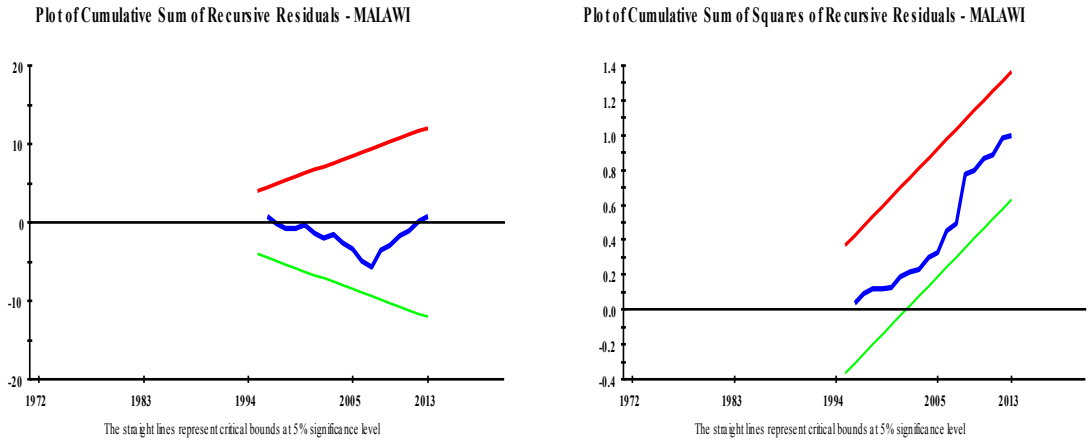
The results reveal a mixed association between population growth and economic growth in the short-run, revealing a significant negative association in the current period and a significant positive association in the previous period at the 10% and 1% significance levels respectively. The results also show that while a 1% increase in the growth of population in the current period leads to a -0.14% decline in the growth of real GDP per capita, a 1% increase in population growth in the previous period leads to a 0.20% increase in the growth of per capita real GDP. Overall, the relationship between population and economic growth is positive and statistically significant in the short-run. The study results are supported by empirical evidence where population growth is found to be positively associated with economic growth (see Sachs and Warner 1997, Radelet *et al*. 2001 among others).

The empirical results show a positive association between the depreciation of the real exchange rate in the previous period and real GDP per capita growth in Malawi and are statistically significant at the 10% significance level. They also show that a 1% depreciation of the real exchange rate in the previous period leads to a 0.11% increase in the growth rate of real GDP per capita in the short-run. These results support the importance of having a stable exchange rate regime with moderate volatility and have been confirmed by similar studies (see Vieira *et al*. 2013 among others).

The relationship between inflation and real GDP per capita growth is found to be negative and statistically significant at the 5% significance level. The results reveal that a 1% increase in the growth of inflation in the current period leads to a -0.02% decline in the growth rate of real GDP per capita in the short-run. This result is supported by a number of empirical growth studies that also found a negative association between inflation and economic growth in developing countries (see Fischer 1992, 1993, Burnside and Dollar 2000, Barro 1999, 2003; Bayraktar 2006, Bhaskara-Rao and Hassan 2011 among others).

The results also reveal mixed results between trade and economic growth, both in the current and previous period. They are statistically significant at the 5% and 10% significance levels, respectively. They show that a 1% increase in the growth of trade in the current period leads to a 0.14% increase in real per capita GDP growth, while a 1% increase in the previous period leads to a -0.11% decline in the growth rate of real GDP per capita. Overall the results reveal a positive association between trade and economic growth in Malawi and are supported by similar empirical growth studies that also found a positive association between trade and economic growth (see, among others, Fischer 1993, Barro 1999, 2003). The study did not, however, find a significant relationship between the growth of human capital development, government consumption, foreign aid and real GDP per capita.

Finally, the following post-diagnostic tests are reported: cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of the recursive residuals (CUSUMSQ) test; Breusch-Godfrey serial correlation test; Breusch-Pagan-Godfrey test for heteroskedasticity; Ramsey RESET test; Normality test; and ARCH test. Figure 1 illustrates the CUSUM and CUSUMSQ results for the estimated growth equation.



Source: Author's estimation

Figure 6 - CUSUM and CUSUMQ Tests

As illustrated in Figure 1, the CUSUM test reveals parameter instability, while the results of the CUSUMQ test reveal variance stability. The CUSUM as well as the CUSUMSQ are within the 5% critical lines and the results are suggestive of coefficient stability in the country studied. Table 4 reports post-estimation diagnostic results.

Table 4: ARDL-VECM Post-Estimation Diagnostic Tests

Test Statistic	Results
Breusch-Godfrey Test: No Serial Correlation F(1,18)	1.18 [0.291]
Breusch-Pagan-Godfrey Test: No Heteroskedasticity F(1,40)	0.92 [0.344]
Ramsey RESET Test: Functional Form F(1,18)	2.85 [0.251]
Normality: CHSQ (2)	2.33 [0.312]
ARCH Test: Heteroskedasticity (no ARCH terms) F(1,18)	0.32 [0.580]

*Note: for all p-values: *** 1% significance level; ** 5% significance level; * 10% significance level.*

The results reveal that the null hypotheses cannot be rejected for all post-diagnostic tests at the 5% significance level. This implies that the final ARDL model for the estimated Malawi growth equation is well-specified and the parameter estimates are not biased.

Conclusion

In this paper, we have empirically investigated the key macroeconomic determinants of economic growth in Malawi during the period 1970-2013. The main macroeconomic determinants investigated include the accumulation of physical capital, human capital development, population growth, government consumption, real exchange rate, inflation rate, international trade and foreign aid. The study has employed an augmented economic growth model; and it has used the Autoregressive Distributed Lag (ARDL) modelling approach to estimate both the short- and long-run elasticities of the selected macro-economic determinants. Using the ARDL bounds testing approach to cointegration, the study found that the key macroeconomic determinants that are positively associated with real GDP per capita growth in the short-run are investment, population growth, depreciation in the real exchange rate and international trade. On the other hand, inflation is negatively associated with the growth of real GDP per capita. In the long run, the study revealed that investment, human-capital development and international trade, are positively and significantly associated with the growth of real GDP per capita; while the population growth and inflation have a significantly negative relationship with long-run real GDP per capita. However, the study did not find any significant relationship between government consumption, foreign aid and economic growth, either in the short run, or in the long run.

These results have significant policy implications for Malawi, both in the short- and the long-run. They imply that the economic strategies that need to be pursued by the authorities in Malawi in the short-run should focus on creating incentives that will attract more investment into the country; technologies that improve the productivity of labour; stabilization of the real exchange rate; control of inflation; and an increase in exports. The long-term strategies that are crucial for Malawi's future include providing incentives that attract more long-term investment; improving the quality of human capital stock; reducing the rate of population growth; inflation stability; and increasing the production and productivity of exports. On the other hand, the lack of any significant relationship between government consumption, foreign aid and economic growth could be attributed to policy inconsistencies. As such, fiscal policies are encouraged to be more investment oriented; and foreign aid should support policies that focus more on making foreign aid more developmentally effective.

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Organization of Contract Relations and Structuring of Modern Investment – Construction Complexes in the Region

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Abstract:

The theory of relations between subjects of the business activity originated long ago when people began to exchange various goods. Nowadays the relations are chaotically changing due to high technologies and complicated problems. Obviously, the contract relations harshly influence consummation of aims in economic processes and people want to control them. The search of methods and forms to improve management of economic systems produces factors for development of new ways of modeling that would reflect the diversity of external impact and imitate reality.

Key words: company cooperation; investment building complex; organizational structures; contract activity.

JEL Classification: E27, L14, L74.

1. Introduction

In the investment building complex, considering its nature, the organization of relations has short cycle related to the period of project realization. On the legislative level subjects of economic activity perform some functions. The formal aspect of relations is reflected in contracts. Characteristics of contracts help to point out and represent processes in the investment building project or a group of such projects. It's crucial for project managers to adhere to contractual terms so that's why they look for methods to enhance the management of a system.

According to the cognitive model the structure of subjects and contract relations helps to solve a scientific problem of structuring investment building complex and represent the organization of contract activity in the economic sphere. In order to form a system of company cooperation we use a cognitive map of structuring clusters as a method in order to understand formations in the investment building complex. The method can also help to use various advantages to solve management problems.

2. Methodology. Systematizing types of models to describe company cooperation as a basis of contract activity

Applied research of models of structuring activity and organization of market cooperation has not been developed because of a lack of effective algorithms to solve its problems and defects of the centralized system of an economic organization.

One of the first models of cooperation based on the search of stable market solutions was worked out by L. Johansen, a Norwegian scholar, in the end of the 50s. According to this model, production volumes and distribution are defined by cooperation between manufacturers maximizing revenue and consumers maximizing profitableness on the competitive market. The model helped to set the policy of industrial sales by the research of cooperation on the market. The model turned out a basic method for the whole scientific research of cooperation equilibrium based on the neoclassical theory.

The second large group of models was introduced in the sphere of behavior principle and peculiarities of the economic mechanism of countries and their economy. The name of the research was neoclassical structuralism. The research includes works in the sphere of life expectancy (Barro and Grossman), market failure (Kornai), dynamic equilibrium (Porter), approaches of coordination of solutions based on the schemes of rationing and excessive goods (V.M. Polterovich, E. M. Bravermash, M.I. Levin).

Due to the research of interconnected industrial processes the third group of models emerges that comprises the description of economic development (V.A. Volonsky), development of international economic links. Makarov (1982, 23 – 58) and A.M. Rubinov contributed to the development of dynamic models of steady structure cooperation (Metallurgical guide, Roberts 1986, 496). They suggested doing research of economic subsystem cooperation based on contract system. They developed conditions to which any subsystem should have adhered otherwise it would not be profitable for any subsystem. The scholars carried out a normative analysis of the conditions and solutions (connection with a nucleus and economic balance).

The forth group of models is related to the developments of business analysis which represents a research approach using clusters and their institutions consolidated by common aims to identify the main characteristics of industrial incorporation. Asaul, (2004, 448), Shepelev (2004, 400), Boyer (2000, 15-23). The instruments of business analysis comprise:

- method of "expert estimation". The method presupposes the identification of structures by the organization of target groups, interviews and preparations of corresponding reviews and facts finding;
- "territory index" which presupposes the identification of structures by the dependence of employment rate inthe structure;
- "costs-revenue" is aimed at the identification of common costs in the structure before the analysis and after implementation of measures to improve business activity;
- "graph theory" is aimed at the identification of the structure by the usage of brand image;
- "correspondence analysis" presupposes the analysis of industrial factors, multirange scaling and non-classical correlation to identify the structure on innovative styles;
- "quantitative analysis of competitive situations" presupposes study of connections between structure members.

The fifth group corresponds to fractals and self-similarity models. The idea of organizing attractors belongs to Warnecke (1999, 280). Then the breakthrough in mathematics appeared. The structures became a subject of the fractal geometry by Mandelbrot (2004, 255).

Mandelbrot argues that structures are fractals − from Latin "*fractus*" (broken, interrupted). The concept of fractals consists in organization of fractal sets in which the fractal is considered as a self-managed and self-organizing enterprise pattern. Fractal structures in the building complex consist of subcontractor organizations which have a structure resembling the structure of the general contracting company. However, it is different from its technological elements of contract work. There are other structures of the fractals which are not different. They combine various formations by means of the functional characteristic. The structures are formed on the basis of attractor field and refer to business clusters.

Business clusters are considered as concentrations of companies with a common idea and project (Great encyclopedic dictionary 1997, 1434). Functional incorporations such as associations, holding companies and industrial groups are types of cluster consolidations. Therefore, many modern researchers turn to the cluster theory to find new forms of organization activity.

The unified definition of economic cluster is a controversial issue among scholars. Each scholar defines the notion cluster in his/her research differently. It is essential to divide clusters into two groups. The first group considers clusters a type of structures studying development dynamics (C. Ketels), interrelations between participants (J. Jacobs, A. de Man, S. Rosenfield, I. Nesterenko, O. Osipova, M. Galushkina) and application sphere and competitive positions(M. Porter, L. Jang). The second group, that is practical, considers the application of cluster structures to solve problems of territory development (territorial approach) studying peculiar properties of regional management (A.N. Asaul, M.P. Voynorenko, P.Y. Eroffeev, A.Prazdnichnykh, Y.A. Prudenko, S.V. Rayevsky) (Asaul 2004, 448, Shepelev 2004, 400) and problems of sectors development (sectoral approach) studying specificity of an industrial organization (E.I. Rubinshtein, V.Prais, A. Voronov, A. Buryak) (Makarov 1982, 23 – 58).

The sixth group includes research and developments in cognitive modeling in the middle of XVII century a famous philosopher and mathematician Rene Descartes introduced an aphorism that became classical: «*Cogito, ergosum*» (I think; therefore, I am). "The cognitive modeling as a method was developed by American researchers including R. Axelrod. They considered the analysis as a method of representing cognitive structures aimed at a specific problem. The method designed a cognitive process while making out next steps and actions. Special characteristics on the basis of cognitive analysis were considered in the works of such scholars as D. Hart, F. Roberts, G. Kelly. They used the cognitive analysis to point out subjects' views and ideas and to make decisions in different situations. In the economic sphere the cognitive approach was developed to make decisions while researching weak structure systems and situations including a variety of elements that has the quantitative character" (Cognitive approach in management 2007, 5). The instrument of the cognitive analysis is convenient because it helps to work either with a qualitative or a quantitative type of data. The usage of quantitative data can increase the dependence of possibilities of quantitative estimation of interrelated factors in iterative cycle modeling (Berge 1962, 196), Galushka (2002, 125 – 134), (Maksimov 2004, 3 – 5), (Roberts 1986, 496), Shindina 2007, 400), (Hallowell 2011, 592-599), (Hikkerova, Ilouga and Sahut 2016, 1868-73), (Chakraborty, Thompson and Yehoue 2016, 288-317, (Gastano, Mendez and Galido 2016, 1690-95).

Model development is a dynamic process flowing chaotically in accordance with the requirements of management tasks. Science is seeking to describe praxis through the models to comprehend their activity and enhance the level of management. We assume that most of organizational problems can be solved, if six organization models of cooperation are used for structuring economic complexes.

3. Results of implementation of contract process analysis in the investment building complex

The building branch is characterized by constant changing of participants and new projects are connected to forming temporary structures. However, functional aspects of building production don't change (hardly change) in the frame of a particular investment building project. This special characteristic helps to generalize the building branch activity of investment building groups and represent them as a system. The cognitive structuring was used for qualified analysis of the interconnection. This structuring is built on the basis of cause-and-effect links (Table 1).

There is an orgraph of participant cooperation in the investment building complex on Figure 1. Factors connected with the performance of building works are highlighted in white. Factorshighlighted in black correspond to professional building structure influence on a project and factors of external environment indirectly related to building works are highlighted in grey. Besides, cooperation between participants in the investment building project is divided into material (Figure 1 full lines) and non-material (dash lines).

Table 1 - Subjects and objects of cooperation in building

Object interrelations	Subject of interrelations															
	Consumer	Client	Investor	Tender committee	Project designer	General contractor	Subcontracor	Suppliers of materials	Transport company	Mediators	Building sector enterprises	Evaluator	Guarantor, Insurer	State control authority	Infrastructure authority	Estate agent
1. Project plan, forming activity aims and order	x		x													x
2. Search of investments, effect grounding		x	x									x				
3. Forming performance requirements, choosing cooperation scheme		x		x												
4. Procurement of permits for building, allocation of land		x	x		x	x	x							x		
5. Search of executives: project designers, constructors; hosting tender contests				x	x	x										
6. Protection from risks, estimation and insurance			x		x	x	x		x		x	x	x			
7. Work with infrastructure institutions: electric power systems, water systems, heating systems etc		x				x									x	
8. Organization of CMR processes: materials, transport, machines					x	x		x	x	x	x					
9. Coordination and control of building		x			x	x	x	x	x	x	x					
10. Acceptance of work, handing over organizations for object operation		x				x										x
11. Usage or selling	x	x														x

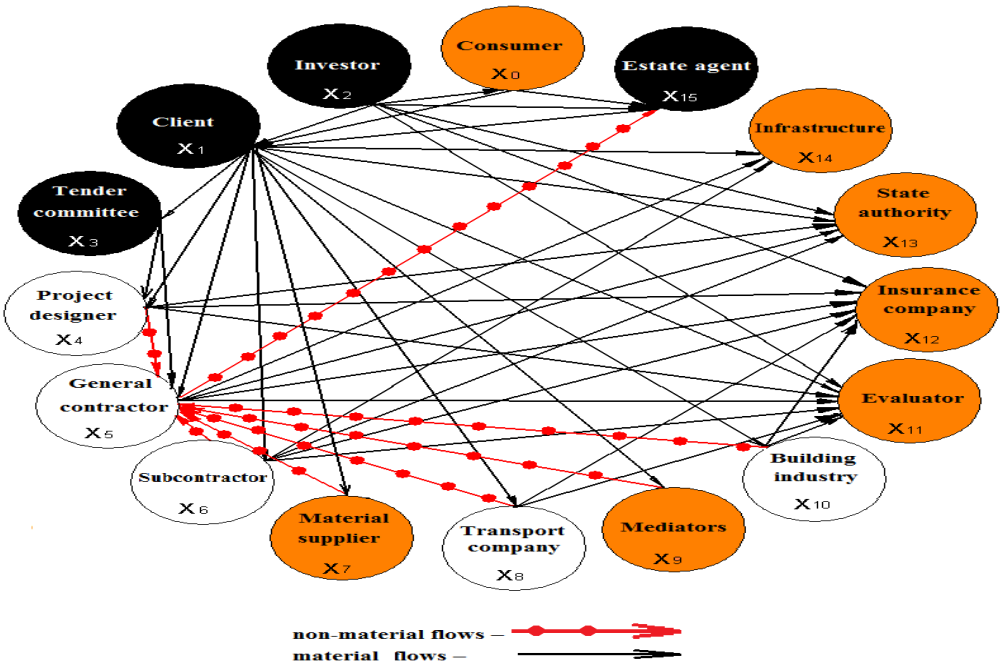

Figure 1 - Orgraphs of subject management in the investment building activity

The structure (Figure 1) is resistant to external influence, protected from risks and negative situations of economic character. The structure chosen by the enumeration of more than 100 solutions guarantees realization of investment building projects.

Thus, according to the results of modeling we can insist that company interrelations characterized as separate contracts should be represented for all lines in the investment building projects. The lack of some set of contracts leads to system breakdown. The contract web (arrows, Figure 1) is the best modeled option to form investment building activity. Thus, the problem solutions to form interrelations between investment building complex participants are based on the developed model of company cooperation. The structure of forming contract activity can be presented in the Table 2.

Table 2 - The structure of subject cooperation system in the investment building complex

Cooperation participant groups	System element	Element aims
1. Industrial subjects of the cluster	Project companies, general contract companies, subcontract companies, transport and building sector companies	Organization, planning, accounting and control of industrial processes in the building sphere
2. Organizational subjects of the clusters	Building client, building investor, tender committee, estate company	Organization, planning, accounting and control of investment and contract processes in the building sphere
3.1. Subjects of inner building circle	Building suppliers, mediator companies, insurance companies, consulting and engineering companies	Consulting and providing cluster group activity of the complex
3.2. Consumers of building products	Individuals and legal entities (citizens, infrastructure institutions, business sphere)	Organization of cluster group activities to solve personal or business problems
3.3. Subjects of government management over the building comp	Ministries and administrative authorities	Regulation of building complex activity to solve state problems

The modeling experience of company cooperation points out practicability of cognitive map application in complex management to regulate structural institution activities in the frame of realization of investment building projects and programs. Forming cluster groups on the basis of cognitive approach is a theoretical basis of organizational activity in the investment building complex under market economic conditions.

4. Discussion

Special characteristics of modeling in investment building complex

Company cooperation should be considered in the qualitative and quantitative aspect. The qualitative aspect is connected with structuring and influence characteristics. The quantitative aspect is characterized by a block of different contracts of an artificial person.

The qualitative aspects are considered as a basis for occurrence of quantitative characteristics in praxis. But qualitative aspects reflect completely sectorial specificity and business intercourse traditions.

The modern investment building complex comprises three management levels:

- in macro-level, federal structures are the management subject and the management object is regional structures representing a territorial variety of our country;
- on meso-level the management subject is regional structures and the object - building industry members;
- on micro-level the management subject is enterprises and organizations but the object is management of investment building projects and programs.

All levels interact with one another by means of connections. The building complex includes enterprises participating in investment building projects on the basis of horizontal connection and state authorities representing vertical connections in the complex (Shindina 2007, 400). Therefore, actual building complex is considered a multilevel system in which its elements are united on the basis of vertical and horizontal connections (connection – means of integrated, determinedand interdependent relation between things).

There is a harsh interconnection between management subjects and objects. The interconnection is centralized, vertical and having a reverse response. On the macro-level state organizations are interconnecting. They are federal structures and structures that are located in federal districts and territorial entities. The aim of interconnection on the macro-level is modeling of conditions for effective functioning of the whole building complex.

Meso-level aims are more concise. The meso-level considers realization possibilities of state building programs. On the meso-level management system of the building complex is divided into 2 types. The first type relates to building harsh vertical connections between regional authorities and enterprises making projects. Vertical connections are connections between companies, participating in investment building projects, and state authorities.

In centrally planned economy, vertical connections provided state control over building complex activity due to the harsh vertical management structure that united all enterprises of the complex. In market economy, part of enterprises, working in the building sphere, are private. The vertical state subordination emerges, if there are unitary enterprises in a country.

According to the economic essence such systems refer to a type of push systems (Figure 2) and relate to a small part of structural organizations in the building complex.

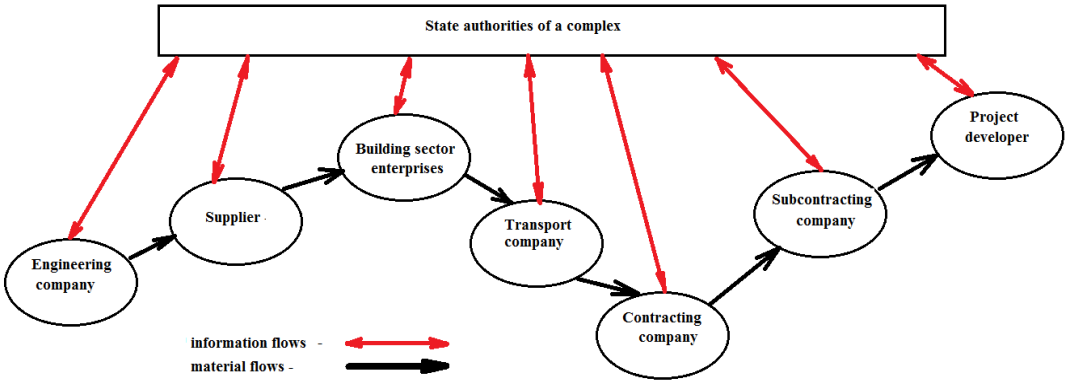

Figure 2 - Cooperation of centralized building complex

Under actual market conditions, vertical connections don't have a defined specific character. The state authority of managing building complex is characterized as integration where cooperation between the subject and the object occurs as an unevident form. Thus, state authorities control the building complex activity by conducting state policy that includes budget projects and legislative changes. The building complex responds to the national influence by following and accepting all game rules or avoiding them.As soon as the management object resists to the management subject, the government has to develop new mechanisms and leverages to

develop and control the complex (Shindina 2007, 400), Mikhailovna (2015, 39387-94), (Hallowell 2011, 592-599), Rey-Mari, Ribeiro-Soriano and Palacios-Marques 2016, 1651-55), (Chakraborty, Thompson and Yehoue 2016, 288-317), (Kind, Nilssen and Sorgard 2016, 101-112), (Sacchetti and Tortia 2016, 93-116), (Winch 2015, 106-116). Under market conditions the vertical connection arises only through the government influence over business company results. The results represent a system of investment relations of national investment building programs. According to economic essence such systems belong to a type of pull systems (Figure 3) that tend to horizontal connection. In this case, the management subject is interested in the result and the process of its accomplishment is not harshly subjected.

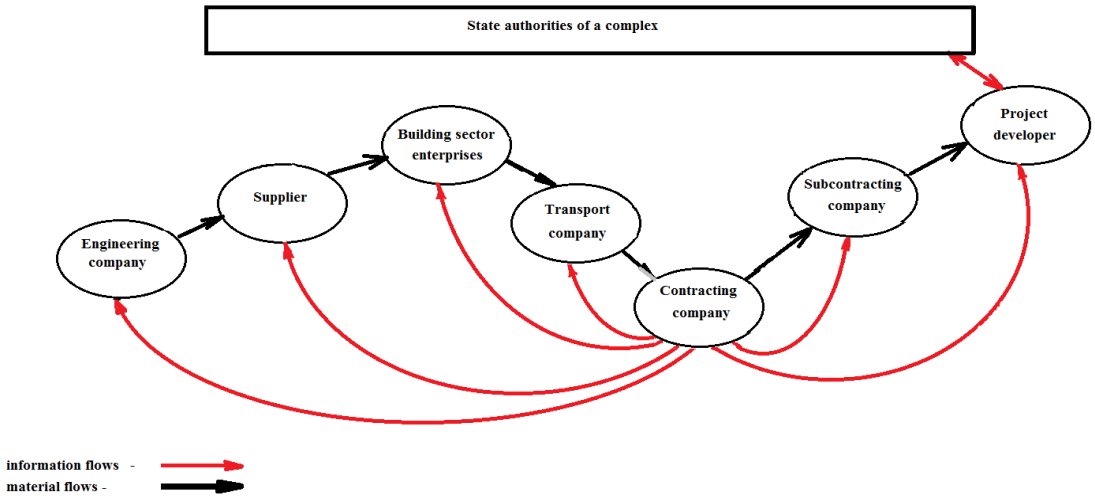

Figure 3 - Cooperation of market building complex

Buaye (2000, 64) argues that the balance between government and market relations can contribute to a condition of economic development in XXI century. It presupposes that the government interference should compensate market faults and the market should contribute to overcome these faults of government regulations by making business competition.

Thus, the meso-level of the building complex is represented as a social economic system in which government and market structures cooperate with one another on the basis of state interests and private goals.

The micro-level of the building complex has less government influence. The level being at the stage of considering building projects is formed for specific project accomplishments and managed by many centersthat are not connected with one another. The micro-level contains two types of the system. The first type – “Contract system”. Systems on managing projects have no internal connections between management subjects. Everything depends on situations and results of contract activity. The project success is dependent on its organization structure, *i.e.,* aggregation of cooperative management bodies placed on different levels of the system. Also, the success stands on an organizational form, *i.e.,* interrelations and cooperation between all participants of the investment building process. Such structures have short economic life, high risk components and are not subjected to generalization. The second type - "Cluster system". Systems representing some incorporation in which participants of the building project have a range of special functions. Such systems occurred due to compensation of contract system faults asthe result of looking for the most advanced organizational management forms. The necessity to form such systems is to combine actual tough requirements with technical level, object quality and growing individualization of market requests to minimize costs and of terms of projects. The cluster system comprises industrial incorporations agricultural firms of the building complex.

Conclusion

According to the results of the organizational activity analysis, development and special characteristics of investment building projects in the building complex it’s essential to form organizational structures. Organizational structures are abstract representations of state of business, correct behavior in staff and society, independence degree of actions and business sphere in which these actions are performed. Besides, organizational structures are models that help to comprehend such characteristics as discipline and disorder, to prove stability of one structure and insecurity of the other, to discuss about methods and practicability of changes or to reserve the practical state of a situation.

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Trade Creation and Trade Diversion in the European Union after Creation of Single Market

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Abstract:

The paper analyses the impact of creation of Single European Market in the European Union on the world economy. To test empirically if there have been some effects of trade creation or trade diversion in the trade flows of the European Community, the simplified version of the gravity model regression with appropriate dummy variables for the European Union membership are used. The analyses throughout the years 1992, 1993 and 1994 conducted with data for 14 countries (7 member countries of EU and 7 third countries) shows, that even though the EU membership of both countries affects the exports of one to the other member country positively, there is no evidence of the trade creation effect in 1993, when the Single European Market as such had been created.

Keywords: economic integration, efficiency of European integration, trade creation, trade diversion, trade creation and trade diversion.

JEL Classification: F14, F15.

1. Introduction

European Union (EU) as the biggest integration bloc in the world economy undoubtedly has a big impact on the trade flows on the global level. The creation of the Single Market of approximately half a billion of inhabitants has a great production potential, but on the other hand the extensive demand of its high income member countries attract the exporters from abroad. One of the main goals of the economic integration within the EU was to enhance the mutual trade between the member countries by withdrawal of the tariff barriers. The aim of this paper is to empirically analyse whether there was a positive impact of the economic integration in EU on the trade creation between its member states and if we can observe any impact on the trade diversion with the third countries. We use the enhanced gravity model to find out the effect of creation of the Single European Market on the world economy.

Trade creation and trade diversion are processes observed in the world economy, which emerge after the first stages of the economic integration (free trade area or customs union) and leads to change in the volume and direction of the trade flows. Trade creation is identified, when the new trade flow occurs or the existing one rises significantly. It can be welfare improving, when the imports replace the non-effective, high-cost domestic production. On the other hand, trade diversion is the opposite, welfare reducing process, where the trade flow is diverted from the original third-country supplier to the new partner within the integration bloc, because of the decrease of tariffs, even though the old supplier could be more efficient. Leading force in these processes is the elimination of tariff barriers. The economic integration is effective when the trade creation prevails over the trade diversion effect. In practice, the outcome may differ by every single traded product.

Based on the extensive existing work researching the effects of economic integration, we have set our aim to be to research of the effect of creation of the Single Market in the European Union. Single Market of the European Communities started to develop already since the end of the 1950s with the establishment of the ESUO and Euratom and had been further expanded in the 1968, when the stage of the Customs Union had been reached. Except of the abolition of tariffs and the common tariff policy towards third countries, the Single Market as the higher stage of integration consists of free movement of goods, free movement of services, free movement of people and free movement of capital, should have been reached. It means that not only tariffs but many other existing berries of the free movement had to be dissolved. Even though the functioning of the single market is still not perfect and there are many barriers remaining, it was officially launched in 1993, when most of the barriers had been dismantled.

To test empirically the effects of the trade creation and trade diversion, we have used the gravity model. The gravity model is one of the most commonly used tools to analyse the mutual trade of countries as well as the trade of regional trading agreements. It is based on the regression of trade on the series of explanatory variables, which have the most important impact on the trade between countries. The most common variables are the mutual volumes of trade, gross domestic product (GDP) of the countries, distance between the countries, number

of population or GDP per capita etc. List of dummy variables are added in the papers, to mention a few it can be a common border, common language, some important historical or cultural ties and other. In our paper, the dummy variables will be used to prove, whether the fact of integration in the EU has an impact on the trade of these countries.

The structure of the article is as follows: The first section introduces the topic and the aims of the paper. The second part consists of the literature review on the subject matter, what constitutes the theoretical base and the framework of the empirical analyses, which is further described. The third part is deducted to the introduction of the development and the current level of integration in the EU. In the fourth part the empirical part of the paper is presented, the data, methodology and the model are closely explained. In the end of the paper, the results of the analyses are presented and they are summarized in the conclusion.

2. Literature review

The traditional classic economic theory claims, that free trade is the best solution for effective functioning of the economy. That's why it was long assumed, that a preferential trading agreement or a customs union is improving welfare, because at least some of the tariffs are reduced. Later on, the analyses of the preferential trading areas started to deal with the effects of trade creation and trade diversion, which describe the effectiveness of the integration bloc. The difference was in the finding that the preferential agreement doesn't need to be always advantageous for all the players on the world scene.

The topic of the effectiveness of regional integration groups was researched by Jocob Viner, Chicago school economist in 1950, who first defined the terms of trade creation and trade diversion. Viner conducted the static analyses of the trade creation and trade diversion effects (Viner 1950). Since than on, Viner's model had been further studied and developed. Johnson used the partial equilibrium diagram to explain trade creation and trade diversion economic effects of the regional trading agreements (Johnson 1960). Others, for example El-Agraa (1998), Jovanocich (1998) or Robson (1998), used the Viner's model and studied the trade creation and trade diversion effect statically as well. In 2009, R.T. Dalimov came with the dynamic tool to the analyses, which he executed by the one-dimensional Navier-Stoxes equation used in physics to calculate the dynamics of the flux of liquid or gas. Dalimov had validated the Viner's trade creation and trade diversion effects even by the dynamic model (Dalimov 2009).

Two major approaches to study of the economic integration effects are the ex-post and ex-ante studies. The ex-post studies are concentrated on examining trade flows after the integration had been accomplished and they compare actual levels of trade with the predictions of trade in case the integration wouldn't be implemented. The ex-ante studies predict the impact of eliminating trade barriers between partner countries, using usually the estimated elasticities or the general equilibrium model.

Aitken was first to use the Tinbergen's gravity model to analyse the processes of trade creation and diversion in the integration groups (Aitken 1973, Tinbergen 1962). Others (including George *et al.* 1977, Frankel and Kahler 1993, Frankel and Wei 1995, Krueger 1999, Clausing 2001 and others) used gravity equations as well to examine also the other integration groups outside the Europe. The problem of this approach is that we cannot measure the extent of trade creation and trade diversion, but despite of that it is very popular by the analyses of the economic integration effects.

Previously mentioned studies have many critics as well. For example, Krugman had disproved the trade creation and diversion effects by arguing, that the mutual integration is conditioned by the previously significant bilateral trade levels, which is by itself trade creating. Krugman's most important factors to influence the volumes of trade are the trade costs and historical ties between the trading partners (Krugman 1991). Similar logic is used by Magee, who empirically tests that higher trade between the countries leads to forming of trade agreement between them (Magee 2003).

Balassa concentrates on studying the effects of integration in the European Community. He applies the comparison of ex-post income elasticities of import demand in intra- and extra-area trade in the periods prior and after integration. His findings show a positive trade creation, but no evidence for trade diversion effect. In addition, the results differ in various commodity categories (Balassa 1967).

By simple observation of the intra-union trade and its share of the total union trade, many would conclude, that the rise of intra-union trade automatically means that trade is created. But this fact can be explained by the rising importance of the European Union and its competitiveness in the world markets (Balassa 1967). Furthermore, today we cannot claim this anymore, because by the rising position of the new emerging market in the world economy, the share of the EU's trade on the world trade is continuously declining.

Lamfalussy had compared the shares of European Community as an import market, in the exports of member and non-member countries in the 1960s, but he didn't find evidence for trade creation nor for trade diversion. (Lamfalussy 1963). Using the trade matrix for calculating the hypothetical trade flows and comparing them with the actual ones, Waelbroeck had come to a conclusion, that the European Common Market has a huge impact on the world trade composition (Waelbroeck 1964). But from the model it was not evident, whether the trade creation or the trade diversion effect prevails. That is why Waelbroeck uses the Tinbergen's gravity model regression analysis further on as well. Even though the model had come to similar results and had shown, that from 1958 to 1962 trade had been created in the EEC, it cannot be assigned to be the integration effect, while before the Common Market creation in 1954 the same result had been reached.

The choice of the countries, their number and types of economies, is also important for the result of the gravity model (Haveman and Hummels 1998). Differences in the sample of the countries used in the gravity model can lead to different outcomes. The results of the gravity model are very sensitive to the variables which are used in the regressions, as well as the researcher's prior beliefs (Ghosh and Yamarik 2004), therefore their choice is very important. Hamilton and Winters (1992) established that the trade preference group variables consisting of the developing countries were statistically less significant in the intra-union trade.

3. Process and state of integration in the European Union

European Union is considered to be the biggest integration bloc in the world economy today. It is seen as economically open, free trade supporting grouping of already 28 member states. No doubt that EU has a big impact on the world economy and international trade as whole. Only the intra-union trade makes up a 20 % share on the world economy today. When we consider the extra-union trade, then we add another 30 % of the world trade, in which EU takes part.

Single European Market (SEM) is a cornerstone of the economic integration in the EU. Creation of an area with a free movement of goods, services, people and capital was one of the first and still is one of the most important goals in the European integration. History of SEM's building dates back to the 1950's, when the four freedoms have been defined in the Treaty establishing the European Economic Community (1 January 1958). Although, according to several experts, the EU had at that time focused on the creation of a customs union, which was successfully reached in 1968, it lacked a fixed timetable for the elimination of other barriers, which would help to fulfil all aspects of the single market. Despite the creation of a customs union, which abolished internal tariffs between the member countries and established a common customs tariff towards third countries, free movement of goods within the European Community was not perfect. In addition, except of the abolition of tariffs there have been further non-tariff barriers that hampered free trade. Liberalization of the other freedoms of the market had been developing very slowly.

To proceed in the building of SEM, European Commission had adopted the White paper about Completing the Single Market (European Commission 1985), where concrete steps and time framework was set up. Based on this white paper, the SEM had to be completed till the end of 1992. Even though many experts doubt that the project of SEM had not been fulfilled within this framework, and its functioning today is still not perfect, this date is commonly accepted as the date of creation of the Single European Market. That's why we are concentrating on this date in our further analysis in this paper.

The year 1993 is also the date, when the European Communities had been transformed into the European Union based on the Maastricht Treaty.[11]

We assume that the real consideration of the trade creation and trade diversion effects in the early stages of the integration, especially shortly after the 1993, when the Single Market had been created, would be important for the future integration plans as well as for the concrete policies adopted for the Single Market completion.

4. Data, methodology and specifications of model

The gravity model is often used not only in economics because it is quite simple, good explainable and it has a statistical explanatory power. Based on the previously mentioned research works, that are using the gravity model, we decided to use it as well. The basic and simplest formulation used in the studies of international trade is as follows:

[11] Because the analysis uses the breakthrough years 1992 till 1994, the names EC and EU are used identically in our paper, regardless of the fact, that the EU have come into existence only in 1993. As Member States in the analysis are considered the countries, which had been actually EU members in the concerned year.

$$X_{ij} = a_0 Y_i^{a1} Y_j^{a2} D_{ij}^{a3} e_{ij} \quad (1)$$

where X_{ij} is the flow of goods from country *i* to country *j*, Y_i and Y_j are incomes of countries *i* and *j*, D_{ij} is the distance between countries *i* and *j* and the e_{ij} represents the error term. *a* is the parameter of proportionality.

Throughout the research papers, we can find many different formulations of the gravity model equation, adding new parameters to the equation attempting to explain some aspects that might not be caught by the others. Some of such examples are added to the Equation 2, but there are even many more. Most likely they wouldn't be used all in one single equation; we present them just for an example.

$$X_{ij} = a_0 Y_i^{a1} Y_j^{a2} N_i^{a3} N_{ij}^{a4} D_{ij}^{a5} C_{ij}^{a6} L_{ij}^{a7} B_{ij}^{a8} e_{ij} \quad (2)$$

where N_i , N_j are populations of countries *i* and *j*, C_{ij} is a dummy variable for the cultural similarity of the countries *i* and *j*, *L* a dummy variable, which has a value 1 when the countries are using a common language, which can make the trading relations simpler, and *B* would be a dummy variable for common border.

Because of the practical mathematical simplification, the gravity equation is usually used in its logarithmical form:

$$\log X_{ij} = \log a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log D_{ij} + \log e_{ij} \quad (3)$$

To calculate the impact of the Single Market establishment through the trade creation and trade diversion effects we are adding 2 special dummy variables EU_{both} and EU_{one} to our equation. EU_{both} will be value 1 when both countries *i* and *j* are members of EU and EU_{one} dummy variable will be value 1 when only one country from the pair is a member state of the EU. As the basis for our estimation, we used the similar methods as some researchers did in the past for other integration groups (Endoh 1999, Muhammad and Yucer 2009). Our reestimated model equation with the dummy variables for EU membership will be as follows:

$$\log X_{ij} = \log a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 Dij + a_4 EU_{both} + a_5 EU_{one} + \log e_{ij} \quad (4)$$

Concerning the whole Equation 4, using these dummy variables we will be looking at how the trade is influenced based on the fact, that it is conducted between 2 member countries, or between a member country of EU and a third country. When the regression coefficient will be higher by the EU_{both} dummy than by the EU_{one} dummy, that would show that membership in the EU positively influences the mutual trading relations of the partners.

We have run 3 regressions with the same data for years 1992, 1993 and 1994 to see the differences caused by the Single European Market created in 1993. Comparing the results of these three regressions we will also be able to evaluate the trade creation and trade creation effects in the time. If the regression coefficient of EU_{both} dummy will rise in time, the trade creation effect will be observed. On the other hand, when the EU_{one} dummy will rise in time that would mean that the trade diversion effect is present, as the EU member countries will increase their export to the third countries.

To have enough observations in our dataset but to keep it manageable and taking into account also the availability of the data needed, we have chosen 7 member countries of the European Community (which were members in 1992) and 7 third countries[12]. First we wanted to have the same number of the countries in and outside of the EC. For the purpose of our analyses, Sweden is considered as a third country, which became a member state only in the year 1995, shortly after the time, in which we are conducting our analyses. As the other third countries, we have chosen the most important trading partners of the EU, because calculating the regression results with the data for minor trading partner would bring irrelevant outcome that could be applicable only to the case at the issue. We incorporated the third countries from more parts of the world and developing as well as developed countries. First we have run the regression using USA as the eight countries outside the European Union, but because of its huge trading position with almost all the countries in the world, we have left it out of the final regression, as it had inconsistently influenced our model.

One of the discussed issues by the gravity model equation is, whether the trade should be represented by the total trade between the partners (export from i to j + import from j to i) or to use only the value of export from i

[12] The countries included in the analyses are: Denmark, Germany, Greece, Ireland, Netherlands, Portugal, Spain, Sweden and Brazil, Canada, China, Japan, Korea, Turkey.

to j as the dependent variable. We are using export data as a dependent variable, because it answers better our question. We are considering the export from EU countries to other member states as well as third countries, to consider whether the membership in the EU influences the export to the partner country positively, or whether the fact that both partners are member countries of EU have a positive impact on the exports of one to the other. To be able to answer the concerned question in complex, in our regression we are using also the data for the mutual trade of the chosen third countries.

The data for exports were used from the UN Comtrade database. As values of the Y variables are in the papers mostly used the GDP of the countries i and j. We have used the GDP at current USD values from the database of World Bank. The distances between the countries represented by the shortest straight line distances between their capitals had been calculated on the specialized website www.http://distancecalculator.globefeed.com.

5. Results

The regressions have been carried out in the EViews 8.0. The detailed outcomes of all regressions can be found in the Appendix 1 of the paper.

Even though that the regressions have proven the positive impact of the EU membership on the exports from one member state to other, as the coefficients of dummy variable EU_{both} are in all three cases positive. However, the fact, that this regression coefficient is declining from 0,63 in 1992 to 0,57 in 1993 and all the way to 0,51in 1994 leads us to rejection of the fact of trade creation in the European Union in years 1993 and 1994.

Table 1 - Summarized results of the regression analyses of the gravity model

Year	1992		1993		1994	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	-32.24450	0.0000	-29.46726	0.0000	-29.67221	0.0000
LOG(GDP1)	1.056908	0.0000	1.009981	0.0000	1.004419	0.0000
LOG(GDP2)	0.949791	0.0000	0.892876	0.0000	0.910882	0.0000
DIST	-0.000185	0.0000	-0.000172	0.0000	-0.000191	0.0000
EUBOTH	0.630967	0.0022	0.571279	0.0055	0.508687	0.0123
EUONE	-0.460598	0.0054	-0.309469	0.0628	-0.365644	0.0269

Source: calculations of the author in EViews statistical software based on the data from sources mentioned in the paper

Surprisingly, the EU_{one} coefficient is negative in all three regressions. A significant decline of the coefficient from -0,46 in 1992 to -0,31 in 1993 shows a possible trade diversion effect, but the coefficient declines in 1994 to the level of -0,37 again.

Compared to other researches, that had conducted similar test for some different time periods (for example Aitken (1973) of Frankel (1993)), which lacked the statistical significance for their EC dummy variables, the EU_{both} variable in our model is statistically significant in all the three regressions. In addition, our model, in contrast to the previously mentioned, ads the trade diversion aspect in the analyses expressed by the EU_{one} dummy variable, which was previously not distinguished from the trade creating effect. Anyway, the EU_{one} dummy variable in the year 1993, where the modest trade diversion effect had been shown, lacks statistical significance. But as the P-value for this variable exceeds the commonly accepted level of significance below 5% only by 1%, we can conclude that this doesn't mean a serious problem for our results.

Conclusion

It is evident, that the preferential trading integration groups are changing the world trade structure. This can be said even about the European Union, which is the biggest integration group in the world economy today. The intra- and extra-union trade is responsible for one of the biggest shares of the world trade. Despite of the fact that many studies have proven the trade creation effect of the European Community or later European Union, our research of the period or years 1992, 1993 and 1994, when the Single European Market had been created (in 1993) had not showed any evidence for the trade creation effect in the European Union. Surprisingly we have calculated a trade diversion effect in year 1993, but the regression result was slightly over the 5 % limit for the statistical significance.

The fact of not finding the evidence for the trade creation in the European Union in the time of Single Market creation can have many reasons. We can conclude that the changes experienced in the year 1993 had been most probably implemented for a very short time to be reflected in the traded volumes of goods already in the year 1993 or in 1994 respectively.

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Appendix 1 – Outcomes of the regression analyses from EViews

Regression of data from year 1992

Dependent Variable: LOG(EXPORT)
Method: Least Squares
Sample: 1 182
Included observations: 182

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-32.24450	2.434948	-13.24238	0.0000
LOG(GDP1)	1.056908	0.062747	16.84389	0.0000
LOG(GDP2)	0.949791	0.061701	15.39336	0.0000
DIST	-0.000185	2.01E-05	-9.179824	0.0000
EUBOTH	0.630967	0.202758	3.111925	0.0022
EUONE	-0.460598	0.163497	-2.817169	0.0054

R-squared	0.760937	Mean dependent var	19.99328
Adjusted R-squared	0.754145	S.D. dependent var	1.774244
S.E. of regression	0.879736	Akaike info criterion	2.614022
Sum squared resid	136.2127	Schwarz criterion	2.719649
Log likelihood	-231.8760	Hannan-Quinn criter.	2.656842
F-statistic	112.0415	Durbin-Watson stat	1.231068
Prob(F-statistic)	0.000000		

Regression of data from year 1993

Dependent Variable: LOG(EXPORT)
Method: Least Squares
Sample: 1 182
Included observations: 182

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-29.46726	2.383329	-12.36391	0.0000
LOG(GDP1)	1.009981	0.061525	16.41565	0.0000
LOG(GDP2)	0.892876	0.060224	14.82587	0.0000
DIST	-0.000172	2.03E-05	-8.490954	0.0000
EUBOTH	0.571279	0.203331	2.809600	0.0055
EUONE	-0.309469	0.165264	-1.872578	0.0628

R-squared	0.737718	Mean dependent var	20.06175
Adjusted R-squared	0.730267	S.D. dependent var	1.694188
S.E. of regression	0.879892	Akaike info criterion	2.614375
Sum squared resid	136.2608	Schwarz criterion	2.720002
Log likelihood	-231.9081	Hannan-Quinn criter.	2.657195
F-statistic	99.00656	Durbin-Watson stat	1.215317
Prob(F-statistic)	0.000000		

Regression of data from year 1994

Dependent Variable: LOG(EXPORT)
Method: Least Squares
Sample: 1 182
Included observations: 182

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-29.67221	2.335235	-12.70631	0.0000
LOG(GDP1)	1.004419	0.059927	16.76073	0.0000
LOG(GDP2)	0.910882	0.058816	15.48694	0.0000
DIST	-0.000191	2.04E-05	-9.351555	0.0000
EUBOTH	0.508687	0.201180	2.528522	0.0123
EUONE	-0.365644	0.163820	-2.231987	0.0269

R-squared	0.747574	Mean dependent var	20.17592
Adjusted R-squared	0.740403	S.D. dependent var	1.715236
S.E. of regression	0.873925	Akaike info criterion	2.600767
Sum squared resid	134.4190	Schwarz criterion	2.706393
Log likelihood	-230.6698	Hannan-Quinn criter.	2.643586
F-statistic	104.2468	Durbin-Watson stat	1.251528
Prob(F-statistic)	0.000000		

Retesting Financial Decoupling Hypothesis: Empirical Study

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Abstract

In this article, we set ourselves a task to test financial decupling hypothesis by studying 18 national credit cycles in developed and developing countries, using monthly data on growth rates of loans to nonfinancial sector for the period from January 2002 to January 2015. The purpose of this article is empirical testing of two hypotheses: validity of financial decoupling for developing economies and empirical testing of Russian credit market's sensitivity to shocks in other national economies. In result, we come to the following conclusions. Firstly, the relationship between credit cycles of countries in the sample over the studied period exists and persists in the short, and is absent in the long run. Secondly, testing the financial decoupling hypothesis between developed and developing countries does not confirm it in its classic state. In the short run, a number of sampled developing countries are sensitive to external credit shocks from developed countries. Third, we have found presence of both long and short-term sensitivity of Russian credit market to shocks in both developed and developing countries. These results confirm the necessity of reconsidering conventional theory of credit market and international finance, and also have to be taken into account when conducting national monetary policy.

Keywords: credit cycle, credit risk, credit market, financial decoupling, financial convergence, elasticity.

JEL Classification: B26, E32, F34.

1. Introduction

The acceleration of economic growth and growth of the financial sector of several developing countries in Latin America and Asia, amid the steadily low rate of developed countries, has led in the late twentieth century to emergence of a hypothesis, according to which the scale and complexity of markets' organization in developing countries has reached such a level that the influence of developed markets is eroding. In other words, it is assumed that stability of national economies and financial markets of developing countries to exogenous shocks has increased significantly, and the sensitivity, on the contrary decreased. This empirical observation, based on prevailing performance of economic sectors, stock markets and banking systems in developing countries over developed countries (primarily the US), has pushed research and expert circles to the extension of the divergence (decoupling) hypothesis. Moreover, this hypothesis applies to economic sectors (economic decoupling) as well as to financial ones (financial decoupling).

The essence of decoupling hypothesis varies and covers different aspects of relationship between national economies and financial markets. For example, in some cases, decoupling hypothesis reflects a degree of synchrony in the movement of national business cycles and their dependencies from each other. In other cases, one can talk about a degree of sensitivity of national financial markets to shocks in demand or technological shocks in other markets.

In this study, because of a number of reasons listed below we consider only financial decoupling hypothesis.

Since a theoretical core of this hypothesis is the question of flexibility, sensitivity to shock phenomena and, consequently, the synchronicity between national economies' and financial and credit markets' dynamics, one of the best approaches to study viability of this hypothesis would be using theory of credit cycles, which takes into account dynamic aspect of credit market on the one hand, and also allows to account for the crisis component, as implementation of accumulated risks and thus analyse an impact of shocks on the credit market of one country to the other and to identify channels of transmission in both the short and long run.

Thus, testing viability of financial decoupling hypothesis - divergence of trends on financial markets of developed and developing countries, is not so much an academic challenge, "science for science's sake", as an objective necessity, which is dictated by a goal of improving credit market's regulation in the national economy, ensuring financial stability of the latter, and thereby facilitating, to a certain extent, achievement of global financial stability. A clear understanding of an absence or presence and extent of sensitivity of some credit markets to dynamics of others will form a theoretical basis for development of instruments aimed at reducing volatility on financial markets, timely response to international capital flows and countering financial crises.

Due to abovementioned facts, testing financial decoupling hypotheses in the light of credit cycles seems to us to be relevant, timely, and appropriate to current goals and objectives of international financial regulation.

2. Literature review

The current state of financial decoupling hypothesis research can be divided into three arrays. The first block of studies is associated with the identification of decoupling, lack of synchrony on the markets of goods, services and capital. The second set of studies refutes financial decoupling hypothesis, presenting arguments in favour of existence of synchronicity and sensitivity of emerging markets to shocks in developed countries. The third set of studies includes determination of characteristics of sensitivity of national financial and credit markets to changes on developed markets. In other words, the third line of research defines the process of divergence-convergence of the existing context and specific channels of transmission.

First, second and third area of research are characterized by the use of different research methods, lines of argumentation and conclusions.

We shall consider each of these areas, including economic decoupling in order to highlight variety of methods to study the issue.

A number of researchers dedicates their work to the analysis of economic decoupling hypothesis. One of the most well-known papers on this subject is the study of Kose et al (2008), in which regression analysis of the degree of business cycles synchronicity of 106 countries in the sample over the period from 1960 to 2005 is carried out, Dividing countries on regions, the study implied averages of output growth rates. The main result of the study was that in the period from 1985 to 2005 synchronicity between business cycles of developed and developing countries is absent. Kose and Prasad (2010) came to the same results in the study based on the use of longer time series for the countries in the sample two years later. The authors of the World Economic Outlook published by the IMF, based on the method of decomposition of variance of data on global, regional and country levels also come to the conclusion that over the period from 1985 to 2005 regional relationship between the samples of developed and developing countries played a key role in explaining business cycles (GDP growth rate). To similar conclusions, using methods of regression analysis came Yeyati and Williams (2012). On the basis of regression analysis of volatility relationship between GDP growth rates of selected developing countries and countries of the G7, authors obtained a positive, stable and statistically significant value of beta-coefficients, which indicates one-directional movement of sampled economies.

However, there is an alternative point of view, according to which decoupling of national economies do not exist or is weak. *For example*, one of the most famous studies denying the decoupling hypothesis is a paper by Welty (2009), which is based on the analysis of 34 developing countries and 29 developed countries, allocated in different groups, for the period 1980-2007. The author, based on the assessment of deviations of GDP from a long-term trend, given the time lag and using methods of statistical filtration, came to conclusion that the relationship between developed and developing countries is strong enough and is not inferior to synchronicity of business cycles of developed countries.

The increasing criticism of financial decoupling hypothesis was associated with large-scale expansion of subprime mortgage crisis in the United States and the beginning of the Great Recession. For example, in paper by Wyrobek and Stanczyk (2013), based on regression analysis of relationship between business cycles in developed countries and Poland, authors argue that sensitivity of an economy to shocks in economic systems of developed countries is statistically significant and significant in 5% confidence interval. To similar conclusions come Baxter and Kouparitsas (2005), Leamer (1983) and Imbs (2006). These studies examine an effect of increased international trade (flows of goods and services) on synchronicity of business cycles in different periods. The authors come to conclusion about the presence of synchronicity in movement of sampled national economies.

In the case of financial decoupling, situation is very similar. For example, Imbs (2004) and Inklaar et al (2008) in their studies argue that financial integration helps synchronizing movements of not only national economies but also financial markets. In contrast, proponents of financial decoupling (Bordo and Helbling, 2004), using VECM to detect long-term dependencies could not find confirmation of importance of financial integration on synchronization of business cycles and financial markets. In the paper studying impact of integration of capital markets on synchronicity of national economies, Kalemli-Ozcan *et al.* (2001) also comes to conclusion about unimportance of this factor, due to the fact that integration of capital markets leads to increased division of labour and industry concentration of national economies, which leads to a decrease in synchronicity of sampled national economies' output.

Results of analysis of financial markets' decoupling-recoupling are also quite ambivalent. Typically, researchers use data on securities traded on stock exchanges, or may use risk premium values to reflect the synchronicity. *For example*, Miankhel etc. (2010) testing the hypothesis on the basis of US mortgage crisis 2007,

comes to conclusion about existence of various transmission channels of shock phenomena having potential impact on capital markets' synchronicity. Among them, he points out international capital flows, effective federal funds rate, as well as trading volumes on stock exchanges. The author concludes that synchronicity of financial and business cycles is context dependent on nature of the shock. To similar conclusions come Floros *et al.* (2013). Using data on risk premium on futures traded on the Greek stock market, authors come to conclusion that the national debt crisis in Greece served as a factor that strengthened convergence on financial markets of European countries. One of the few papers on financial decoupling hypothesis, using data on dynamics of credit markets, is the work of Stolbov (2014), in which a VAR model is used to determine relationship between national credit markets at the regional level. The author uses annual data on credit-to-GDP ratio between 1980 and 2010 and comes to conclusion about existence of relationship at the regional level of sampled national credit markets. However, in this study the author did not set a task of testing financial decoupling hypotheses, and applying credit-to-GDP ratio may not be the best indicator of synchronicity between financial markets.

Thus, considering positions of various researchers, it can be assumed that a single and generally accepted point of view regarding financial decoupling hypothesis in modern research community does not exist. It is also important to note that studies, testing this hypothesis for credit markets are few or absent.

This fact determines a purpose and objectives of this study. In this article, we set ourselves following objectives: to test the financial decoupling hypothesis on the example of national credit cycles and to determine presence/absence and nature of sensitivity of Russian credit market to exogenous shock on credit markets in developed and developing countries.

3. Methods of research

This section describes the tools and outlines hypotheses underlying our study.

Sample composition.

To conduct research to identify presence of financial decoupling/recoupling between developed and developing countries and testing this hypothesis on the Russian financial sector, we choose 18 developed and developing countries. In the sample of developed countries are included the USA, UK, Germany, France, Italy, Spain, Portugal, Czech Republic, Norway, Finland, Sweden. In the sample of developing countries, we include India, Indonesia, Malaysia, Brazil, Mexico, Turkey, Poland and Russia.

Therefore, composition of the sample allows to test the hypothesis on example of various national financial markets with their inherent specificity, structure and characteristics of the relationship even when continental heterogeneity is present.

Sampling period.

The sampling period represents a time period for which the selected variables for the analysis are used to test proposed hypotheses. In our case, sample period includes data from January 2000 to January 2015, base period for calculations is 1 month. Choice of monthly values in contrast to using annual values of loans to non-financial sector's growth rate or using quarterly values of credit-to-GDP gap, is explained by the fact that the use of monthly statistics allows, to a greater extent, reflecting sensitivity of national credit markets to shocks and thereby enhances reliability and statistical significance of the analysis.

Information sources.

Statistical data on national credit markets in the sample is obtained from official sources, including national statistical agencies and national statistical database, Central or Reserve banks of countries in the sample.

Hypotheses of the study and methods of verification.

Methods of analysis, used in this study, include: comparative analysis, dynamic analysis, correlation and regression analysis. In order to empirically test viability of the thesis on existence of financial decoupling between developed and developing economies, we put forward several hypotheses.

The *first hypothesis:* during the sampling period, functioning of credit markets in developing countries is independent from credit markets of developed countries and sensitivity of developing countries in the sample to exogenous shocks in developed countries is either absent or statistically insignificant.

The second hypothesis assumes that Russian credit market, according to financial decoupling hypothesis, is insensitive to shocks on credit markets of developed countries.

Verification of hypotheses is performed by studying synchronicity of national credit cycles (cycles in corporate lending). The credit cycle is a formal manifestation of the cyclic patterns of credit market dynamics. Thus, verification of these hypotheses allows to reveal peculiarities of credit markets, their degree of synchronicity and amplitude of oscillations and sensitivity of national credit markets to exogenous shocks.

In case of comparative study, we use correlation analysis that can identify presence or absence of relationship between national credit cycles, as well as negative or positive nature of this relationship. However, it is important to remember that the results of correlation analysis of time series do not allow removing problem of a time lag – a delay in the reaction of a dependent variable from one side. On the other hand, results of correlation analysis may be false due to presence of serial correlation in the variables.

In this regard, the best for the purpose of the study is to use regression analysis in order to eliminate these problems with potential deterioration in quality of results.

However, even when using a regression analysis there is a risk of obtaining spurious regression. Because the analysis of time series in most cases is associated with non-stationarity of data, presence of serial correlation and heteroscedasticity, not to mention presence of seasonal effects, the first step of the study is the use of statistical methods of filtering and obtaining stationary data for the study.

To filter sampled time series and obtain smoothed series in order to identify relationship in the long-run we use Hodrick-Prescott filter. The resulting time series consist of a set of elements that minimizes the following expression:

$$\sum_{t=1}^{T}(y_t - s_t)^2 + \mu \sum_{t=2}^{T-1}((s_{t+1} - s_t) - (s_t - s_{t-1}))^2 \rightarrow min$$

In order to resolve the problem of nonstationarity of data, all data sampled are tested for presence of unit root using traditional advanced test Dickey-Fuller (ADF test). The required number of lags is determined by Informational Akaike Criteria and Schwartzman Criteria.

$$\Delta y_t = \delta + \beta_t + \pi y_{t-1} + \sum_{j=1}^{p} c_j \Delta y_{t-j} + \epsilon_t$$

where δ is a constant, t is the trend value, y_t– investigated variable of a time series, for example, dynamics of credit market of the Russian Federation or the United States, $\in_t$– meaning of "white noise" or error; the null hypothesis (H_0) is π=0 (unit root), alternate (H_1) - $\pi < 0$ (stationarity).

The second stage of the analysis both the first and second hypotheses, is to test analyzed time series for the presence of cointegration by applying the Johansen Cointegration Test to determine presence or absence of relationship between the variables in the long-run. In absence of cointegration between the elements of the sample, a more appropriate method of regression analysis would be the use of unrestricted vector autoregressive model (VAR):

$$Y_t = a_0 + a_1 Y_{t-1} + ... + a_p Y_{t-p} + b_1 X_{t-1} + ... + b_p X_{t-p} + u_t$$

$$X_t = c_0 + c_1 X_{t-1} + ... + c_p X_{t-p} + d_1 Y_{t-1} + ... + d_p Y_{t-p} + v_t$$

where Y_t is the value at time t of the credit cycle of country Y (resulting variable), X_t is the value at time t of the credit cycle of country X (dependent variable).

Regression analysis of sampled elements through the use of VAR model will allow us to determine existence of substantial and statistically significant relationships not only from values of other sampled countries, but also dependency on previous values of dependent variables. However, the VAR model must meet the requirements of absence of serial correlation, heteroscedasticity of residuals and meet the requirement of stability. Only in this case, obtained results can be considered true.

The last stage of analysis of relationship and its direction is the use of the test to identify Granger causality. Thus, rejection of null hypothesis of Granger causality test (H0), according to which:

$$b_1 = b_2 = ... = b_p = 0,$$

in favor of alternative hypothesis (H1) suggests that a change on the credit market of country X determines movement of the credit market in country Y. The same is true for the opposite. Thus, the rejection of null hypothesis of the Granger causality test (H0), according to which

$$d_1 = d_2 = ... = d_p = 0,$$

in favor of the alternative hypothesis (H1) suggests that a change on the credit market of country X determines movement of the credit market in country Y.

The final stage of the analysis is determination of short-term sensitivity of credit cycles in developing countries in the framework of the first hypothesis, and Russia's in the second, to exogenous shock on the markets of developed countries. Based on built VAR models, we use impulse response function to determine presence/absence and the rate of reaction of sampled credit markets within the framework hypotheses tested.

4. Results and discussion

The overall results of correlation analysis are presented in Table 1. Starting from obtained results, we can assume that the financial decoupling hypothesis in light of research questions put forward by us regarding developing countries and Russia deserves the right to live, due to the fact that no significant relationship (R^2> is 0.8) between domestic credit cycles has not been identified. However, results may not be significant due to possible falsity of obtained correlation values because of autocorrelation problem and multicollinearity issue. It's necessary then to carry a more in-depth analysis of time series sampled in order to further reinforce or disproof our hypotheses.

In order to conduct regression analysis, we first applied Hodrick-Prescott filter to all data, smoothing time series and eliminating statistical disturbances. Obtained time series are tested for compliance with the requirement of stationarity and are tested for unit root by using an extended Dickey-Fuller Test and Phillips-Perron Test. In case of presence of a unit root, differentiation of time series on the n number of orders is necessary in order to ensure their stationarity. The test results for the presence of unit root are presented in Table 2.

Table 2 – Results of unit-root testing

	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Statistical probability**		Statistical probability **	
Data in levels				
With constant	8,44	0,94	2656957,00	0,90
With constant and trend	7,35	0,32	943179,00	0,37
First differenced				
With constant	770,82	0,0000**	745,54	0,0000**
With constant and trend	749,75	0,0000**	720,58	0,0000**

Note: ** means absence of unit root (stationarity of data)
Source: Own processing on data of statistical agencies of sampled countries

As can be seen from results of common test for presence of unit root, all original time series are characterized by nonstationarity in levels. Solving this problem is possible by differentiating time series. In case of using a differential of first order problem of a unit root disappears, which allows us to use obtained time series for regression analysis for hypothesis testing.

Model selection for regression study (vector autoregression model or vector error correction model) depends on two factors. First, it is necessary that the condition of stationarity of used time series in the first differential (I(1)) is fullfilled. In the second place, cointegrating equations must exist, in other words, presence of cointegration between time series sampled in order to verify long-term equilibrium between the variables. The first requirement of time series stationarity in the first-order is fullfilled. Test results of sampled time series to determine presence of cointegration are presented in Table 3.

Table 1 – Correlation matrix of sampled countries

	BR	CZ	FNL	FR	GER	IND	INDO	IT	MAL	MEX	NOR	POL	POR	RUS	SPN	SW	TUR	UK	USA
BR	1,00																		
CZ	0,03	1,00																	
FNL	-0,02	0,32	1,00																
FR	0,08	0,54	0,48	1,00															
GER	-0,07	0,12	0,18	0,23	1,00														
IND	0,10	-0,02	0,26	0,32	0,19	1,00													
INDN	0,42	0,04	0,05	0,15	-0,07	0,17	1,00												
IT	0,03	0,64	0,40	0,71	0,25	-0,05	0,16	1,00											
MAL	0,06	0,45	0,47	0,69	0,13	0,22	0,11	0,57	1,00										
MEK	0,16	0,03	0,07	0,17	-0,03	0,21	0,20	0,04	0,03	1,00									
MEX	0,09	0,38	0,35	0,80	0,21	0,44	0,12	0,63	0,54	0,15	1,00								
POL	0,04	0,50	0,60	0,59	0,25	0,08	0,14	0,72	0,47	0,06	0,53	1,00							
PORT	0,06	0,35	0,47	0,70	0,26	0,02	0,07	0,71	0,55	0,07	0,64	0,67	1,00						
RUS	0,30	0,11	0,25	0,33	0,22	0,17	0,16	0,28	0,25	0,29	0,39	0,34	0,29	1,00					
SPN	0,13	0,27	-0,03	0,18	0,22	0,38	0,13	0,17	-0,02	0,22	0,27	0,13	0,11	0,26	1,00				
SW	-0,02	0,38	0,51	0,73	0,31	0,12	0,10	0,67	0,62	-0,05	0,70	0,61	0,77	0,29	0,10	1,00			
TUR	0,00	0,19	-0,05	-0,02	0,01	-0,17	0,05	0,14	0,06	-0,07	-0,08	0,07	0,12	0,00	0,07	0,08	1,00		
UK	0,13	0,22	0,21	0,50	0,29	0,25	0,21	0,32	0,30	0,18	0,36	0,32	0,35	0,33	0,37	0,33	0,08	1,00	
USA	0,16	0,24	0,30	0,44	0,29	0,36	0,23	0,37	0,30	0,25	0,37	0,34	0,32	0,31	0,44	0,37	-0,03	0,52	1,00

Source: Own processing on data of statistical agencies of sampled countries.

Table 3 – Results of Johansen Cointegration Test

Number of cointegrating equations	Eigenvalue	Trace Statistic	Critical Value (5% confidence interval)	P-value.**
None	0,289	145,38	197,37	0,35
At most 1	0,236	127,87	159,53	0,20
At most 2	0,168	124,67	125,62	0,18
At most 3	0,153	88,34	95,75	0,15
At most 4	0,111	55,55	69,82	0,40
At most 5	0,085	32,33	47,86	0,59
At most 6	0,057	14,81	29,80	0,79
At most 7	0,014	3,11	15,49	0,96
At most 8	0,002	0,34	3,84	0,56
At most 9	0,001	7,82	12,34	0,64
At most 10	0,106	29,32	34,23	0,43
At most 11	0,121	17,51	19,23	0,83
At most 12	0,124	22,34	28,95	0,49
At most 13	0,215	42,12	46,95	0,62
At most 14	0,186	80,94	87,14	0,13
At most 15	0,152	2,18	5,78	0,58
At most 16	0,032	39,73	43,94	0,67
At most 17	0,154	88,53	103,21	0,12

Note: ** means rejection of null hypothesis
Source: Own processing on data of statistical agencies of sampled countries

As can be seen from Table 3, p-values and values of trace statistics do not correspond to the critical values at 5% confidence interval, forcing us to accept the null hypothesis of Johansen Cointegration Test, according to which there is no cointegration between the variables of the sample.

These results are quite remarkable for two reasons. First, for the purposes of further research we can only use an unrestricted VAR model. Second, absence of cointegrating equations is an indirect argument in support of financial decoupling hypothesis. In other words, the results of this test suggest that relationship between the studied time series in the long term is not observed. I.e., we can assume that long-term dependency of national credit cycles in developing countries from the developed countries are not revealed within this test. However, this result speaks only in favour of absence of long-term, but not short-term dependence.

So, to determine sensitivity of credit cycles in developing countries from variations in developed ones and their degree of synchronicity we turn to the construction of VAR models, allowing to test our hypotheses. To build a VAR model we use obtained stationary filtered time series. First we need to determine the optimal time lag that will best determine synchronicity of credit cycles. For this purpose, we use the Akaike Information Criterion and Schwartzman. The optimal time lag for hypotheses I and II are presented in Table 4.

Table 4 – Results of optimal lag length selection

Number of lags	LogL	LR	FPE	AIC	SIC	ICHQ
0	9196,34	24312,48	1.72e-81	-132,05	-131,65	-131,89
1	20214,45	18865,54	4.5e-148	-285,39	-277,37	-282,13
2	23527,72	4767,30	2.1e-166	-327,87	-312,22	-321,51
3	24499,63	1132,73	6.6e-170	-336,66	-313,39	-327,20
4	25332,59	743,07	3.8e-172	-343,45	-312,56	-330,90
5	26543,82	749,3983*	5.4e-176*	-355,6809*	-317,1739*	-340,0327*

Source: Own processing on data of statistical agencies of sampled countries. * indicates lag order selection by the criterion.

As can be seen the results of estimating the optimal time lag, all the information criteria speak in favour of choosing 5 months as an optimal number for a time lag to build VAR model. It is also important to note that the final prediction error tends to zero, indicating a fairly high quality and the predictive power of the model.

Table 5 presents results of diagnostic tests of a constructed model for presence of heteroscedasticity of residuals and serial correlation of residuals. Also of great importance is testing the model on the requirement of stability. As can be seen from the Table, a constructed VAR model of relationship of national credit cycles in developed and developing countries meets all the necessary criteria.

Table 5 – Results of VAR model diagnostic testing

DIAGNOSTIC TEST	RESULTS		
Autocorrelation LM-Test	Lag	LM-statistics	*p*-value
	1	325.7519	0.2106**
	2	343.2983	0.1132**
	3	380.4855	0.2305**
	4	293.7904	0.4126**
	5	397.3257	0.0912**
Residuals stability Test	All roots rie within the circle.		
	VAR model meets the stability condition.		
Heteroscedasticity of Residuals Test (White Test)	0,2396*		
Cross Correlation of Residuals Test	No autocorrelation is found		

Note: * indicates validity of null hypothesis (no serial correlation, homoscedasticity of residuals)
Source: Own processing on data of statistical agencies of sampled countries

It is also necessary to pay attention to testing causal relationships of sampled countries according to the hypotheses put forward. For determining it, we use a Granger causality test. The results of this test, both for the group of developing countries, and separately for Russia are presented in Tables 6 and Table 7.

Table 6 – Results of Granger Causality Test (Hypothesis 1)

Sampled country (reaction)	P-value*			
	US	UK	Germany	France
India	0,0241*	0,1451	0,0005*	0,0524
Indonesia	0,0496*	0,2024	0,3712	0,0499*
Malaysia	0,1694	0,3434	0,2591	0,0028
Brazil	0,031*	0,1179	0,0002*	0,0476*
Mexico	0,0304*	0,0002*	0,6732	0,0041*
Turkey	0,0014*	0,4505*	0,2149	0,4219

Note: * indicates rejection of null hypothesis of no Granger causality
Source: Own processing on data of statistical agencies of sampled countries

As can be seen from Table 6, reflecting presence of a causal relationship between credit cycles of emerging countries and USA and UK, dependence (reaction) of sampled countries from changes on credit markets of UK and US is present, which indicates that sensitivity of developing credit markets to shocks on the credit markets of developed countries. These results can be interpreted as an argument against the financial decoupling hypothesis. This result is quite natural, given the role of globalization and international integration of capital markets, including credit markets. Increased international trade and capital flows on the one hand connects national markets. On the other –transmission of shocks through different channels is manifested with more force.

Testing the second hypothesis (of sensitivity of Russian credit market to shocks in markets of developed countries), the results of which are presented in Table 7, also speak against financial decoupling hypothesis.

Table 7 – Results of Granger Causality Test (Hypothesis 2)

Sampled country (impulse)	P-value*
	Russia
USA	0,0012*
UK	0,0304*
France	0,1239
Germany	0,0057*
Italy	0,1305
Spain	0,1511
Sweden	0,0081*
Finland	0,2756
Norway	0,0032*

Note: * indicates rejection of null hypothesis of no Granger causality
Source: Own processing on data of statistical agencies of sampled countries

This table presents p-values of statistics that reflect the truth or falsity of the null hypothesis of Granger test. Thus, in case of all sampled countries, there is a Granger causal relationship between russian credit cycles and credit cycles of developed countries. The presence of synchronicity in movement of credit cycles is explained in our view by the existence of trading relations between Russia and the Eurozone countries on the one hand. The close link with the UK until early 2015 is due to dependence of domestic resource base of commercial banks from foreign liquidity. Dependency from US credit cycles is not unique only for Russia, but almost for all developing countries in the sample. The explanation for this kind of financial convergence is usually associated with a dominant nature and role of the credit market of the United States, defining a global trend of consumption, export and import operations in terms of not only raw materials, but also goods and services. And given the fact that US credit market is very sensitive to changes in effective federal funds rate, which determine expectations and monetary policy of a large part of the global players, presence of convergence of this kind does not cause confusion.

The last test revealing short-term sensitivity of developing countries' credit cycles from cyclic processes in developed countries is the use of impulse response functions. The essence of this method is to test the constructed model to identify presence of statistically significant and meaningful response of resulting variables to shocks in explaining ones and definition of time lag and scale of reaction. The results of impulse response of credit cycles of developing countries to shocks in developed countries are presented in Figures 1-3.

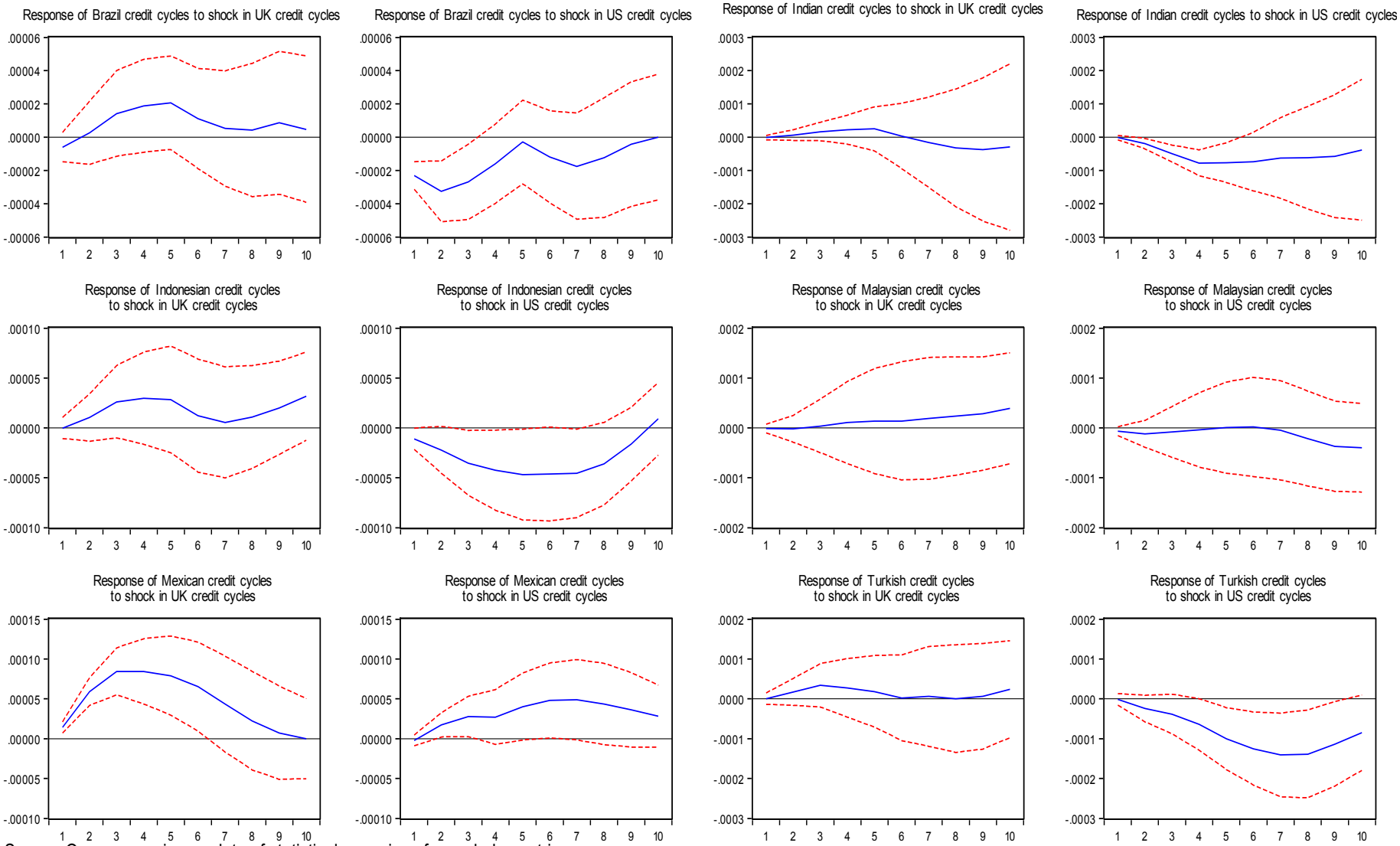
Thus, explaining the results of impulse response functions of credit cycles of developing countries to shocks in developed countries, it is possible to draw several conclusions. First, among a number of developing and developed countries in the short term (up to 10 periods under the base period in 1 month) there is a statistically significant and stable relationship (*e.g.*, between credit cycles of Brazil, India, Indonesia, Turkey and USA; Brazil, India, Malaysia and Germany).

This allows speaking about existence of a certain degree of synchronicity of credit cycles in developed and developing countries. This conclusion does not speak in favour of financial decoupling hypothesis that confirms assumption of preservation of globalization processes throughout the sampling period. Second, at the same time, we cannot say that synchronicity of credit cycles is stable and stationary for all countries in the sample. For example, in case of Malaysia, it is possible to speak of existence of financial decoupling.

At the same time, if we turn to sensitivity analysis of credit cycles of Malaysia from the Eurozone countries, we can observe synchronicity in the short term (on examples of Germany and France).

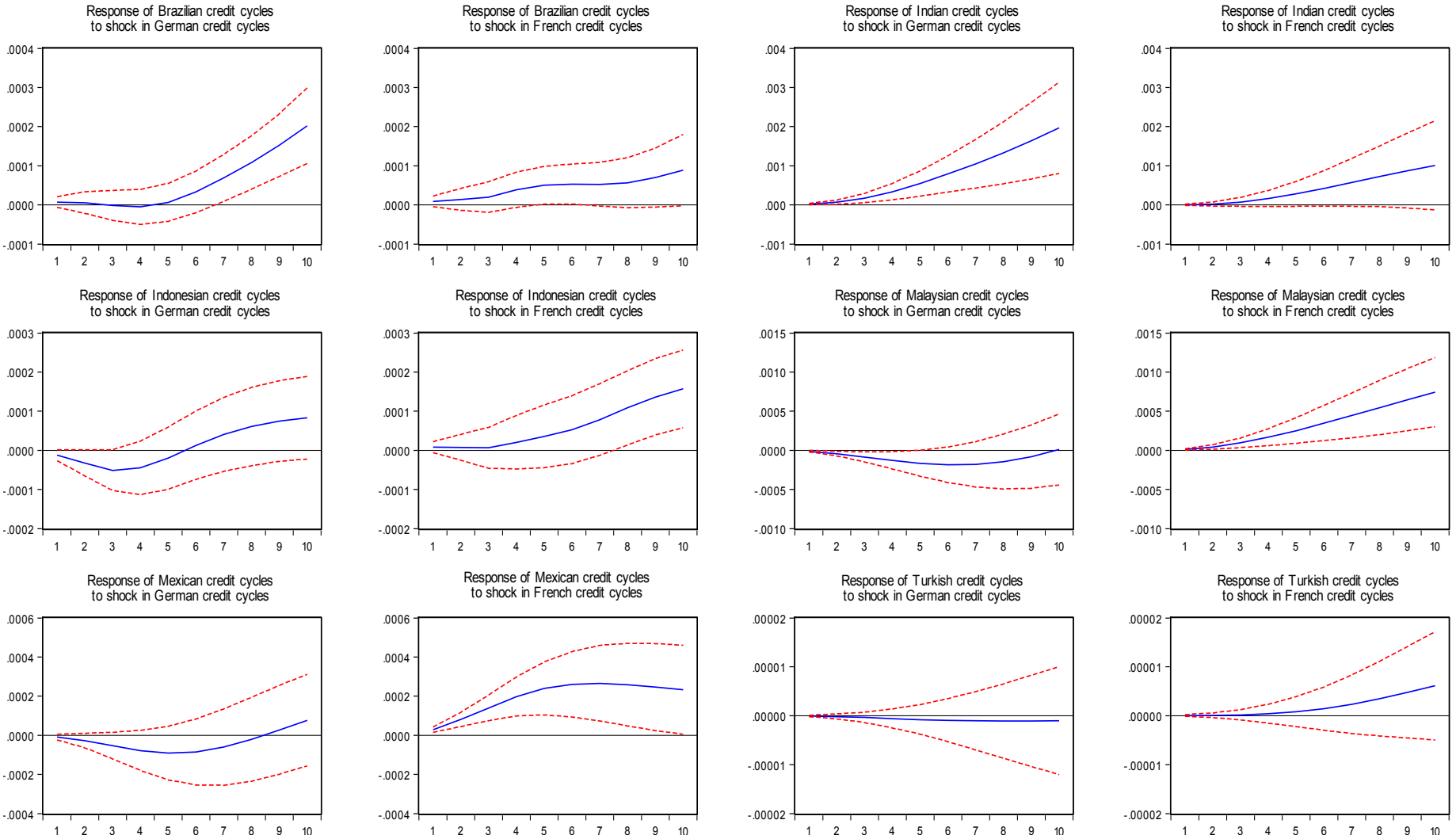
In other words, results, validating the first hypothesis, speak in favour of the third group of studies, implying that the financial decoupling is heterogeneous, synchronicity of credit cycles between developed and developing countries is context dependent, due to peculiarities of international flows of goods and capital.

If we turn to results of impulse response analysis of the second hypothesis – presence of financial decoupling in Russia, results (Figure 3) are similar with results of the Granger test on the one hand, and with results verifying the first hypothesis on the other. Thus, for Russian credit cycles, condition of sensitivity and, as a consequence, synchronicity of credit cycles is observed in case of exogenous shocks penetrating into the national banking system from USA, UK, Germany, Norway and Sweden.



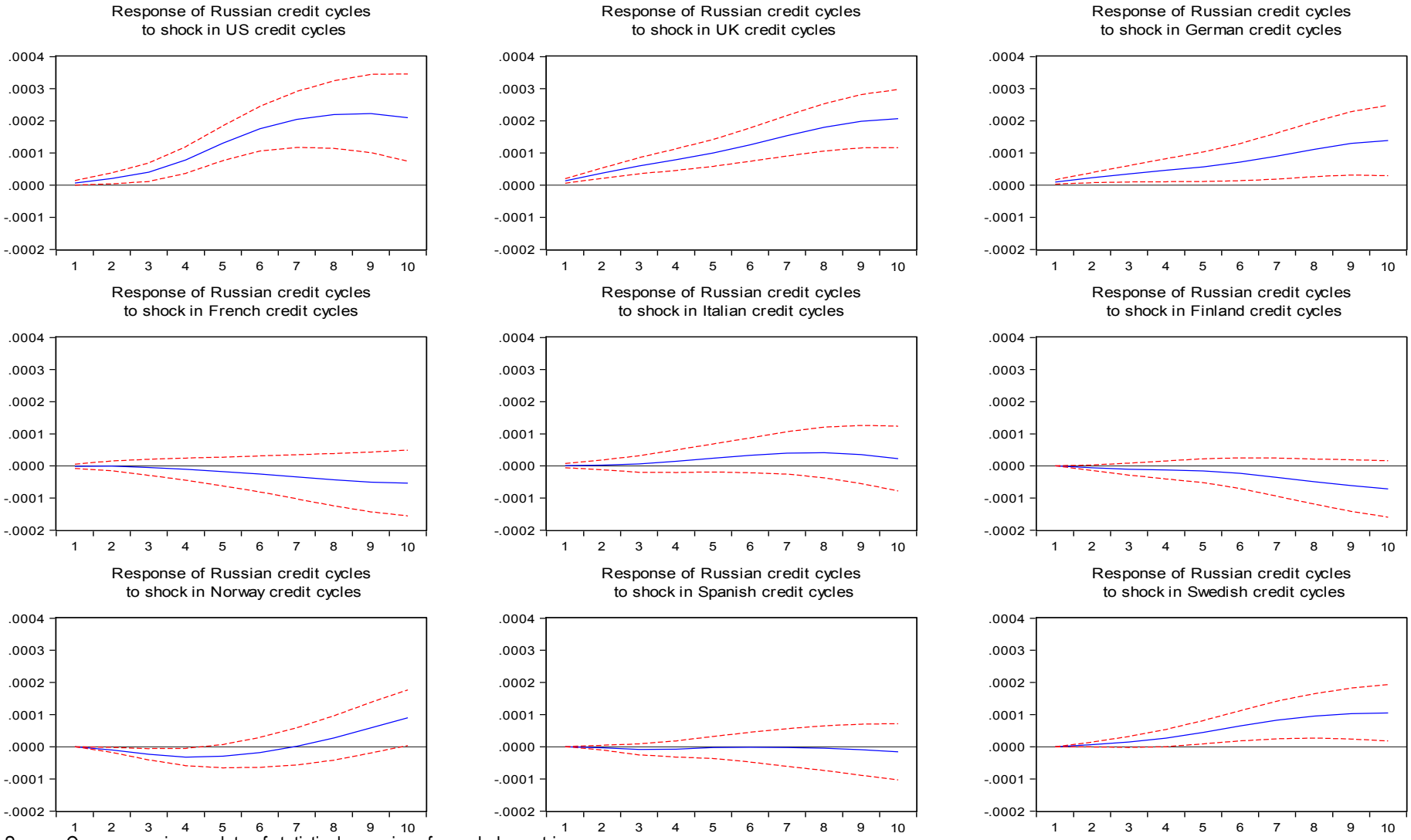
Source: Own processing on data of statistical agencies of sampled countries

Figure 1 – Response of sampled national credit cycles to shocks in one S.D.



Source: Own processing on data of statistical agencies of sampled countries

Figure 2 – Response of sampled national credit cycles to shocks in one S.D.



Source: Own processing on data of statistical agencies of sampled countries

Figure 3 – Response of Russian credit cycles to shocks in one S.D. in sampled countries

In case of the Anglo-Saxon camp, synchronicity of credit cycles is due to dependence of russian economy from international capital flow, inflow and outflow, influence of rate of return in different economic sectors, and also due to the transmission effects of US monetary policy, given the fact that the UK acts as the main transmission channel to countries of the Eurozone.

In case of Germany, Norway and Sweden synchronicity can be explained, in our opinion, by co-dependency in movement of raw materials, goods and services (export-import channel) on the one hand, and the proximity of structures of national economies (e.g., Norway as an oil exporter) on the other.

Thus, specificity of international economic relations, established trade partnerships, structure of the national economy, international capital movements, and the existence of a global monetary policy continue to be important in an international context and serve as substantial and significant channels of risk (shocks) transmission in national economic and financial system.

In other words, the hypothesis of financial decoupling, according to which economic and financial trends of developing countries broke away and gained independence from developed countries does not receive a clear confirmation. Rather one should talk about the hypothesis of decoupling-recoupling, as a cyclical, pendulum-type process, which in recent years gain massive support in international research community.

Conclusion

This study examines the hypothesis of financial decoupling, according to which specificity of development of a number of countries determines independence of their national economic and financial systems, thus allowing to form an immunity to exogenous shocks coming from the developed country.

In this article, we set ourselves a task to test this hypothesis on the example of several developing countries on the one hand and to determine degree of synchronicity of credit cycles with the cycles of the developed countries in order to empirical test the hypothesis of financial divergence on the example of Russia.

In the result, we come to conclusion that financial decoupling hypothesis deserves a right to live, but not in the rigid, orthodox form in which it has appeared. Modern research increasingly recognizes the context dependence of processes of divergence and convergence, as exemplified by our study.

As a result of testing our hypotheses, we come to conclusion on coexistence of two opposite trends in the movement of national credit markets. Through the analysis of national credit cycles of sampled countries, we have found that depending on specifics of A national economy and credit markets, convergence/divergence of credit markets has its duration and amplitude. In case of most developing countries, dependence from shocks on the credit market of the USA remains. The same is true for a number of Eurozone countries. Even if we have different channels of transmission of shocks, it's not enough to speak of existence of credit cycle's independence: synchrony of credit, as well as business cycles remains, which once again confirms the continuation of the era of financial globalization, even with the emphasis on regionalization of economic and trade relations.

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Implementation Risks in Investment Projects on Boosting High-Tech Business Production Capacity: Analysis and Management

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Abstract:

The classification of the changes in the forecasted conditions of the production capacity development projects have been suggested including changes in demand for the product, changes in the product mix and in the production technologies. Quantitative evaluations of potential losses under different types of changes and relative to the stage of the investment project implementation have been obtained. Adaptation to the changes under analysis can require considerable costs; the changes can entail irrecoverable loss of the invested capital. Thus, at the investment stage, the project is exposed to major risks.

This study takes into account sector-specific conditions of the aviation industry including technological structure of capital investments, time structure of the investment stage of the production capacity development projects and the technological affinity of different types of products. Based on the obtained evaluations, the most important types of risks have been identified for each stage of the project implementation; the recommendations have been developed on managing these risks both tactically and strategically, particularly, by means of selecting the technologies that are less exposed to that or another type of risk. The analysis has been carried out to estimate the effect produced by the technological levels of the production facilities.

Keywords: aviation industry, investment project, risk, technological affinity, technological structure of capital investments, real options.

JEL Classification: A12, A31, C58, O22.

1. Introduction

Over the long period of implementing the project on developing the material and technical resource base of industrial companies, i.e. the project on constructing new production facilities, reconstruction or conversion of the existing ones, the changes can occur that would affect the future efficiency of these plants and equipment. Fundamental problems of Russian practical management of investment project implementation are that the companies integrated within the structures of the high-tech industrial sector as well as the governmental authorities that control them usually “look back” when they check the legitimacy of the expenditures already incurred, whereas they ought to “look forward” making economically justified decisions on further funding and on the areas of future expenditures. In Russian high-tech sector, management systems hardly ever apply monitoring that “faces the future” estimating, from the market perspective, the advisability to proceed with the project, taking into account the following factors: changing market situation; emerging new technologies; changes in the accessibility of the technologies and equipment, especially, the imported ones; changing currency exchange rate,

etc. Delays and inaccuracy in evaluating the above mentioned groups of factors affect the efficiency of developing the production capacity.

2. Methodology

Justifying the current importance of the problem

Russian enterprises of the high-tech sector and the state budget that still remains the major source of investments for many industries suffer losses due to the insufficient flexibility of management in developing material and technical facilities under the conditions of the invariably unstable and volatile future. Principal object of the investigation and application of the approaches developed in this study is represented by aviation industry, one of the leading high-tech industries of Russian mechanical engineering. At the same time, the tools developed within the framework of this study could also prove to be useful for other high-tech industries and for other countries. As a rule, technologically specific features generate common problems existing in these specific industries across different countries of the world. According to the Russian Federation State Program on Development of the Aviation Industry in 2013-2025, there is a large scale technological revamping going on in the sector requiring considerable capital investments. Under the conditions when the proprietary funds of the companies are limited, when the resources of the state budget are not sufficient (which have already resulted in the amendments to the state program and in cutting down the planned investments), when the ruble becomes weak and narrows down the opportunities for importing the expensive process equipment, special attention has to be paid to the quality of justifying investment decisions and to analyzing the associated risks.

Literature review

Many research writers have dedicated their works to separate aspects of the problem of assessing, mitigating and avoiding project risks at the stage of investment. Thus, the effects produced on the project implementation at the investment stage by the investment cycles have been studied in the work of Nanda and Rhodes-Kropf (2013). The interrelations existing between the efficiency of the investment project implementation and the development and maturity of the venture investment institutions have been described in a number of studies (Li and Zahra 2010, Ozmel *et al*. 2013). The possibilities for mitigating the risks in the course of the project implementation at the investment stage by means of crowd-funding have been analyzed by Harrison (2013), Bertoni, Croce and Guerini (2012). However, all those mechanisms can hardly be employed by the industries under investigation in any foreseeable future.

Several works (McNeil *et al.* 2014, Sadgrove 2015, Haimes 2015, Kendrick 2015) have been dedicated to the problems of quantitative evaluation of the investment risks. Another study (Allen *et al.* 2015) considers the effects of risk management produced on the costs of the investment project; thereat, special attention is paid to the differences observed in various sectors of the economy.

A number of works that do not actually analyze the specific features of the aviation or any other high-tech industry, do, nevertheless contain similar ideas. One of such studies (Sokolova 2011) justifies the advisability of so-called incremental funding of high-risk projects meaning that the funds for implementing the next stage of the project should be allocated only upon passing the scheduled “decision-making milestone” where the feasibility of proceeding with the project implementation is analyzed taking into account the updated forecasts.

One more study (Mishchenko and Koshelev 2014) should be mentioned that is dedicated to the principles of decision-making under changing predicted conditions in the process of the long-term innovative project implementation.

However, simple and practically applicable methods for quantitative assessment of the risks occurring at the implementation stage of the production capacity development investment projects have never been presented in literary sources. Such methods should directly account for the specific features of the particular sector of the economy at the levels of the project life-cycle, at the level of capital investment technological structure, etc. In all, it is necessary to identify the most critical types of risks in business capacity development for each industry based on the specific characteristics of the particular sector that will help creating the rational risk management system. Failure to solve those problems in modern economic literature stipulates the current importance of the task set in this study.

Hypotheses and plan of investigation

The efficiency of the adaptive management of the production capacity development needs be evaluated quantitatively taking into account the specifics of the aviation industry. Within the framework of this study, the authors do not provide models and formulae for quantitative evaluation of real options that originate from the flexibility of the investment project implementation management. At the same time, quantitative evaluations of the

risks that occur at different stages of the implementation process under specific industrial environment make it possible to build such models based on the assumptions made on the properties of the random processes that create the changes in the conditions of the project implementation.

The changes in the future company's operational environment that take place in the course of implementing the production capacity development investment project can be subdivided in the categories as follows:

- changes in the forecasted demand for the products (within the planned product mix) that necessitate changing the level of the production capacity, in the first place: either increase or decrease in the planned facility output as compared to the original design;
- changing requirements to the characteristics of the future products and to the product mix that entail conversion of the production facilities and their readjustment for manufacturing other products;
- changes in the forecasted prices for different kinds of resources (feedstock, materials and component parts, wages of the employees according to their professions and qualifications, costs of the equipment and stock, etc.) that make it necessary, even if the product mix remains the same, to reconstruct the production facilities, to introduce different technological processes that would make it possible to substitute, either partially or in full, those resources that became more expensive (or that became inaccessible).

While the first type of changes basically makes for quantitative adjustments, for adapting the created production facilities, the second and the third types require that quantitative adjustments should be undertaken. It is suggested that the potential costs and losses associated with such kinds of adaptation at different stages of the investment project implementation should be estimated.

Normally, the investment projects focused on developing material and technical resource base of the companies in the aviation industry include the following:

- design and survey operations (DSO);
- construction and installation operations (CIO) meant to build (repair, reconstruct) the fixed-capital assets, *i.e.* buildings and structures, utility systems;
- ordering, manufacturing, delivering and installing the process equipment;
- start-up and commissioning operations (SCO).

Generally, these stages can overlap, and their partial combination is practicable for the purposes of cutting down the overall schedule of the investment project implementation and, thus, reducing the associated losses to the company. At the same time, today in Russia, the adopted budgetary discipline practically excludes any possibility of such overlapping stages under the pretext of strengthening control over the process of spending the funds as per their intended purpose. Several studies (Burenok *et al*. 2006) prove that such practice results in considerable losses, but, probably, it helps decreasing potential losses under unexpected circumstances which consequences are considered in this section. Besides, consequent implementation of the project stages makes the investment process modeling easier for the purposes of this study.

Analyzing the structure of costs of production capacity development investment projects in aviation industry

Correlations between the costs for implementing the abovementioned stages – DSO, CIO, procurement and installation of the equipment, commissioning operations – are predetermined by the technological structure of the capital investments that is specific for that or another subsector of the aviation industry. Figure 1 shows the graphs of the changing share of the equipment in total amount of investments in three basic subsectors in the USA aviation industry over the period of 1998-20012.

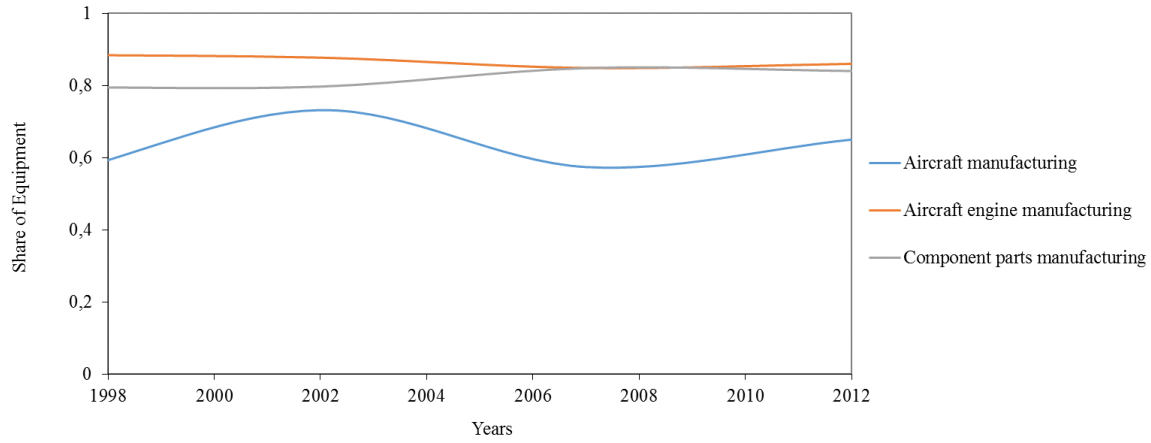

Figure 1 - Dynamics of capital investment technological structure in principal subsectors of aviation industry in USA in 1998-2012

The analysis of the shown graphs proves that, given the modern technological level in the relevant subsectors of the aviation industry, the share of the equipment costs in aviation drive engineering and in aircraft component parts manufacturing amounts to 80-90% (10-20% account for the fixed-capital assets, accordingly). Only in aircraft industry, where highly qualified manual labor still prevails, the share of the equipment costs can reach 60-70% with correspondingly higher ratio of buildings and structures. Thereat, the long-term trend for labor mechanization and automation should be taken into account for aircraft industry, particularly, for assembling flying vehicles (especially, given the increased share of polymer composite materials in their structure) that will also increase the share of the equipment within the technological structure of the capital investments in this subsector of the industry as well.

In Russian environment, given the more demanding requirements to the characteristics of the fixed-capital assets (which are stipulated by natural and climate conditions, by poorly developed communal utility infrastructure, etc.), the share of the fixed-capital assets can be envisaged to be higher, for example, twice as high, as compared to that in the USA. However, even in this situation, the conclusion would still hold that the share of the equipment prevails in the technological structure of the investments. Moreover, further progress of the aviation industry would make it possible to predict that the levels of labor mechanization and process automation will increase together with the capital-labor ratio primarily due to the fact that the companies in the aircraft industry will be satisfying their demand for the process equipment and the share of manual labor will be lower than it is now, namely, very high as compared to other mechanical engineering subsectors that manufacture more mass products. Consequently, it may be expected that the share of the equipment in the technological structure of the capital investments will grow.

Method for quantitative evaluation of risks in production capacity development investment projects in aviation industry

At different stages of the investment project implementation, the changes in the project parameters can result in different irrecoverable losses and can require costs for adapting to those changes. For the purposes of this study, it is actually possible to be limited by two major stages as follows:

- CIO (insofar as at the stage of DSO all potential changes should be taken into account among other things; besides, as a rule, DSO costs make a relatively small share in overall amount of the investments);
- equipment procurements (including its installation and commissioning).

Designate the duration of those integrated stages as follows, $\tau_{\text{DSO+CIO}}$ (represents the sum of durations of DSO and CIO: $\tau_{\text{DSO+CIO}} = \tau_{\text{DSO}} + \tau_{\text{CIO}}$) and $\tau_{\text{equip+SCO}}$ (represent the sum of durations of purchasing, installation and commissioning of the equipment: $\tau_{\text{equip+SCO}} = \tau_{\text{equip}} + \tau_{\text{SCO}}$). The amount of the investments will be designated accordingly: $I_{DSO+CIO}$ and $I_{equip+SCO}$, thereat, as it has already been justified elsewhere, in the majority of the subsectors of the aviation industry their correlation is as follows: $I_{\text{equip+SCO}} > I_{\text{DSO+CIO}}$. As to the durations of these stages, it is hardly possible to establish any unambiguous correlation apriori. In principle, especially when the object is constructed in complicated infrastructural conditions, in unfavorable natural and

climate environment, it is possible, that the correlation will be as follows: $\tau_{DSO+CIO} > \tau_{equip+SCO}$. Summary duration and costs of the investment project are formed of the abovementioned additive components: $\tau = \tau_{DSO+CIO} + \tau_{equip+SCO}$; $I = I_{equip+SCO} + I_{DSO+CIO}$.

Thus, if it is assumed, that the investments at each of the generalized stages are allocated in uniform manner, then it is possible to represent schematically the change of the accumulated sum of investments as of a particular moment in time $I_{\Sigma}(t)$ within the period of the investment project implementation as follows, see Figure 2 (here t_0 is the moment of the start of the investment project implementation).

Consider possible economic consequences of the abovementioned changes in the forecasts and plans of the company that occurred at the stage of CIO (including DSO). Given the fact that during this stage the buildings, structures and utility systems universal for this type of production are constructed or reconstructed, it can be assumed that the changes in the product mix will affect slightly the characteristics of the fixed-capital assets created during this period.

Potential changes in the technological processes can affect their parameters more seriously, especially, they can, for example, affect the requirements to energy efficiency characteristics, to environmental protection or sanitary characteristics, to microclimate and to the atmosphere in the buildings, to stability of the foundations and basements, purity of technological gases and liquids, power supply reliability, etc. Finally, the most serious effect at this stage can be produced by the changes in the forecasted demand for the products, especially, when the demand is supposed to decrease. As a rule, the liquidity of the special-purpose production buildings and structures built for the companies of the aviation industry is very limited; their subsequent conversion for the purposes of other industries would be very expensive. Therefore, in case of decreasing the planned output at this period, the irrecoverable loss of investments can, by its order of magnitude, be similar to all funds invested in CIO. At the same time, it should be highlighted that this amount, even upon CIO accomplishment, does not exceed 10-30% of the overall project costs in this sector of industry.

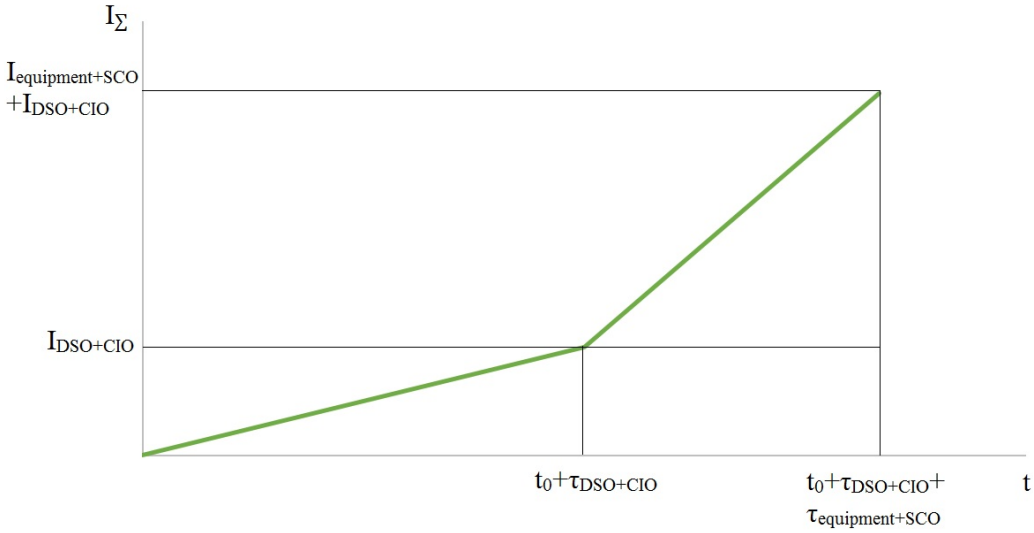

Figure 2 - Change in accumulated investments in production capacity development projects in aviation industry

At the second integrated stage, during purchasing, installing and commissioning the equipment, the effects produced by the changes in all abovementioned parameters will be quite different. Changes in the product mix (with the same technological level and with the same general production profile), due to the universal nature of modern process equipment, will not result in any considerable cost increase, as compared to the original costs of purchasing and installing the equipment. Normally, the investments in purchasing and installing the process equipment at multi-product company can be divided in two parts:

- general investments in purchasing and installing the universal equipment, in procuring universal software, personnel training and other things for manufacturing the relevant type of components (for the final products of different kinds);
- specific investments in purchasing or manufacturing the unique equipment required for producing the items of specific types and dimensions, investments in development or upgrade of the software for the same purposes.

It has already been mentioned that the technological affinity of the elements of the manufactured items in aviation industry, provided that modern, flexible, universal and highly automated equipment is employed for the purpose, is quite high (factor of technological affinity or the share of common costs of investments in the majority of subsectors of the aviation industry exceeds 50% by far). Therefore, even drastic changes in the product mix will require specific investments within the limits of just 10-20% of overall project costs.

On the contrary, changes in technology, in the very technological level of production can entail the irrecoverable losses that, by their order of magnitude, can be equal to those spent on the already purchased equipment and to the costs for its installation and commissioning, as, under these changes, this equipment can become obsolete and practically loose liquidity. If no such drastic technological shifts are envisaged, but the planned output is reduced, then the equipment, being a quick asset, can, in principle, be sold to other interested buyers in foreign aviation industry or, in some cases, even beyond the industry. At the same time, if the drop-in demand for the products is expected not only in the company but across the whole aviation industry, including global industry, then the liquidity of the relevant equipment can be low and the excessive stock can be sold at a considerable discount only.

3. Results

Thus, it is now possible to systematize in Table 1 the results of the undertaken analysis of the risks occurring in the course of implementing the projects focused on developing the material and technical resource base of the companies in the aviation industry.

Table 1 - Evaluation of potential irrecoverable losses and costs for adjusting investment project based on the stage of its implementation and given the nature of changes

Project implementation stage	CIO	Purchasing, installing, commissioning of the equipment
Decrease in demand for the products	Order of magnitude of the costs already invested in the redundant facilities; *Total* – up to 10-30% of the costs of the *redundant* production facilities.	Losses at CIO stage, + costs for installation and commissioning of the equipment, + losses for dismantling the equipment, + losses to the salvage value of the equipment (can be high in case of decline across the industry), *Total* – up to 30-40% of the costs of the *redundant* production facilities.
Changes in the product mix (with no changes at technological level)	Extra expenses are negligibly small	Costs at CIO stage, + costs circa 10-20% of the original costs of the equipment, its installation and commissioning *Total* – up to 7-15% of the project costs.
Changes in technological processes	Extra expenses up to 30-50% of the costs for buildings, structures and utility systems; *Total* – 5 to 15% of the project costs.	Costs at CIO stage, + costs close, by order of magnitude, to the amount already invested in purchasing and installing the equipment (in cases of drastic technological shifts), commissioning *Total* – up to 70-85% of the project costs.

The obtained preliminary estimations can be updated as of the moment in time when the changes in the project parameters under consideration actually occur, and, naturally, taking into account the share of the costs for this particular stage that have already been invested. In real calculations, it is possible to account for the uneven distribution of the cash flows, including those within the stages of the investment project implementation; then, the graphs in Figure 2 will no longer be linear. However, even in their simplified representation, the evaluations, shown in Table 1, give the idea about the relative significance of different types of risks occurring in the course of implementing the projects on developing the material and technical resource base of the companies in the aviation industry. The most significant are the risks of drastic changes in technological processes, in the requirements to their characteristics and to the employed process equipment that actualize at the stage of purchasing, installing and commissioning the equipment. Closer to the moment of putting the object in operation, the potential losses and additional costs can become almost equal to the overall costs of the project (at the least, they can amount up to 70-85% of the total capital investments). At CIO stage the most serious losses can be incurred if the planned output is decreased, but, in any case, they would not become higher than the costs of the fixed-capital assets which, in principal subsectors of the aviation industry, are not higher than 10-30% of the total amount of the investments. The minimal risk is associated with changes in the product mix under the existing level of technology in the aviation industry. In all other cases, the upper limit of potential losses is at the level of

15 to 40% of the total costs of the project, even when its relevant stages of implementation have already been accomplished.

Naturally, the management system of implementing the projects on improving the material and technical base of the companies in the aviation industry should be built taking into account all most critical risks that have been identified above.

Thus, a simple methodological approach has been suggested for quantitative assessment of the risks associated with the business production capacity development. Thereat, by contrast to the available studies that have been mentioned in the literary review, here the industry-specific features are directly accounted for. This study makes use of generally accessible statistical information only, which is important from the perspectives of the practical application of the results. Finally, it gives opportunities for rational risk management in the course of implementing the relevant projects.

Based on the risk analysis above, it becomes possible to outline the directions for improving the quality of managing the implementation of the investment projects on developing the material and technical resources of the companies in the aviation industry. Based on the obtained evaluations, it is possible to develop mechanisms for managing the production facility development applying the concept of real options, that has already been described in several works (Baev and Alyabushev 2010, Baranov and Myzyka 2011). The advisability of introducing real options policy for the purposes of implementing long-term investment projects has been declared by the Russian Federation State Program on Development of the Aviation Industry in 2013-2025.

At first sight, the practicability of practicing flexible adaptive management in implementing the production capacity development projects is obvious. If, before the project is finished, the information becomes available that the conditions for future development and operation of the enterprise can be different, the measures should be taken to adjust the project to the changing conditions. However, such categorical evaluation should be specified in more detail due to two reasons.

First, it is not always feasible to respond to the changes that occurred, insofar as the funds that have already been invested represent sunk costs and they should not affect current decisions. To make justified decisions on introducing changes to the project, on allocating additional funds, etc. the following parameters should be compared:

- amount of additional costs of investments that are supposed to be incurred in order to adjust the project to the changed conditions;
- the level of losses (lost profit, extra operational expenditures at the stage of operation of the objects of material and technical resources, etc.) if no changes are introduced to the project.

As a rule, even if, up to some particular moment in time, the adjustment of the project is not deemed advisable, then, as the project approaches its accomplishment, the adjustment becomes either impracticable or unprofitable. In terms of the theory of options, not all the options should be carried out; only profitable options should be performed, as the option represents the right and not the obligation of its holder.

Thereat, it has to be highlighted that changing conditions and decision-making on adaptation to these changes can occur not only in the course of creating new objects of the material and technical resource base, i.e. within the period off, but well until the end of the life-cycle of the object. During the production period, the facilities are upgraded, revamped, converted, upsized or downsized, and so on. Pre-production stages are notably characterized by the fact that during these stages the whole amount of costs has not been invested yet, and there is still a possibility to correct the parameters of the project with lower losses that it could be done at the stage of operation of the production facilities.

Second, flexible management of the investment project implementation requires that different resources should be spent for the purpose. Therefore, these expenses should be compared with the potential profit that could be obtained by shifting to “real-option” management strategy. Evaluation of the economic efficiency of adaptive management system for implementing the investment projects on developing the material and technical resources of the companies in the aviation industry could be obtained as estimation of the costs of the real options that correspond to the relevant possibilities for adjusting the project parameters under different changes in the forecasted conditions of their implementation.

There is a great number of works dedicated to the problems of applying the theory of real options to evaluating and managing the investment projects. Thereat, while some studies (Grullon *et al.* 2012, Iazzolino and Migliano 2015, Sipp and Carayannis 2013) are of rather general character and are concerned with stock markets, patents, etc, other works (Smit and Trigeorgis 2004, Biancardi *et al.* 2016) are basically dedicated to mathematical, tool-based aspects of evaluating real options, and still some other works (Rodger 2013, Cedric 2013, Cedric *et al.* 2014) directly deal with applying the theory of real options to large-scale aerospace programs.

However, they specifically consider the programs on developing and manufacturing the items, not the programs on developing the production capacities of the companies.

One of the articles (Nuzhdenov 2016) highlights the portfolio aspects of the interrelations between real options in the company that implements several projects. In another article (Burenok *et al.* 2006) as well as in some preceding articles major attention is paid to the specific features of evaluating the projects that contain the elements of real options in the framework of the venture fund portfolios. The study lays stress on the fact that the risks associated with the project implementation are principally different at different stages of its implementation as well as the possibilities for managing those risks. Strictly speaking, it is important for the area under investigation that it should also consider the mutual effects found between several projects implemented in one and the same company; however, at this stage of the investigation, the authors limit their efforts by just one project and by the analysis of the special features of the aviation industry, of its intrinsic structure of costs and duration of the investment project implementation.

Quantitative evaluation of the profit that could be obtained from applying adaptive management to implementing the production capacity development projects of the sector of the economy can be performed based on the suggested evaluations of costs and losses associated with adjusting the investment projects to different types of changes in the project parameters at different stages of their implementation. To a first approximation, it can be assumed that the changes in the conditions occur irrespectively of the implementation of this particular project. Then, the distribution of the moments in time when these changes become possible (future demand for the products, the required product mix, prices for the resources and technological processes) can be considered uniform, i.e. the specified changes can occur with equal probability at any moment over the whole period of the investment project implementation. Based on these assumptions, it is possible to evaluate the expected losses and costs for adjusting the project to the changed environment. Thereat, as it has already been highlighted above, the possibility and the practicability of making flexible decisions depending on the stage of the project implementation and taking into account the number of funds that have already been invested should be considered.

Efficiency of the flexible policy in the sphere of managing the development of the material and technical resource base of the company in the aviation industry within the framework of the concept of real options can be evaluated by averaging, over the period within which the changes in the conditions can occur, the maximum profit that could possibly be achieved during the whole lifecycle if the adjustments to the project are performed and if they are deemed advisable at this particular moment, and also if such adjustments are not implemented and if they are no longer deemed feasible. Formally, this averaging is expressed by integrating the achievable profit over the whole duration of the production project lifecycle; not only for the duration of the period when those production facilities are created. Then, this integral composite function should be compared with the analogous integral indicator that was obtained under the assumption that no adjustments would be done to the project. The correlation between those two evaluations will characterize the efficiency of the real option that represents the possibility of adjusting the parameters of the investment projects on developing the material and technical resource base of company in this sector of the economy. In turn, changes in the environment can have different amplitude and frequency (thereat, as it has been shown above, the changes of different nature can result in different losses at different stages of the project implementation), therefore, the averaging will have to be performed for those parameters as well.

Some certain methodological problems occur due to the availability of several types of the risks described above. If, to a first approximation, they are considered as independent, then the quantitative evaluation of the economic efficiency of flexible management of the investment project implementation can be represented as the sum of the costs of the real options that correspond to the adjustments of the output of the production facilities, to the adjustments of the product mix and of the technological processes. Further investigations in this area should be proceeded with taking into account the factors specified in the available research studies (Melnikova 2015, Savilov 2015).

Conclusion

Based on the undertaken analysis and taking into account the specific technical and economic features of the aviation industry at the existing stage of its technological development, the study showed that the most significant risks are represented by the risk of drastic changes in the technological processes, in the requirements to their characteristics and to the process equipment that are actualized at the stage of purchasing, installing and commissioning the equipment. Getting closer to the moment of putting the object in operation, the potential losses and extra costs can become almost equal to the total costs of the project (at the very least, they can be as high

as 70-85%). At CIO stage, the most severe losses can occur if the planned output is reduced, but, in any case, these losses cannot exceed the costs of the fixed-capital assets that make, in all basic subsectors of the aviation industry, not more than 10-30% of the total amount of capital investments. The least significant risk is associated with changes in the product mix with the unchanged existing technological level across the aviation industry. In all other cases, potential losses cannot be higher than 15 to 40% of the total costs of the project, even under the conditions when the stages under consideration have already been accomplished.

The efficiency of developing production facilities in Russian aviation industry is decreasing considerably due to the lack of flexibility in the decision-making processes over the long period of the investment project implementation. Over this period, the predicted future demand for the products and the costs of the equipment can change; new technological processes can emerge. It is deemed advisable that the methodology of real options should be applied for managing the implementation of the long-term investment projects.

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Grounding of the Combination Parameters of the Agricultural and Processing Branches of the Agricultural Enterprises by the Operations Research Method

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Abstract

Combination parameters of the agricultural and processing branches of the agricultural enterprises and their parameterization were grounded. The cooperative connections of the branches of agricultural enterprises and their parameterization were studied. The mathematical model of combination optimization of the production and processing of agricultural raw material at the agricultural enterprises was offered. Optimization calculations of the parameters of the model enterprises of Krasnodar Krai were carried out. Optimal economical parameters of the agricultural enterprises with separate processing plants were studied. The comparison of the various scenarios of the development of the agricultural formations was carried out: production of the agricultural products without its processing; production of sunflower oil; processing of winter wheat grain into flour and farina; milk processing into the packed milk, production of butter and cheese; possibility to acquire the agricultural raw material for the processing at the existing facilities and sale of the processed products. The comparison of the scenarios was carried out according to the parameters characterizing the scale of production, commercial potential, level of concentration and specialization, intensity, level of intercompany agro-industrial integration, production efficiency.

Keywords: parameter, operation research, agriculture, enterprise, model, optimization, scenario, processing.

JEL Classification: C51, F14, Q10, Q19.

1. Introduction

In the modern economy, when the conditions of the functioning of agricultural enterprises have been changed due to the institutional transformations stipulated by the improvement of the business logistics, implementation of the innovational developments into the production and processing of the agricultural products, development of the logistic promotion of the finished products, the search of the approaches to the grounding of the parameters of agricultural formations become critical. When creating and developing of subsidiary processing production facilities, the manufacturers of the agricultural products get the possibility to become independent from the trading and processing companies that take the monopoly position and dictate the prices for the raw material and also to adapt faster to the changing conditions of the market by means of a better mobilization of the resources of the enterprise, diversification of the activity, improvement of the financial condition, obtaining of the additional profit as the sale of the finished processed product is much more profitable than the sale of the raw agricultural materials.

Agricultural enterprises face a choice of the cooperation form that depends upon some factors: availability of land, material, labour and other resources, level of specialization of an enterprise, availability of the market outlets, convenience of location, availability of the equipment for processing of products, etc. Scientists and

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practitioners were interested in the problems of cooperation and agricultural integration in the last century (Chayanov 1927, Malofeev 1972, Bagmut 1996), as well as now (Ternovykh *et al.* 2013, Rysmyatov *et al.* 2008).

When using not only intuition but also the strict mathematical computations and calculations, applying the modern mathematical methods and instrumental means in economy, the efficiency of the decisions taken increases significantly (Afonichkin 1998). Determination of the optimal variants of the interconnections of agricultural and processing branches is necessary for the efficient operation of the agricultural enterprises, and taking into account the fact that modern large-scale agricultural formations are mostly diversified enterprises and do not only produce, but also process the products, that is why the problems of optimization of cooperation connections of agricultural and processing branches of the enterprises are of such a great importance.

2. Method

2.1. Idea of combination parameterization of branches

The study of the modern economical literature reveals that the parameters are understood as the main qualitative characteristics expressed numerically by means of every second parameter, several of them or metrics (Burda 2001). The terms “parameter” and “indicator” have similar meanings as they both are the result of measuring or calculation, reflect qualitatively the particular value, but not every indicator can be interpreted as a parameter. Parameter does not reflect any property, every state, but only the significant one. The values of parameters are always considered in its inseparable connection with the internal content because the qualitative state corresponds to every mathematical value. The essence of the parameter as a measurer of the value of one of the properties of an object is in the unity of the qualitative and quantitative characteristics.

In the system analysis, the parameterization is considered as an element of the method used for the building of the model by distinguishing the measured characteristics. That is where we took the idea of parameterization of the enterprises. Parameterization of the agricultural enterprises is a process of their study by means of the system of parameters. The agricultural enterprises that are very complicated systems combine social, economic, production, technological, material, energy, biological, informational, psychological and other elements. Parameterization of agricultural formations is carried out according to particular aspects or by its sets. Eventually, the essence of the parameterization is in its study by means of parameters.

Problems of optimization of the production parameters in the agricultural production are considered by the scientists with regard to the particular branches, for example, fattening of cattle in the complexes (Gataulin and Kutsenko 2006), structural subdivisions of agricultural enterprises (Serdyuk *et al.* 2015) and agricultural formations as a whole (Kurnosov *et al.* 2007) and to the optimization of the parameters of the agricultural complex at the regional and country level (Cundius 2007).

At the modern stage, the cooperation connections of agricultural and processing branches of agricultural formations are not studied well enough and require the proper grounding.

Using of the cooperation form of business has several advantages. First, the costs of the manufacturer decrease due to the decrease of consumed resources and increase of the loading of facilities. Second, when establishing the cooperatives, the agricultural manufacturers have the possibility to support their interests together, in the interactions with the processers, banks and financial and credit institutions, trading companies and logistics companies. Forms of the agricultural cooperatives can be different. These are production, consumer, credit, supply and trading cooperatives. For the development of the agricultural cooperation, the organization of processing agricultural cooperatives can become perspective.

The conclusion of the authoritative scientists of the Timiryazev Agricultural Academy of the imperfection of the interindustry distribution and redistribution of the added value (Gataulin and Kozlov 2009) leads to the idea of consideration of perspectives of transformation of external connections into the internal ones, to the research of the practicability of organization of intercompany processing of the agricultural products. The enlargement of processing of agricultural raw materials directly at the agricultural enterprises has the following advantages:

- Smoothing of the season use of labour at the agricultural enterprises because the workers are attracted by the processing plants;
- Perishable, agricultural products unsuitable for transportation are processed directly at the place of their production;
- Level of competitiveness is increasing in the product market, and that contributes to the increase of quality of products.

The study of the world experience of use of the operations research methods in economics of agricultural complex shows the success of the operations research in the agriculture of Great Britain (Audsley and Sanders

2009), of the wide use of the advanced analytical methods when taking the grounded decisions at the management of the agricultural resources and complex management of the product delivery chains (Carravilla and Oliveira 2013), use of personal computers in economic calculations (Kuboniva *et al.* 1991). The representatives of the Russian school of economic and mathematical modeling offered the methods of determination of the best use of the resources (Kantorovich 1959) that described the use of mathematical methods and models in the organization and planning of the agricultural production (Nemchinov 1965, Braslavets and Kravchenko 1972, Tuneev and Sukhorukov 1986, Gridnev 2008).

We offer to use the operations research methods to ground the combination parameters of the production and processing of the products in the agricultural companies.

2.2. Mathematical model of combination of production of agricultural products and processing of the agricultural raw material at the agricultural enterprises

The economic and mathematical model was developed at Kuban State Agricultural University, Economic Cybernetics Department to determine the optimal parameters of the agricultural enterprises at the production and processing of the various types of agricultural products and realization of the processed products from own or purchased agricultural raw material (Francisco 2008). Particular numerical models reflect the most typical scenarios of the intercompany agro-industrial integration in Krasnodar Krai: processing of sunflower oil and production of vegetable oil, grain milling into flour and farina, production of cheese and butter from milk in various combinations of these derivative products and also providing the possibility of processing of purchased agricultural raw material at the production facilities of the model enterprise.

2.2.1. Formalization

To write down the structural mathematical model we shall introduce the legend:

- Indices: j – ordinal number of the variable; n – number of variables.
- Sets where the variables reflect: J_1 – use of labour force; J_2 – total number of livestock; J_3 – crop rotation and agricultural lands; J_4 – sown area of the cultivated crops; J_5 – physical mass of forages; J_6 – crop output in natural units of measurement; J_7 – cost of crop output; J_8 – crop output used for processing; J_9 – products obtained from the crop raw material, in natural units of measurement; J_{10} – cost of products obtained from crop raw material; J_{11} – cattle-breeding products in natural units of measurement; J_{12} – cost of cattle-breeding products; J_{13} – cattle-breeding products used for processing; J_{14} – products obtained from cattle-breeding raw material, in natural units of measurement; J_{15} – cost of products obtained from cattle-breeding raw material; J_{16} – purchased agricultural raw material for the further processing in natural units of measurement; J_{17} – cost of purchased agricultural raw material for the further processing; J_{18} –products of processing facilities used as forage for livestock; J_{19} – cost for the forage production; J_{20} – cost of fixed assets; J_{21} – sum of depreciation allowances, funds for repair and maintenance; J_{22} – cost of fuel and lubricants, energy and water supply; J_{23} – costs related to the intercompany transportation; J_{24} – costs related to the zooveterinary service; J_{25} – costs for the salary and social insurance; J_{26} – insurance premiums and costs for emergency needs; J_{27} – short-term credit; J_{28} – credit for purchase of fixed assets; J_{29} – refund of credits and paid interests; J_{30} – total costs and annual payments; i – ordinal numbers of restrictions; m – number of restrictions.
- Sets where elements reflect the restrictions related to: I_1 – use of labour force; I_2 – total number of livestock; I_3 – lend resources, crop rotations; I_4 – sown crop areas; I_5 – forages in natural units of measurement; I_6 – balance of nutrient elements and structure of ration of livestock feeding; I_7 – crop products in natural units of measurement; I_8 – crop products and products obtained from processed crop raw material in monetary terms; I_9 – products obtained from processed crop raw material in natural units of measurement; I_{10} – livestock products in natural units of measurement; I_{11} – livestock products and products obtained from the livestock raw material in monetary terms; I_{12} – products obtained from the livestock raw material in natural units of measurement; I_{13} – costs for production of forage for livestock; I_{14} – fixed assets; I_{15} – sums of depreciation allowances, costs for repair and maintenance; I_{16} – costs of fuel and lubricants, energy and water supply; I_{17} – costs related to the intercompany transportation of goods; I_{18} – costs related to the zooveterinary service; I_{19} – salary and social insurance; I_{20} – insurance premiums and costs for emergency needs; I_{21} – determination of the demand in short-term credit; I_{22} – determination of the demand in long-term credit for purchase of fixed assets; I_{23} – refund of credits and paid interests; I_{24} – determination of total costs and annual payments; I_{25} – maximal levels of loading of production facilities of processing plants; I_{26} – minimal levels of loading of production facilities of processing plants; I_{27} – specific weight of agricultural and industrial products in proceeds.
- Constants: B_i, b_i – i-type resources reservoir; W_i – production facility of processing plants for the j-type

products production.

- Factors: A_{ij} – resource cost standards of i-type for j-type activity; v_{ij} – output of j-type products for the unit of i-type resource; h – land share, hectare; p'_{ij}, p''_{ij} – variables coupling factors; q_{ij} – consumption of nutrients of i-type per unit of j-type livestock product; u_{ij} – content of nutrients of i-type in the unit of j-type forage; d^{min}_{ij}, d^{max}_{ij} – minimal and maximal norms of feed supply per one animal; c_j – estimation factors; S – average distance of intercompany transportations; λ_{ij} – factor reflecting the term of credit payment; λ'_{ij} – factor reflecting the credit interest payment; g_i – minimal allowed level of loading of production facilities in the processing field; x_j – variables value.

2.2.2. Target function

The problem is to find the parameters of the agricultural enterprise allowing to obtain the maximal profit that is expressed by the target function:

$$C = \sum_{j \in J_7, J_{10}, J_{12}, J_{15}} x_j - \sum_{j \in J_{30}} x_j \rightarrow \max \quad (1)$$

2.2.3. Restrictions

System of restrictions is the following:

- Number of permanent employees in the model is an endogenous characteristic; it is given by:

$$x_j = B_i \qquad where \quad j \in J_1, \quad i \in I_1 \quad (2)$$

- Restrictions of the use of labour force:

$$\sum_{j \in J_1} a_{ij} x_j \le b_i, \quad where \quad i \in I_1 \quad (3)$$

- Ratio restrictions of the particular sex and age groups of livestock:

$$\sum_{j \in J_2} p'_{ij} x_j - \sum_{j \in J_2} p''_{ij} x_j = 0, \quad where \quad i \in I_2 \quad (4)$$

- Compliance restrictions of crop rotations:

$$\sum_{j \in J_3} p'_{ij} x_j - \sum_{j \in J_3} p''_{ij} x_j \begin{Bmatrix} \le \\ = \\ \ge \end{Bmatrix} 0, \quad where \quad i \in I_3 \quad (5)$$

- Restrictions of use of land resources:

$$\sum_{j \in J_4} a_{ij} x_j - \sum_{j \in J_4} h x_j - \sum_{j \in J_3} x_j \le 0, \quad where \quad i \in I_4 \quad (6)$$

- Restrictions of use of forages in natural units of measurement:

$$\sum_{j \in J_3} v_{ij} x_j - \sum_{j \in J_5} x_j = 0, \quad where \quad i \in I_5 \quad (7)$$

- Restrictions of green conveyor:

$$\sum_{j \in J_2} a_{ij} x_j - \sum_{j \in J_5} x_j \ge 0, \quad where \quad i \in I_5 \quad (8)$$

- Restrictions of conservation of soil fertility and use of organic fertilizers:

$$\sum_{j\in J_2} a_{ij}x_j - \sum_{j\in J_3} a_{ij}x_j \geq 0, \quad where \quad i\in I_3 \tag{9}$$

- Observance of ration structure, zootechnic requirements and nutrient elements:

$$\sum_{j\in J_2} q_{ij}x_j - \sum_{j\in J_4, J_{18}} \upsilon_{ij}x_j \leq 0, \quad where \quad i\in I_6 \tag{10}$$

$$x_j \geq \sum_{j\in J_2} d_{ij}^{\min} x_j, \quad where \quad i\in I_5 \tag{11}$$

$$x_j \leq \sum_{j\in J_2} d_{ij}^{\max} x_j, \quad where \quad i\in I_5 \tag{12}$$

- Calculation of the crop products in natural units of measurements:

$$\sum_{j\in J_4} v_{ij}x_j - \sum_{j\in J_2, J_8} a_{ij}x_j - \sum_{j\in J_6} x_j = 0, \quad where \quad i\in I_7 \tag{13}$$

- Balance of use of crop products of the processing plants:

$$\sum_{j\in J_9, J_{18}} a_{ij}x_j - \sum_{j\in J_8, J_{16}} x_j \leq 0, \quad where \quad i\in I_9 \tag{14}$$

or:

$$\sum_{j\in J_9, J_{18}} a_{ij}x_j - \sum_{j\in J_8, J_{16}} v_{ij}x_j \leq 0, \quad where \quad i\in I_9 \tag{15}$$

- Calculation of cost of realized crop products and its derivative products:

$$\sum_{j\in J_6, J_9} c_j x_j - \sum_{j\in J_{16}} c_j x_j - \sum_{j\in J_7, J_{10}, J_{17}} x_j = 0, \quad where \quad i\in I_8 \tag{16}$$

Similarly, we write the restrictions of crop products and its derivative products:

- Calculation of livestock products in natural units of measurements:

$$\sum_{j\in J_2} v_{ij}x_j - \sum_{j\in J_2, J_3, J_{13}} a_{ij}x_j - \sum_{j\in J_{11}} x_j = 0, \quad where \quad i\in I_{10} \tag{17}$$

- Balance of use of livestock products by the processing plants:

$$\sum_{j\in J_{14}, J_{18}} a_{ij}x_j - \sum_{j\in J_{13}, J_{16}} x_j \leq 0, \quad where \quad i\in I_{12} \tag{18}$$

or:

$$\sum_{j\in J_{14}, J_{18}} a_{ij}x_j - \sum_{j\in J_{13}, J_{16}} v_{ij}x_j \leq 0, \quad where \quad i\in I_{12} \tag{19}$$

- Calculation of cost of realized livestock products and its derivative products:

$$\sum_{j\in J_{11}, J_{14}} c_j x_j - \sum_{j\in J_{16}} c_j x_j - \sum_{j\in J_{12}, J_{15}, J_{17}} x_j = 0, \quad where \quad i\in I_{11} \tag{20}$$

- Determination of the costs for the forage production:

$$\sum_{j\in J_4,J_{18}} a_{ij}x_j - \sum_{j\in J_{19}} x_j = 0, \quad where \quad i\in I_{13} \tag{21}$$

- Determination of the required fixed assets:

$$\sum_{j\in J_4} a_{ij}x_j + \sum_{j\in J_2} a_{ij}x_j + \sum_{j\in J_9,J_{14}} a_{ij}x_j - \sum_{j\in J_{20}} x_j = 0, \quad where \quad i\in I_{14} \tag{22}$$

- Calculation of depreciation allowances, costs for the repair and maintenance of equipment:

$$\sum_{j\in J_{20}} a_{ij}x_j - \sum_{j\in J_{21}} x_j = 0, \quad where \quad i\in I_{15} \tag{23}$$

- Calculation of costs for fuel and lubricants, energy and water supply:

$$\sum_{j\in J_4} a_{ij}x_j + \sum_{j\in J_2} a_{ij}x_j + \sum_{j\in J_9,J_{14},J_{16}} a_{ij}x_j - \sum_{j\in J_{22}} x_j = 0, \quad where \quad i\in I_{16} \tag{24}$$

- Calculation of costs for intercompany transportations:

$$\sum_{j=1}^{n} sc_j x_j - \sum_{j\in J_{23}} x_j = 0, \quad where \quad i\in I_{17} \tag{25}$$

$$s = \alpha\sqrt{x_j} \quad j\in J_3 \tag{26}$$

where α is a factor reflecting the configurations of the land lots and intercompany networks of roads.

- Calculations related to the zooveterinary service:

$$\sum_{j\in J_2} a_{ij}x_j - \sum_{j\in J_{24}} x_j = 0, \quad where \quad i\in I_{18} \tag{27}$$

- Sums of salary, social security contributions, local taxes payment:

$$\sum_{j\in J_1} a_{ij}x_j - \sum_{j\in J_{25}} x_j = 0, \quad where \quad i\in I_{19} \tag{28}$$

- Payment of premium, costs for emergency needs:

$$\sum_{j=1}^{n} a_{ij}x_j - \sum_{j\in J_{26}} x_j = 0, \quad where \quad i\in I_{20} \tag{29}$$

- Calculation of sum of short-term credit:

$$\sum_{j\in J_1} x_j + \sum_{j\in J_3} c_j x_j + \sum_{j\in J_{16}} x_j + \sum_{j\in J_{22}} x_j + \sum_{j\in J_{24}} x_j - \sum_{j\in J_{27}} x_j = 0, \quad where \quad i\in I_{21} \tag{30}$$

- Calculation of credit demand for the purchase of fixed assets:

$$\sum_{j\in J_2} c_j x_j + \sum_{j\in J_{20}} x_j - \sum_{j\in J_{28}} x_j = 0, \quad where \quad i\in I_{22} \tag{31}$$

- Calculation of annual sums of credit and interest payment:

$$\sum_{j\in J_{27}}(\lambda_{ij}^{'}+1)x_j+\sum_{j\in J_{28}}(\lambda_{ij}^{'}+\lambda_{ij})x_j-\sum_{j\in J_{29}}x_j=0,\quad where\quad i\in I_{23} \tag{32}$$

- Calculation of total sum of costs and annual payments:

$$\sum_{j\in J_1}\tilde{n}_j x_j+\sum_{j\in J_3}\tilde{n}_j x_j+\sum_{j\in J_{19}}x_j+\sum_{j\in J_{21}}x_j+\sum_{j\in J_{22}}x_j+\sum_{j\in J_{23}}x_j+\sum_{j\in J_{24}}x_j+\sum_{j\in J_{25}}x_j+\sum_{j\in J_{26}}x_j+\sum_{j\in J_{29}}\lambda_{ij}^{'}x_j-\sum_{j\in J_{30}}x_j=0,\quad i\in I_{24} \tag{33}$$

- Restrictions of output maximal level of finished products of processing plants:

$$\sum_{j\in J_9,J_{14},J_{16}}x_j\le W_i,\quad where\quad i\in I_{25} \tag{34}$$

- Restrictions of providing of minimally allowed level of loading of production facilities in the product processing field:

$$\sum_{j\in J_9,J_{14}}x_j\le g_i W_i,\quad where\quad i\in I_{26} \tag{35}$$

- Restrictions stipulated by the legal tax limitations of the specific weight of the agricultural and industrial products in the proceeds:

$$\sum_{j\in J_6,J_{11}}x_j-f\sum_{j\in J_9,J_{14},J_{16}}c_j x_j\le 0,\quad where\quad i\in I_{27} \tag{36}$$

where f is a norm coefficient.

- Restriction of non-negatively of variables:

$$x_j\ge 0 \tag{37}$$

Economic and mathematical model offered by us reflects the economic and natural conditions, requirements of the technology of production and processing of agricultural products. Use of this model can help to calculate the optimal parameters at the enterprise that can maximize its profit from the production of agricultural products and also the organization of the primary and industrial processing of agricultural raw material in the agricultural formations.

2.3. Scenarios of calculations

After approbation of this economic and mathematical model by means of solving of tens of problems using the various systems of restrictions, in different settings we can conclude about the adequate reaction of the model to the changes of the initial information, which is reflected in the parameters of the enterprise obtained as a result. Using this symbolic model, we prepared ten economic and mathematical problems to determine the optimal parameters of the model enterprise oriented for the production and processing of the agricultural products according to five scenarios for the conditions of the central zone of Krasnodarsky Krai. The number of permanent employees was the control variable and the other parameters of the model enterprise were determined as a result of this solution.

Numerical models of the solved economic and mathematical problems include 65-92 restrictions and 57-79 variables depending upon the scenario. Computer calculations determined the parameters of the model enterprise oriented for the production and processing of the agricultural products. Five scenarios of the enterprises with 300 and 500 permanent employees were calculated.

We considered the following scenarios. According to the first scenario, the production of the agricultural products without its primary or industrial processing was provided. The second scenario is the production of sunflower oil from the sunflower, the third scenario is the processing of the grain of winter wheat by milling to produce the flour and farina; the fourth scenario is processing of milk into packed milk, production of butter and cheese. The fifth scenario provides that the enterprise takes the role of the integrator for local individual farms and peasant farms, purchases the oilseeds for its processing at the available production facilities and realizes the sunflower oil and by-products of the processing.

All scenarios provide the possibility to produce not only products that can be processed but also other types of crop products and livestock products for sale in the market or for the intercompany consumption in the un-processed form.

3. Results of the optimization calculations of the combination of production and processing of the agricultural products at the agricultural enterprises

3.1. Production

As a result of computer calculations, it was revealed that the output of the agricultural products depends upon the type of the processed products because it is for its production the limited production facilities will be used due to the higher profitability. Thus, in the farm where 300 employees work the production of winter wheat is 2,232-4,145 tons according to the scenarios that do not provide the grain milling and when processing the wheat grain into flour (scenario 5) its output is 7,322 tons.

However, the volumes of sunflower productions do not depend upon the processing of oilseeds. So, according to the scenario without processing and with processing of sunflower, the gross yield of oilseeds is 1,490 tons and it decreases a little in the scenarios providing the production of milk products and vegetable oil. This is explained by the fact that according to the agricultural requirements made for the sunflower sown areas, sunflower sown area cannot be less than 12%. Besides, this enterprise produces 3,042-19,773 tons of sugar beet, 11.1-12.8 thousand tons of milk, 804-934 tons of live weight of livestock; the production of the forage for livestock is 178,515.9-208,829.5 center of feed unit of various feeds per year that satisfy the livestock demand for feed. The enterprises produce 472-2,865 tons of vegetable oil, 5,491 tons of flour, 210 tons of packed milk, 144 tons of butter, 317 tons of cheese and by-products (serum, oilcake, mill offals, and grain screenings). By-products are used for the feed of livestock; the rest is sold.

With the increase of the number of employees up to 500 people, the production of all types of products changes significantly. Thus, according to the scenario with the wheat processing, the production is increased up to 12,002 tons that allows to obtain 3,509 tons of flour or 63.9% more than according to the same scenario with 300 employees. The production of sunflower oil is increased from 472 to 793 tons according to the scenario providing the sunflower processing, and from 2,865 to 4,800 tons according to the scenario with the possible purchase of the sunflower for its processing. Production of cheese increases by 43 tons. With the increase of the number of enterprise employees, the production of the butter and packed milk are not changed because the volume of its output is limited by the capacity of the equipment that is loaded completely.

A part of the produced products is used for the consumption inside the company. A part of by-products obtained during processing is used for the feed of the livestock. A part of milk is used for calf rearing, manure is used as a fertilizer, only its surplus can be sold. Table 1 shows the marketable products of the enterprise with 300 employees, realizing various scenarios of the development of the auxiliary processing plants. Range of products is increased significantly when realizing the scenarios with primary and industrial processing of the agricultural raw material, consequently, the enterprise has the possibilities for growth of its competitiveness in the market. The attention should be paid to the fact that the processing of the agricultural products prolongs its terms of storage and sale. Thus, the whole milk can be stored for several hours only, but the packed milk can be stored for several days. Cheese and butter can be stored for weeks and even months as well as the vegetable oil when following the necessary conditions. In comparison with the grain, the flour is less stable product for storage. Under the influence of temperature, air humidity and oxygen the undesirable processes start that require to follow the strict storage conditions.

Table 1 – Optimal solution of commodity products

Indicator	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Milk, thousand ton	12.3	12.1	10.6	7.8	10.6
Livestock in live weight, ton	933	914	804	894	804
Bred heifer livestock, animals	233	228	201	224	201
Winter wheat, tons	2,327	2,871	–	2,232	4,145
Sugar beet, tons	16,224	15,912	–	15,561	14,001

Indicator	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Sunflower, tons	1,490	–	328	1430	–
Sunflower oil, tons	–	472	–	–	2,865
Flour, tons	–	–	5,491	–	–
Packed milk, tons	–	–	–	210	–
Cheese, tons	–	–	–	317	–
Butter, tons	–	–	–	144	–
Serum, tons	–	–	–	3,292	–
Oilcake, tons	–	549	–	–	1,402

Analyzing the commodity products of the enterprise in the second, third and fourth scenarios of its development all oilcake obtained during the sunflower processing is used for the feed of the livestock, and when processing the purchased oilseeds (scenario 5) there is a surplus of oilcake that can be sold.

3.2. Commercial potential

Using the proposed model, the commercial potential of the enterprise can be calculated. The commercial potential is understood as the cost indicator reflecting the cost of the sold agricultural products and the products of agricultural raw material processing.

The calculations show that the introduction of the primary or industrial processing leads to the increase of its commercial potential. Thus, the sunflower processing in the model enterprise increases its commercial potential by 0.9%, grain milling – by 4.3%, milk processing – by 13.6%, processing of purchased oilseeds – by 33.8%.

Our research to some extent coincides with the studies of the foreign authors who offer the mathematical tools for the study of the impact of fiscal restrictions on the efficiency of the decisions taken by the economic entities (Joy, 1984). In the model offered by us, the volumes of the processed agricultural products are limited by the existing norm in the fiscal legislation, according to which the products shall not exceed 30% of the profit of the agricultural enterprise because otherwise the general taxation system will be applied to the enterprise.

Besides, one shall take into account the production facilities of the processing plants that shall not be overloaded nor under loaded. The minimal load of the production facility is set according to the fact that the processed products shall satisfy the intercompany needs at least.

The obtained optimal decision provides the following structure of the commercial potential of the agricultural enterprise in the various conditions of economy management (Table 2).

Table 2 – Compositional analysis of the commercial potential of the agricultural enterprise, %

INDICATOR	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Livestock products	79	76	64	51	51
Crop products	21	17	1	18	14
Products of processing plants	–	7	35	31	35
including:					
Primary processing:	–	7	35	1	5
vegetable oil	–	7	–	–	4
sunflower oilcake	–	–	–	–	1
wheat flour	–	–	35	–	–
packed milk	–	–	–	1	–
Industrial processing	–	–	–	30	–
Cheese	–	–	–	19	–
Butter	–	–	–	7	–

INDICATOR	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Serum	–	–	–	4	–
Purchased raw material for processing	–	–	–	–	30
TOTAL	100.0	100.0	100.0	100.0	100.0

The analysis of the data showed that the structure of commercial potential is unchanged regardless to what number of permanent employees of the model agricultural enterprise the calculations are made and optimal parameters are obtained. A share of livestock products in the structure of the commercial potential is 51-78% depending upon the scenario, of the crop products – 14-21%, that is in the optimal decision, regardless the scenario the share of livestock products is prevailing.

The maximal share of the industrial processing at the agricultural enterprise shall not exceed 30%, otherwise the enterprise will lose its status as agricultural commodity producer and this will lead to the loss of taxation benefits and the possibilities of the special taxation treatment. The share of the products of the processing plants of the enterprise is limited by the production facilities. The share of the products of the processing plants changes from 0 to 35% depending upon the scenario, the share of industrial processing does not exceed 30% in any of the variants of development.

If the number of employees of the enterprise is increased up to 500 people, at all stated scenarios of the development the share of the products of the processing plants will reach its maximum from the point of view of the load of the processing facilities and from the point of view of 30% minimum.

If the processing is available in one of the scenarios the increase of the share of the corresponding processed products is observed together with the simultaneous decrease of the shares of other products. At the same time, if there is a possibility to process one or another product, all the products grown at the enterprise are processed completely.

3.3. Labour force

The analysis of the use of labour force of the model agricultural enterprise is of interest at the various development scenarios (Table 3).

For the economic and mathematical model and solving of the problems using it the ratio was used when one seasonal employee is hired for every three permanent employees of the enterprise. Such ratio can be met at the existing agricultural enterprises because it is scientifically proven from the point of view of the organization and labour norming.

Table 3 – Labour force of the model enterprise in the optimal decision, thousand people

INDICATOR	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Total labour resource	716.1	716.1	716.1	716.1	716.1
including: permanent employees	530.1	530.1	530.1	530.1	530.1
Seasonal employees	186.0	186.0	186.0	186.0	186.0
TOTAL labour costs	716.1	716.1	716.1	716.1	716.1
including: administrative staff	30.1	30.1	30.1	30.1	30.1
commodity production	76.0	78.4	46.5	72.9	79.3
feed production	104.6	95.8	73.1	100.3	70.0
livestock branch	505.4	495.2	435.6	484.6	435,8
processing plants	–	16.6	130.8	28.2	100,9

The following main directions of the use of labour force were distinguished: administrative staff, and regardless the scenario of the development of an enterprise, commodity and feed production, livestock branch, processing plants, the available total labour resource is used completely.

Table 4 shows the structure of labour costs of the model enterprise at the various scenarios.

Table 4 – Structure of labour costs of the model enterprise, %

INDICATOR	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Administrative staff	4	4	4	4	4
Commodity production	10	11	7	10	11
Feed production	15	14	10	14	10
Livestock branch	71	69	61	68	61
Processing plants	–	2	18	4	14
TOTAL	100.0	100.0	100.0	100.0	100.0

In the structure of the labour costs, the costs for the livestock branch have the biggest specific weight from 61 to 71% of all labour costs, the costs for the processing plants are changing depending upon the scenario from 0 to 18% of the total labour resource.

3.4. Land resources and sown areas

The presented economic and mathematical model of the development of the agricultural enterprise provides that it produces not only agricultural crops but also forage crops to provide the livestock with forage in a necessary volume. The ration shall correspond to the zootechnical requirements and contain enough nutrient elements and also possess a particular structure, including the concentrated, rough, juicy and green forages.

Sown areas of the agricultural crops at the various scenarios of the development of the enterprise are shown in the Table 5.

Table 5 – Sown area of agricultural crops of model enterprise, thousand hectares

INDICATOR	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Square of commodity crops:	1.53	1.64	1.76	1.47	1.81
winter wheat	0.52	0.64	1.63	0.50	0.92
sugar beet	0.42	0.41	–	0.40	0.36
sunflower	0.60	0.60	0.13	0.57	0.53
Square of feed crops:	3.54	3.32	2.61	3.40	2.56
perennial grasses	1.55	1.34	0.77	1.49	0.89
including: hay	0.56	0.55	0.40	0.54	0.48
haylage	0.38	0.37	0.30	0.37	0.33
green mass	0.53	0.33	–	0.50	–
corn	1.14	1.28	1.48	1.10	1.38
including: grain	0.70	0.69	0.59	0.67	0.61
green mass	0.24	0.40	0.73	0.23	0.61
silage	0.20	0.19	0.17	0.19	0.17
winter and wintering grasses	0.25	0.25	0.22	0.24	0.22
winter barley	0.51	0.37	0.06	0.48	–
TOTAL sown area	5.07	4.96	4.37	4.86	4.37

Area designated for the commodity crops is from 30 to 41% of the total square of the sown area in different scenarios, the area designated for forages is changing from 59 to 70% correspondingly.

If the development scenario of an enterprise provides the availability of the processing of agricultural products, the decrease of the total sown area is observed, and the square of those commodity crops that are processed later is increasing. This happens as a result of the redistribution of the labour forces of the enterprise, the volume of which is limited by the conditions of the problem. One more peculiarity that shall be paid attention

to is the fact that if the scenario provides the processing of sunflower or the wheat milling the transformation of the forage crops sowing structure takes place. As a result of the sunflower processing there is a by-product – oilcake, as a result of the wheat milling the by-products are bran and grain screenings, and the developed model provides the use of the by-products, if available, to feed the livestock, which leads to the decrease of the sown areas of the feeding crops.

On the whole, regardless of the scenario of the development, the land resources of the enterprise are used efficiently providing the necessary volume of the production of the commodity crops taking into account its economic efficiency and agrotechnical requirements to the structure of the sown areas, and the sufficient amount of the feeding crops to provide the available livestock with own forages.

3.5. Structure of production costs

The main parameter characterizing the economic efficiency of the model enterprise is the value of production costs. The model provides the classification of the production costs according to the elements of costs and that allowed to divide them into groups: material costs, labour costs, depreciation, and other costs.

The analysis of the obtained calculation data showed that the introduction of the processing at the agricultural enterprise increases the amount of the material costs because it leads to the additional costs related to the additional use of the power, fuel and lubricants and other expendables. The costs related to the labour remuneration are not changed from one scenario to the other because the number of employees is not changed. The value of depreciation is decreasing after introduction of the processing due to the rather long service life of the processing equipment in comparison with the various farming machinery. The value of other costs is changing slightly depending upon the scenario. Figure 1 shows the structure of the production costs of the model enterprise.

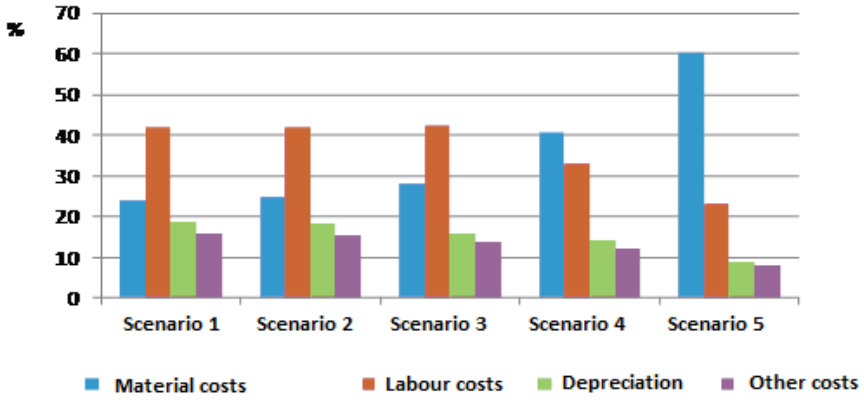

Figure 1 – Structure of the production costs of the model agricultural enterprise

Material costs are increasing significantly after the introduction of the processing, especially its specific weight is observed in the fifth scenario, which provides the processing of sunflower and purchase of raw material. Costs, related to the labour remuneration, also take the significant specific weight, their share changes from 23 to 42% in the various scenarios. Depreciation and other costs have a low specific weight.

4. Discussion

4.1. Level of intercompany agro-industrial integration

When developing the processing in the agricultural enterprises the analysis of the level of intercompany agro-industrial integration is of interest (Table 6).

Table 6 – Change of level of intercompany agro-industrial integration of the model enterprise

INDICATOR	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Income from the processed products, thousand rubles	14,633	72,484	70,273	94,240
Share of processed products in the income, %	7	35	31	36
including: – primary processing – industrial processing	7 –	35 –	1 30	6 30
Income from processed products for 100 hectares, thousand rubles	270	1,521	1,325	1,977
Employees engaged in processing, people	10	74	16	57
Share of employees engaged in processing, total, %	3	19	4	14
Profit of processing plants, thousand rubles	9,757	51,619	48,324	68,912
Profitability of processing plants, %	200	247	220	272

In different scenarios of the development of the agricultural enterprise, the share of processed products in the income is changing from 7 to 36%. The share of the products of the industrial processing or the processed products from purchased raw material is limited by the limit of 30% in all scenarios. From 10 to 74 people or from 3 to 19% of the total number of employees of the enterprise are engaged in the processing of the agricultural products.

Processing plants of the model agricultural enterprise show rather high level of profitability; in different scenarios, it can be from 200 to 272%.

If the number of permanent employees of the enterprise is increased up to 500 people, it will lead to the growth of income from the processed products, with some decrease of its share in the total income. The number of employees engaged in the processing is increasing. However, the value of the profitability indicators of the agricultural products processing plants will be almost unchanged.

4.2. Cost efficiency

Let us analyse the efficiency of work of the agricultural enterprise in the different scenarios of its activity development (Table 7).

Table 7 – The indicators of the enterprise efficiency at different scenarios

INDICATOR	Scenario 1: agriculture only	Scenario 2: sunflower processing	Scenario 3: wheat milling	Scenario 4: milk products	Scenario 5: processing of sunflower and purchase of raw material
Value of commercial potential, mln rubles	198	200	206	225	265
Value of commercial potential per:					
1 employee, thousand rubles	495	500	516	562	662
1 hectare, thousand rubles	36	37	43	42	56
1 ruble of costs, rubles	2.6	2.7	2.8	2.4	1.9
Profit, mln rubles	123	124	132	129	127
Profit per:					
1 hectare, thousand rubles	22	23	28	24	27
1 employee, thousand rubles	307	311	329	323	319
Profitability, %	163	165	176	135	93

The value of commercial potential gives an idea of the sum of money that the enterprise will get selling the grown agricultural products and also the products processed at their own processing plants; as opposed to it, the value of the income shows the financial result obtained by the enterprise as a result of its activity. The values of the production efficiency allow to estimate the results of use of the available means of production, labour and land resources of the enterprise.

Thus, the results from the table show that in the different scenarios of the development the values of efficiency indicators of the use of resources of the enterprises tends to fluctuations, and if the processing of any agricultural product is provided, the values are increasing. All stated scenarios of the activity development of the model enterprise have a high profitability, the level of which fluctuates from 93 to 176% in different scenarios.

We share the point of view of the authors who think that optimal sizes of the agricultural enterprises shall be determined taking into account the level of specialization and the development of outsourcing institute (Rysmyatov *et al.* 2008). The researchers who explain the optimal size of the agricultural enterprises mention that now in Krasnodar Krai there are agricultural holdings having the tilled areas up to 210 thousand hectares, the average collective agricultural enterprises having tilled areas from 1,000 to 10,000 hectares and also the farms with the lands from 10 to 450 hectares (Nechaev *et al.* 2015). Using their own grounding method of the agricultural enterprises sizes that is based upon the application of the mathematical methods and models, they came to the conclusion that every ruble invested into the expansion of the production of agricultural holdings generates twice less by-products than in the middle size enterprises and they came to an important conclusion about the increase of the efficiency due to the possibility of partial interchangeability and complementarity of the production resources at the diversification of the activity and diversified specialization of the agricultural enterprises.

However, the purchase of the processing equipment involves huge investments. Consequently, before taking decision to use the processing plants in its activity the management of the agricultural enterprise shall estimate the efficiency of such investments. The offered economic and mathematical model provides the calculation of the sum necessary to introduce the different types of processing plants. According to the design sums of investments and also the growth of the profit value as the expense of the organization of the processing plants, the payback period was determined for the processing equipment for every scenario. It is in the range of 2.5-5 months because the expenses for purchase of the processing equipment are not very high and the profit obtained from the sale of the processed products is significant.

The research conducted allows to conclude that the organizing of the processing plants the agricultural enterprise gets more possibilities and variants of its development. The use of the offered economic and mathematical model gives the possibility to ground the choice of one or another scenario of the development of the auxiliary processing branches of the enterprise activity.

Conclusion

The conducted research allowed to clarify the system of economic parameters of the agricultural enterprises adding to them the level of intercompany agro-industrial integration characterizing the formation of the auxiliary processing plants and its efficiency. This parameter shall be considered by means of the indicators as share of processed products in the income, income from processed products per 100 hectares of land, share of employees involved into processing of the total number of employees, profit from processing plants, profitability of the processing plants, etc.

Using the methods of modeling and optimization, the scenarios of the development of the agricultural enterprises and the optimal parameters of the agricultural enterprises, involved into the processing of the various types of agricultural raw material, were developed. The numerical model composed according to the offered economic and mathematical model can be used many times, it can be trained inserting the corrections in case of conditions changes of the activity of the agricultural enterprise, and that makes this method efficient.

Using the offered economic and mathematical model, we can determine the optimal parameters of any agricultural enterprise for any scenario of its development, combining the production and processing of the agricultural raw material (sunflower into oil, wheat into flour and farina, milk into packed milk, cheese and butter), and at the same time its maximal efficiency will be provided.

The theoretical, methodical and practical recommendations offered in the research give the possibility to implement the development of the scenarios of the development of the agricultural enterprises processing the agricultural products by means of the economic and mathematical modelling. The scenarios of the development obtained as a result will lead to the increase of economic efficiency of its activity as a result of the organization of

their own processing plants. At the same time, the head of the agricultural enterprise can choose the scenario of the development that corresponds to the conditions of the operation, his experience and intuition.

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Terms of Trade and Economic Growth in Thailand

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Abstract:

The purpose of this study is to examine the impact of the terms of trade and its volatility on economic growth in Thailand through the Auto Regressive Distributed Lag (ARDL) model. The analysis was employed with time series data from 1981 to 2015. Results of the bounds testing procedure confirm that there is a long run relationship between the terms of trade volatility with economic growth. Results show that only the volatility of the terms of trade significantly affects the economic growth of Thailand in the long run and in the short run. The study provides some interesting findings; the improvement of labor force quality, capital productivity, import and export prices, and the characteristics of trading partners should be considered when formulating policy in Thailand.

Keywords: terms of trade, terms of trade volatility, economic growth.

JEL Classification: C32, F41, F43.

1. Introduction

An important issue in the current period is the impact of macroeconomic variables on economic growth. Terms of trade, terms of trade uncertainty, exchange rate regimes and foreign direct investment (FDI) are some interesting macroeconomic variables identified in previous research (Bleaney and Greenaway 2001, Broda and Tille 2003, Jawaid and Waheed 2011, Samini, Sadeghi and Sadeghi 2011, Skare, Simurina and Tomic 2012, Wong 2004, Wong 2010).

Specially, volatility in the terms of trade is greater at present. This may be a result of globalization, economic integration and technology and may lead to greater uncertainty. Changes in terms of trade can explain approximately fifty percent of output volatility according to Mendoza (1995, 1997).

For Thailand, the terms of trade and volatility in the terms of trade have barely been investigated in terms of economic growth, but there are only some related studies. Kohpaiboon (2003) indicated the effect of foreign direct investment (FDI) on aggregate growth in Thailand, and Turnovsky and Chattopadhyay (2003) tested the effects of the terms of trade and terms of trade volatility on economic growth in developing countries. They indicated that there is a relationship between terms of trade and terms of trade volatility and economic growth in these countries. Past studies are unclear as to how both variables affect economic growth.

Moreover, it is widely believed that the terms of trade and their volatility are linked with the relative price of exports and imports. These variables should also significantly influence export, import and economic growth in Thailand. Exports and imports are considered to be an important part of gross domestic product (GDP) in Thailand. As data from the Ministry of Commerce reveal, exports and imports account for more than forty percent of Thailand's GDP. Therefore, the analysis of the terms of trade and its volatility is important in broadening the understanding of this issue. The purpose of the study is to investigate the effects of the terms of trade and the volatility of the terms of trade on economic growth in the case of Thailand.

The components of the article are organized as follows. Section 2 reviews some literature about terms of trade, terms of trade volatility and economic growth. Section 3 describes the model, followed by the presentation of data and methodology in Section 4. The results are reported in the next section. Section 6 provides the conclusion.

2. Literature review

Two main parts present related studies based on the literature review covering the terms of trade and economic growth, and terms of trade volatility and economic growth.

2.1 Terms of trade and economic growth

The terms of trade have various effects on economic growth. Previous studies of the issues show two directions, namely a positive direction, and no direction. The direction of most relationships is positive (Bleaney and Greenaway 2001, Cakir 2009, Fatima 2010, Jawaid and Raza 2013, Samini, Sadeghi and Sadeghi 2011,

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Skare, Simurina and Tomic 2012, Wong, 2004). The expansion of economic growth occurred in many countries as a result of improved terms of trade. Emerging countries such as, Croatia, India, Malaysia, Pakistan, Sub-Saharan African countries, and oil exporting countries, for example, have the same direction of association between the terms of trade and economic growth. Second, Berge and Crowe (1997) indicated that terms of trade have an insignificant effect on economic growth in developed markets. However, there is a significant effect of terms of trade on economic growth in less developed countries.

There are various reasons offered in earlier studies to explain the effect of the terms of trade on economic growth. Currency depreciation was found to affect both variables. The reduction of real income in a country will result from the deterioration of the terms of trade because currency depreciation influences on the increase of real expenditure (Herberger 1950, Laursen and Metzler 1950). The specialization in some commodities should be a factor that influences the relationship. Kaneko (2000) stated that the relationship between terms of trade and economic growth is positive for a country specializing in consumption commodities. In contrast, there is no relationship between terms of trade and economic growth in a country specializing in capital commodities. The development level of countries may result in a difference in terms of trade and economic growth. Berge and Crowe (1997) indicated that there is significant effect of terms of trade on economic growth in less developed countries but developed markets were excluded.

2.2. Terms of trade volatility and economic growth

Volatility in the terms of trade leads to change in economic growth for several countries, but obstructs economic growth (Bleaney and Greenaway 2001, Jawaid and Waheed 2011, Samini, Sadeghi and Sadeghi 2011, Skare, Simurina and Tomic 2012, Turnovsky and Chattopadhyay 2003, Wong, 2010). Turnovsky and Chattopadhyay (2003) reported that terms of trade volatility, government expenditure volatility and monetary volatility negatively influence the equilibrium growth rate of a developing economy. Low levels of real per capita gross domestic product result from an increase in the terms of trade volatility. In oil exporting countries, volatility in the terms of trade negatively affects these countries (Samini, Sadeghi and Sadeghi 2011). For Japan and Korea, Wong (2010) revealed that decreased economic growth was caused by volatility in the terms of trade. Like the study of Skare, Simurina and Tomic (2012), Jawaid and Waheed (2011), Bleaney and Greenaway (2001) showed that the decreased economic growth of Croatia, India and Sub-Saharan African countries was caused by the increase in terms of trade volatility.

Two types of terms of trade volatility were considered in previous studies, namely commodity terms of trade, or net barter terms of trade, and income terms of trade Bleaney and Greenaway (2001), Jawaid and Waheed 2011, Samini, Sadeghi and Sadeghi (2011), Skare, Simurina and Tomic (2012), Turnovsky and Chattopadhyay (2003), Wong (2010). There is no difference in the relationship of both.

Furthermore, there has also been analysis of the important reasons for the relationship. Some discovered that the cause of the relationship was the degree of risk aversion and globalization. The results of Mendoza (1997) indicated that the effect of terms of trade uncertainty on savings and economic growth are determined by the degree of risk aversion. The increased variability in the terms of trade with low risk aversion reduces growth and social welfare. Jawaid and Waheed (2011) found that terms of trade volatility have a significant positive relationship with economic growth due to globalization.

3. Model specification

The production function framework is used to construct models to determine the impacts of the terms of trade on economic growth as follows:

$$GDP = f(L, K, A) \quad (3.1)$$

where GDP is the gross domestic product per capita, L is the labor force, K is the capital stock and A is the total factor productivity.

The assumption is that A is operated by the impacts of terms of trade (TOT) and the volatility of terms of trade (VTOT) on the growth of economy in equation (3.2). Some economic factors endogenously influence A according to the new growth theory (Kohpaiboon 2003).

$$A = g(TOT, VTOT) \quad (3.2)$$

So, that GDP is a function of the labor force, capital stock, terms of trade and volatility terms of trade in equation (3.3).

$$GDP = f(L, K, TOT, VTOT) \quad (3.3)$$

To take logarithm in equation (3.3), the regression models are specified in logarithm form as follows:

$$\text{Log } GDP_t = \beta_0 + \beta_1 \log L_t + \beta_2 \log K_t + \beta_3 \log TOT_t + \beta_4 \log VTOT_t + \varepsilon_t \quad (3.4)$$

The study concentrates mainly on the net barter terms of trade (NTOT). Also, the regression models in the study are added by the volatility of net barter terms of trade (VNTOT). The regression models can be developed as follows:

$$\text{Log } GDP_t = \beta_0 + \beta_1 \log L_t + \beta_2 \log K_t + \beta_3 \log NTOT_t + \beta_4 \log VNTOT_t + \varepsilon_t \quad (3.5)$$

4. Data and methodology

4.1 Data

All annual data on Thailand are from between 1981 and 2015. Figures for GDP per capita, the capital stock and net barter terms of trade are obtained from the World Bank database. Work labor figures are obtained from the UNCTAD database. The volatility of the terms of trade or variance is measured by the generalized autoregressive conditional heteroskedasticity (GARCH) model. The model consists of two steps; the mean equation and the variance equation. Firstly, the error term is determined by the mean equation. Secondly, the ARCH (p) process and the GARCH (q) process are employed in the variance equation. GARCH (1,1) is conducted to determine the volatility measure of the terms of trade (Bleaney and Greenaway 2001, Skare, Simurina and Tomic 2012, Wong 2010).

4.2 Methodology

4.2.1 Stationary Test or Unit Root Test

The stationary properties will be examined for the time series data before estimating the model. The existence of the unit root of data is confirmed by the Augmented Dickey-Fuller (ADF) test. The null hypothesis is non-stationary data or a unit root problem. The alternative hypothesis is stationary data or no unit root problem. The equation for the ADF test is presented as follows:

$$\Delta GDP_t = \eta_0 + \eta_1 GDP_t + \Sigma^k_{j=1} d_j \Delta GDP_t + \varepsilon_t \quad (4.1)$$

where Δ represents the differenced operator, η_0 represents the constant term, and k represents the optimal number of lags for the dependent variable.

The values of the calculated ADF test statistic are less than the critical values. It indicates that the variable is non-stationary. The rejection of the null hypothesis specifies that the variable is stationary.

4.2.2 The ARDL estimation procedure

The Auto Regressive Distributed Lag (ARDL) approach is employed to examine the relationships between economic growth, terms of trade and the volatility of the terms of trade. The advantage of the approach is the mixed integration order of all variables. Pesaran, Shin and Smith (2001) developed the ARDL model regardless of whether the variables are I(0) or I(1) or mutually co-integrated. The ARDL procedure involves the analysis of short run and long-run relationships. The ARDL model is specified as follows:

$$\Delta GDP_t = \alpha_0 + \alpha_1 \Sigma^p_{i=1} \Delta GDP_{t-i} + \alpha_2 \Sigma^p_{i=1} \Delta L_{t-i} + \alpha_3 \Sigma^p_{i=1} \Delta K_{t-i} + \alpha_4 \Sigma^p_{i=1} \Delta NTOT_{t-i} + \alpha_5 \Sigma^p_{i=1} \Delta VNTOT_{t-i}$$
$$+ \gamma_1 GDP_{t-1} + \gamma_2 L_{t-1} + \gamma_3 K_{t-1} + \gamma_4 NTOT_{t-1} + \gamma_5 VNTOT_{t-1} + \mu_t \quad (4.2)$$

where Δ is the first difference operator, α_0 is the constant term, the parameters α_1, α_2, α_3, α_4, α_5 are the coefficients of the short run dynamic, the parameters γ_1, γ_2, γ_3, γ_4, γ_5 are the corresponding long run multipliers and μ_t is the white noise error term.

Furthermore, the order of the distributed lag function is applied to the ARDL. The selection of the optimum lag length of the model is determined by the Schwarz Bayesian Criteria (SBC). The reason is that the SBC should describe more parsimonious specifications for the small data sample in the current study (Pesaran and Smith 1998).

The procedure of the ARDL model consists of two stages; the bounds test approach and the estimates of the long run and short run coefficients. Firstly, the F-statistic test indicates that there is a long run relationship between all variables under the ARDL model. If the value of calculated F-statistics from the ARDL model is more

than the upper bound value, the null hypothesis is rejected. The null hypothesis of cointegration is H0 = $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = 0$ or there is no a long run relationship between variables. The alternative hypothesis of cointegration is H1 $\neq \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq 0$ or there is a long run relationship between variables. Secondly, the ARDL and error correction model (ECM) are conducted when the variables are related to each other in the long run. The terms of trade, the volatility of the terms of trade and economic growth have long run relationships to estimate the coefficients in the long run. The model is used to estimate as follows:

$$GDP_t = \varphi_0 + \varphi_1 \Sigma^p_{i=1} GDP_{t-i} + \varphi_2 \Sigma^p_{i=1} L_{t-i} + \varphi_3 \Sigma^p_{i=1} K_{t-i} + \varphi_4 \Sigma^p_{i=1} NTOT_{t-i} + \varphi_5 \Sigma^p_{i=1} VNTOT_{t-i} + \mu_t \quad (4.3)$$

Then, the estimates of the ARDL short run are precisely conducted with the long run relationships of variables. The short run coefficients are specified as follows:

$$\Delta GDP_t = \upsilon_0 + \upsilon_1 \Sigma^p_{i=1} \Delta GDP_{t-i} + \upsilon_2 \Sigma^p_{i=1} \Delta L_{t-i} + \upsilon_3 \Sigma^p_{i=1} \Delta K_{t-i} + \upsilon_4 \Sigma^p_{i=1} \Delta NTOT_{t-i} +$$

$$\upsilon_5 \Sigma^p_{i=1} \Delta VNTOT_{t-i} + nECT_{t-1} + \mu_t \quad (4.4)$$

where Δ represents the differenced operator, n represents the coefficients of error correction term, and ECTt-1 represents the lagged error correction term. The coefficients of error correction term indicate the speed of the adjustment to the long run equilibrium.

5. Results

The calculated Augmented Dickey-Fuller test statistics are presented in Table 1. Gross Domestic Product per capita (GDP_t), labor force (L_t), capital stock (K_t) net barter terms of trade ($NTOT_t$) and volatility of net barter terms of trade ($VNTOT_t$) are stationary in levels and first difference at a 5% significance level.

Table 1 - Results of Unit Root Test

VARIABLES		Augmented Dickey-Fuller test statistic		CONCLUSION
		without trend	with trend	
GDP_t	Level	-0.6819	-1.4399	I(1)
	First difference	-7.6472**	-7.3466**	
L_t	Level	-3.6227**	-5.1633**	I(1)
	First difference	-5.5892**	-6.3219**	
K_t	Level	-3.4916**	-3.7014**	I(0)
	First difference	-7.4441**	-7.2664**	
$NTOT_t$	Level	-1.2695	-1.7362	I(1)
	First difference	-4.2094**	-4.1967**	
$VNTOT_t$	Level	-3.3156**	-3.0502**	I(0)
	First difference	-4.6941**	-4.9482**	

Source: *Author's estimation*
*Note: ** 5% significance level*

The results of the unit root tests on Thailand are different in the integration order of all variables. They are stationary on gross domestic product per capita, labor force and net barter terms of trade variables for Thailand in the first difference, denoted by I(1). In contrast, capital stock and the volatility of net barter terms of trade variable are stationary in level, denoted by I(0). The calculated F-statistics, the critical values for the upper and lower bounds by Narayan (2005) at a 1%, 5% and 10% significance level and the SBC lag specifications for the model are presented in Table 2.

Table 2 - Results of Bound Tests for Co-integration Analysis

Optimum Lag		(1,2,1,0,0)	
Calculated F-statistics (k=4)		5.1137	
Critical Value: Intercept and no trend (Narayan 2005)		Lower Bound Value	Upper Bound Value
N=34	1%	4.165	5.650
	5%	2.957	4.117
	10%	2.465	3.472

Source: *Author's estimation*

The calculated F-statistics exceed the upper bound critical values at a 5% and 10% significance level. There is a rejection of the null hypothesis. The value is 5.1137. It indicates that economic growth is related to all factors in the long run; gross domestic product per capita, labor force, capital stock, net barter terms of trade and volatility of net barter terms of trade variables. The optimal order of the ARDL based on SBC is ARDL (1,2,1,0,0).

The optimum ARDL order is conducted in equation (4.3). The results of the long run estimation based on the ARDL model are shown in Table 3.

Table 3 - Results of the estimates of long run coefficients

VARIABLES	Coefficient
C	-7.4042 (-1.3668)
L_t	1.1125 (2.5765**)
K_t	0.2504 (6.5781**)
$NTOT_t$	-0.5038 (-2.002)
$VNTOT_t$	-0.0057(-2.1636**)

Source: *Author's estimation*
*Note: ** 5% significance level. The values of the t-statistics are within parentheses.*

Labor force, capital stock and the volatility of net barter terms of trade are significant for economic growth at the 5% level. The coefficients are 1.11, 0.25 and -0.005, respectively. The labor force and capital stock in the long run have a positive effect on GDP. The result is consistent with Jawaid and Raza (2013), Wong (2004), Skare, Simurina and Tomic (2012). The result indicates that the increase in the labor force is less than the increase in GDP, but capital stock is more than the increase in GDP. In contrast, the volatility of net barter terms of trade in the long run has a negative effect on GDP. The result is consistent with Wong (2010), Bleaney and Greenaway (2001), Skare, Simurina and Tomic (2012). The increase in total exports leads to a slight decrease in GDP. In addition, the net barter terms of trade in Thailand does have an insignificant impact on the economic growth of Thailand. It may be possible that Thailand is specialized in capital commodities as shown in the study of Kaneko (2000). The findings are contrary to the results of Jawaid and Raza (2013), Wong (2010), Skare, Simurina and Tomic (2012) which indicated that economic growth is affected by the terms of trade.

The long run relationship of these variables on economic growth results in the short run estimates of ARDL as presented in equation (4.4). The results of the short run based on ARDL are provided in Table 4.

Table 4 - Short run results based on the ARDL model

VARIABLES	Coefficient
C	-1.6542 (-1.2185)
ΔL_t	0.6604 (3.1138**)
ΔL_{t-1}	-1.0876 (-4.8922**)
ΔK_t	0.09185 (9.0278**)
$\Delta NTOT_t$	-0.1125 (-1.9347)
$\Delta VNTOT_t$	-0.0012(-2.8675**)
ECT_{t-1}	-0.2234 (-5.9856**)
R-squared	0.9356
D.W. statistics	2.2725
F-statistics	55.7145

Source: *Author's estimation*
*Note: ** 5% significance level. The values of the t-statistics are within parentheses.*

The result of the one-lagged error correction term (ECT_{t-1}) for Thailand is significant and negative. It specifies that the volatility of net barter terms of trade is still related to economic growth in the short run. The coefficient is approximately -0.22 or the speed of the adjustment to the long run equilibrium in the current year account for 22% of the disequilibrium from the previous year's shock.

A modified Wald (MWALD) test is used to examine the causality between the dependent and independent variables as in the study of Toda and Yamamoto (1995). Non-Stationary or co-integrated data are ignored for the test. Therefore, the analysis of the causal direction of the net barter terms of trade and the volatility of net barter terms of trade with economic growth is carried out by the approach.

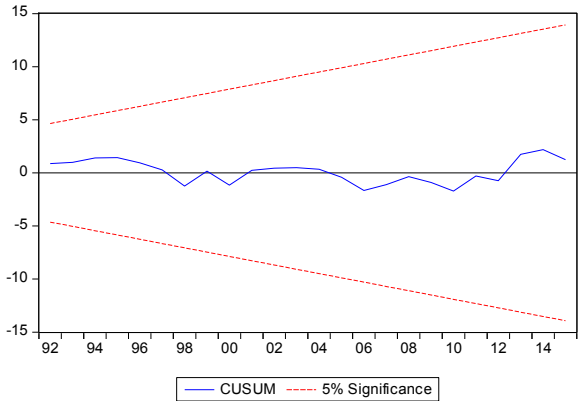
Table 5 - Results of the Toda-Yamamoto Causality Tests

Dependent variables	Chi-square statistics ($\chi 2$)				
	GDP	L	K	NTOT	VNTOT
GDP	-	5.5850 (0.0613)	10.6282 (0.0049)	2.5178 (0.2840)	1.5019 (0.4719)
NTOT	0.1209 (0.9413)	0.0979 (0.9522)	0.5405 (0.7632)	-	0.2869 (0.8664)
VNTOT	5.1820 (0.0749)	6.8891 (0.0319)	3.3391 (0.1883)	1.4543 (0.4833)	-

Source: Author's estimation
Note: The values of the probability are within parentheses.

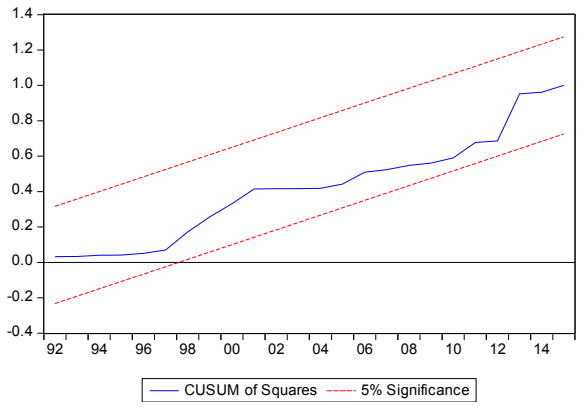
The result from the bounds test for co-integration is confirmed by the causality results as presented in Table 5. Volatility of net barter terms of trade exhibits evidence of causality for economic growth. Economic growth reveals unidirectional causality with the volatility of net barter terms of trade.

The cumulative sum (CUSUM) and CUSUM of square (CUSUMSQ) test on the recursive residuals are employed in the structural stability test of the short run model. The results of the CUSUM and CUSUM of square are presented in Figures 1 and 2. The short run regression is stable at the five percent critical boundary. The statistics value of the CUSUM and the CUSUM of square test are between interval bands.



Source: *Author's estimation*

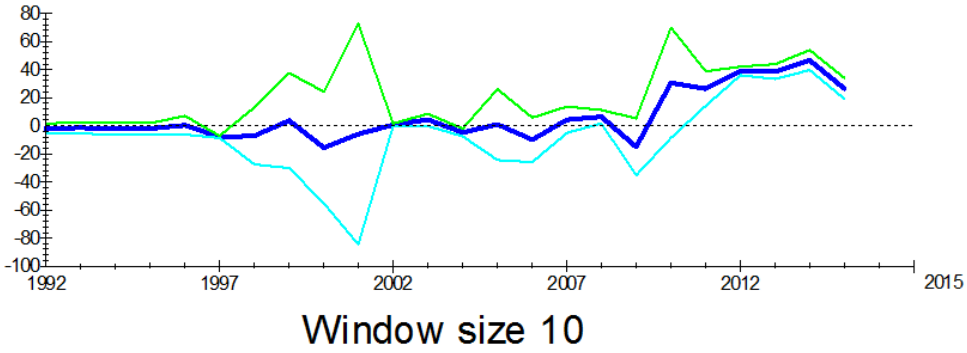
Figure 1 - Cumulative sum of recursive residuals plot for the coefficient stability.



Source: *Author's estimation*

Figure 2 - Cumulative sum of squares of recursive residuals plot for the coefficient stability.

The coefficient of the long run model in the sample period indicates the stability by the rolling window regression method. The result of the rolling window regression method of net terms of trade volatility is presented in Figure 3.



Source: *Author's estimation*

Figure 3 - Result of the stability coefficient in the long run and its two S.E. bands based on rolling OLS (dependent variable: GDP)

Fluctuation in the coefficient of net terms of trade volatility occurred between 1992 and 2015. The coefficient from 1992 to 1996 was quite stable. The reduction in the coefficient of net terms of trade volatility was in 2000, 2004, 2006, 2009 and 2011. The coefficient in 2010 rapidly increased. After that, the coefficient in the remaining year fluctuated.

Conclusion

The purpose of this study is to examine the impact of the terms of trade and its volatility on economic growth in Thailand through the Auto Regressive Distributed Lag (ARDL) model. The analysis was employed with time series data from 1981 to 2015. The data are obtained from World Bank and UNCTAD database. The terms of trade volatility are measured by employing the generalized autoregressive conditional heteroskedasticity (GARCH) model. The stationary Test, the bound tests, the Toda-Yamamoto approach, the CUSUM and the CUSUMSQ test and the rolling window regression method are applied in the empirical analysis.

The unit root test results show that each variable is different in the integration order of all variables. The result of the analysis of the terms of trade and its volatility's impact on economic growth by using the Auto Regressive Distributed Lag (ARDL) model is that the labor force, capital stock and terms of trade volatility have a significant impact on economic growth in the long run. The terms of trade have an insignificant impact on economic growth. It is possible that Thailand is specialized in capital commodities. The labor force, capital stock and terms of trade volatility have significant impact on economic growth in the short run. Unidirectional causality is revealed between the volatility of terms of trade and economic growth. The CUSUM and CUMSQ tests show that the short run model is stable. The rolling regression results show that for the period of 1992 to 2015 the terms of trade volatility are unstable.

The results suggest that the improvement of labor force quality and capital productivity are initially important policies for economic growth in Thailand. In addition, the components of import and export goods and the differences in their price should be considered because they are significant determinants of the terms of trade volatility. Therefore, trade policy should give importance to price and the characteristics of trading partners to reduce volatility. Moreover, it may imply that Thailand should be a small open economy to reduce the impacts of terms of trade shocks as terms of trade volatility impacts economic growth.

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Journal of Applied Economic Science

Trade Balance and Money Supply: Evidence from Iran

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Abstract:

This paper aims to examine the effect of money supply on trade balance in Iran. A simple Kynesian model is modified to account for money market through absorption approach. In this model, the imbalances in the money market are linked to trade balance. After testing series against unit root under structural break, a co-integration relationship among trade balance, real money supply, economic growth and inflation rate was found during 1970-2014. Our findings imply that a positive balance on trade needs to exert contractionary monetary policy, which leads to control of money supply and lowers inflation rate, and adopting proper fiscal policies, and also institutional reforms towards sound macroeconomic environment.

Keywords: domestic absorption, money supply, current account, structural break.

JEL Classification: E12, E51, F32, C21.

1. Introduction

Monetary and fiscal policies are commonly made to achieve macroeconomic goals including stable economic growth, economic stability, full employment, fair distribution of incomes and balance of payments. One main element of balance of payments is trade balance, which plays central role in open economies.

Due to high dependency of Iranian economy on oil and gas revenues, trade balance is affected by exogenous oil price shocks, on one hand, and domestic economic policies on the other hand. When oil, gas and related exports are excluded from goods exports, a chronic trade deficit is observable for a long period in the trade relationships between Iran and its trade partners. The relatively weak industrial base and low diversity of exportable goods and services result in undesirable records in trade balance. Meanwhile the increasing demand for imports of capital and intermediate goods worsens trade deficit in Iran.

From the Kynesian approach to economic equilibrium, there is no strong and direct link between monetary policy and trade balance. If an expansionary monetary policy can boost the economic growth, through reducing interest rate and stimulating employment, then increases in domestic production will be led to international markets. Consequently, it is expected that trade balance will change in a favorable direction.

Devaluation of national currency is a common policy for a country facing a persistent balance of payments (Bahmani-Oskooee 1985). According to elasticities approach to balance of payments, devaluation will improve the trade balance, when Marshall-Lerner condition is satisfied. This condition states that exchange rate devaluation will improve the balance of trade if the absolute value of sum of the long-term export and import demand elasticities is greater than unity.

In keeping with the absorption approach, devaluation changes the terms of trade, increases production, and switches expenditures from foreign to domestic goods. Thus, trade balance is improved. From the viewpoints of international monetarists, devaluation reduces the real value of cash balances, and improves the trade balance (Himarios 1989, Reinhart 1995). In empirical studies, the undesirable effect of devaluation on trade balance, i.e., J-curve concept, are also confirmed (Demirden and Pastine 1995, Halicioglu 2007, Bahmani-Oskooee and Kutan 2009).

Miles (1979) related changes in the trade balance to changes in the exchange rate, income, and money supply. Using annual data for 14 countries over the period 1956-72, he found that the devaluation did not improve the trade balance.

Focusing on Iran this paper aims to study the mechanism and amount of impact of money supply on trade balance. This paper uses income and money variables as predictors of trade balance. By a combination of absorption and monetary approaches to the balance of payments, the effect of inflation rate on trade balance is also considered.

The remainder of this paper is organized in (4) sections. Section (2) devotes to a review of literature. Data and methodology are presented in section (3). Section (4) discusses the results from empirical strategy. Finally, section (5) concludes.

2. Review of literature

There are at least three theories about the explanation of balance of trade, and balance of payments. Traditionally, these are classified in elasticities, absorption and the monetary approach.

The elasticities approach relates to the Marshallian analysis of elasticities of supply of exports and demand for imports. In this simple approach, exports are dependent on the price of exports, and imports are related to the price of imports. The response of balance of trade, *i.e.,* exports minus imports, to changes in the exchange rate is measured in elastciticties.

The absorption approach analyses the balance of trade from the national accounting perspective. The sum of private consumption, gross domestic capital formation and government expenditure is called absorption capacity of the national economy, and the difference between gross domestic product (GDP) and domestic absorption constitutes the balance of trade. Any increase in GDP over the domestic absorption may improve the trade balance.

The monetary approach explains the trade balance, and balance of payments in terms of the difference between changes in the monetary base and changes in the domestic credits.

Duasa (2007) examined the short- and long-run relationships between trade balance, real exchange rates, income and money supply in the case of Malaysia. Using the bound testing approach within an autoregressive distributed lag (ARDL) framework, he found evidence of a long-run relationship between trade balance and income and money supply variables but not between trade balance and real exchange rate. In his study, Marshall–Lerner condition did not hold in the long-run for Malaysia.

By a co-integration approach, Kale (2001) studied the relationship between the balance of trade and the real exchange rate for the Turkish economy. He concluded that a real depreciation improves the Turkish balance of trade in the long run, implying the validity of Bickerdike-Robinson-Metzler condition. In addition, the effects of a real depreciation last about a year. Given the dependence of Turkish exports on the imported intermediate goods, contraction in imports can improve the balance of trade.

Ferrero, Gertler and Svensson (2008) explored the implications of current account adjustment for monetary policy within a simple two-country DSGE model in the United States. They found that the behavior of the domestic variables (for instance, output, inflation) is quite sensitive to the monetary regime, while the behavior of the international variables (for instance, the current account and the real exchange rate) is less so. They conclude that domestic inflation targeting achieves the best stabilization outcome of aggregate variables.

Devereux and Engel (2003) developed a welfare-based model of monetary policy in an open economy, and examined the optimal monetary policy under commitment, focusing on the nature of price adjustment in determining policy. They investigated the implications of these policies for exchange-rate flexibility. In the presence of LCP, they found that the optimal monetary policy leads to a fixed exchange rate, even in the presence of country-specific shocks.

Baig and Goldfajn (2002) evaluated monetary policy and its relationship with the exchange rate in the five Asian crisis countries. They found that there is no evidence of overly tight monetary policy in the Asian crisis countries in 1997 and early 1998. The usual tradeoff between inflation and output when raising interest rates suggested the need for a softer monetary policy in the crisis countries to combat recession.

Justiniano and Preston (2010) explored optimal policy design in an estimated model of three small open economies: Australia, Canada and New Zealand. Within a class of generalized Taylor rules, they showed that to stabilize a weighted objective of consumer price inflation and nominal interest variation optimal policy does not respond to the nominal exchange.

Schmitz and Von Hagen (2011) interpreted the trade imbalances in some EU countries as indicators of net capital flows among the euro-area countries. They found that for euro members the net flows follow differences in per-capita incomes, even before the introduction of the euro.

Belke and Dreger (2013) explored the determinants of the current account imbalances by using panel econometric techniques. They showed that a lack in competitiveness is the main explanation for the external deficits of the countries that are at the heart of the euro area debt crisis.

Mallick and Sousa (2012) provided evidence on monetary policy transmission for five key emerging market economies: Brazil, Russia, India, China, and South Africa. They identified monetary policy (interest rate) shocks using modern Bayesian methods and sign restrictions approach. They found that contractionary monetary policy has a strong and negative effect on output, and tends to stabilize inflation in these countries in the short term, while producing a strongly persistent negative effect on real equity prices.

Klein and Shambaugh (2015) considered the relationships among partial capital controls, limited exchange rate flexibility and full monetary policy autonomy. They found that partial capital controls do not generally allow for

greater monetary control than with open capital accounts, but a moderate amount of exchange rate flexibility does allow for some degree of monetary autonomy, especially in emerging and developing economies.

3. Methodology

3.1. Model

According to the national income accounting, gross domestic product (GDP) consists of both demand for domestic and foreign goods and services. In the Kynesian macroeconomic approach, domestic demand accounts for private consumption, gross fixed capital formation, and government expenditure, while demand for foreign products is reflected in the current account, or net exports, i.e, exports minus imports. The fiscal and monetary policies affect national income ingredients in different forms. Since, this study emphasizes on the effects of monetary policies on current account, thus a simple model is designed to capture these interactions. We begin with national income identity as follows:

$$y = c + i + g + (x - m) \tag{1}$$

Where all variables are in real figures, (in constant prices). The sum of private consumption (*c*), investment (*i*) and government expenditure (*g*) is called domestic absorption (*abs*). From Eq.(1), the current account, exports (*x*) minus imports(*m*), is expressed as the following relation:

$$x - m = y - abs \tag{2}$$

The equilibrium in the money market is satisfied through equality between real demand for and supply of money:

$$\frac{M^S}{P} = \frac{M^d}{P} \tag{3}$$

In which M^s, M^d and P denote money supply, demand for money and general price level, respectively. In Eq. (3), the real balances, or $\frac{M^d}{P}$, depend on real GDP, *y*, and interest rate, *r*. Hence, for simplicity, we write it in a linear form:

$$\frac{M^d}{P} = \alpha y + \beta r \tag{4}$$

In Keynesian tradition, the first term of the right-hand expression in Eq. (4) is called transactions (and precautionary) demand for money, and the second one gives the speculative demand for money. The increases in real output results in increasing transactions demand for money, and any increase in the interest rate, until the limitation, reduces the speculative demand for money. Of course, in the extreme situation, the decreases in interest rate face with liquidity trap, in which demand for money is maximized, and bondholders sell all their bonds. Thus, the expected signs of α and β will be positive and negative, respectively.

The domestic absorption is linked to money market according to the adjusted and simplistic form of monetary approach to balance of payments. It evolves along with changes in GDP and partial adjustment in excess demand for money. As a result, the following relation represents the link between money market and domestic absorption:

$$abs = y + \gamma\left(\frac{M^s - M^d}{P}\right) \tag{5}$$

where γ, the adjustment factor of monetary imbalance, varies from 0 to 1. If $\gamma = 0$, we have an open non-monetary system. When $\gamma = 1$, then the domestic absorption is linearly correlated to real monetary gap in the whole economy.

Using Eqs. (2) to (5), we obtain the following expression:

$$nx = x - m = -\gamma\left(\frac{M^S}{P} - \alpha y + \beta r\right) \tag{6}$$

After simplifying and writing Eq. (6) in econometric model, we obtain the time-series model as follows:

$$nx_t = \theta_0 + \theta_1\left(\frac{M^S}{P}\right)_t + \theta_2 y_t + \theta_3 r_t + \varepsilon_t \tag{7}$$

In Eq. (7), t denotes time, and ε_t is the disturbance term of the model, which converts deterministic form of Eq. (6) into stochastic form of Eq. (7). Theoretically, it is expected that θ_1 and θ_3 will be negative, and θ_2 will be positive.

3.2. Data and variables

The statistical data of all variables under study are extracted from the Central bank of Iran (CBI) time series economic database[3] and key economic indicators[4]. Real net exports, *x-m*, money supply, M^s and real *GDP*, *y* are all in billion Iranian Rials. (in constant 2004 prices). The interest rate, r, is a variable controlled by Central Bank, and has no continuous and permanent variation over time. Prior to estimation the econometric Eq. (7), we first examine the trend in the variables. Figure 1 illustrates the net exports trend during 1970-2014.

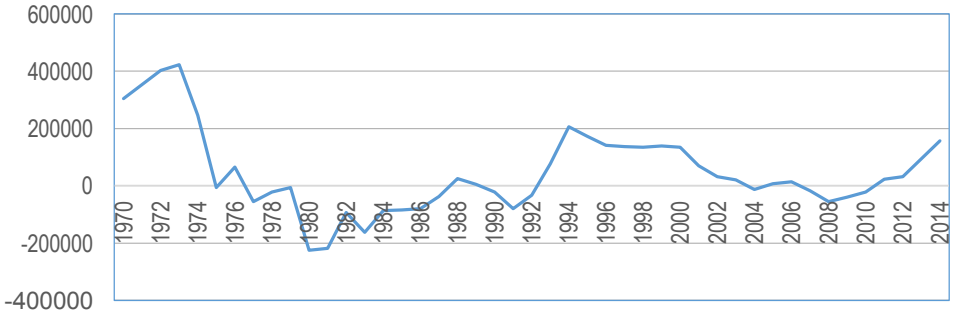

Figure 7- Net exports in 2004 constant prices (billion Iranian Rials)

This figure indicates deficit in current account in the most phases under consideration. The boom in oil prices over the early 1970s and unification of exchange rate during 1993-2004 ruled by the Reformist cabinet resulted in surplus in current account, however the remaining periods include revolutionary and war turbulent epochs. In addition, mismanagement of oil revenues and ambitious plans by hardliners cabinet over the 2004-2013 caused increasing imports and forced net exports to be zero, or negative.

Figure 2 depicts real GDP. The overall variation in this variable is indicative a relatively small and steady economic growth. Calculation by official data show that the long run economic growth is about 2.5% per annum, on average. Iran as a leading oil exporting country among OPEC cartel is heavily dependent on oil revenues to finance its national 5-year development plans. If we compare this figure to a diagram of world oil prices, we may obtain a strong correlation between economic growth and oil price.

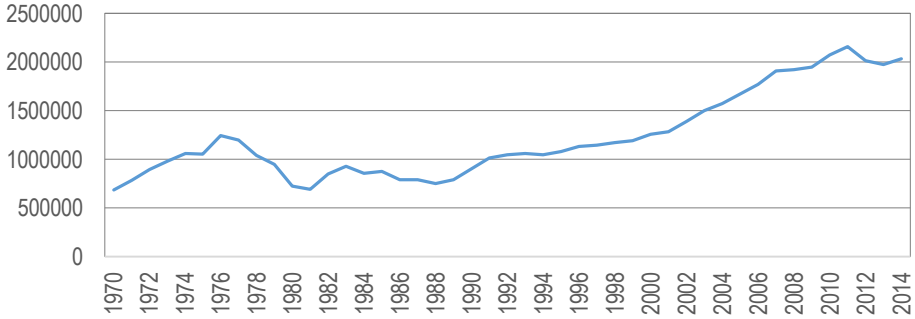

Figure 2- Real GDP (Constant 2004 billion Iranian Rials)

As Central Bank of Iran is a part of government body, the fiscal policies play vital role in making monetary policy by Central Bank. In the Iranian economic sphere, when the ruling government spends more and more, the central bank and commercial banks have to respond accordingly to public decisions. Therefore, expansionary monetary policy supports expansionary fiscal policy. As a result, prices go up and influence the other macroeconomic variables.

Figure 3 demonstrates the changes in real money supply. This variable is deflated by implicit GDP deflator. As shown, it varies in keeping with real GDP movements generally. The partial correlation between real

[3] http://tsd.cbi.ir/
[4] http://www.cbi.ir/default_en.aspx

GDP and real money supply is +0.885, which is statistically significant at 1%. This fact confirms our claim about role of monetary system in stimulating real sectors in Iran.

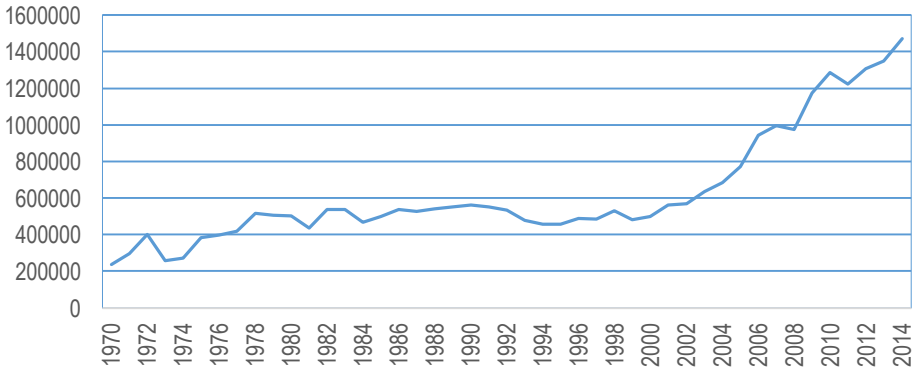

Figure 8 - Real money supply (Constant 2004 billion Iranian Rials)

Finally, the interest rate as a key variable in monetary policy is examined here. According to the law of Islamic Banking of Iran, paying and receiving interest on loans are forbidden. Therefore, a proxy instrument titled "term investment deposit rate(TIDR)" has been introduced in order to encourage depositors to hold their deposits near the banks. Consequently, TIDR is an Islamic instrument and substitute for interest rate. This rate is highly managed by the Money and Credit Council, which representatives of government, parliament, judiciary system and central bank are its members. Figure 4 illustrates the movements in the "TIDR" as a proxy for interest rate.

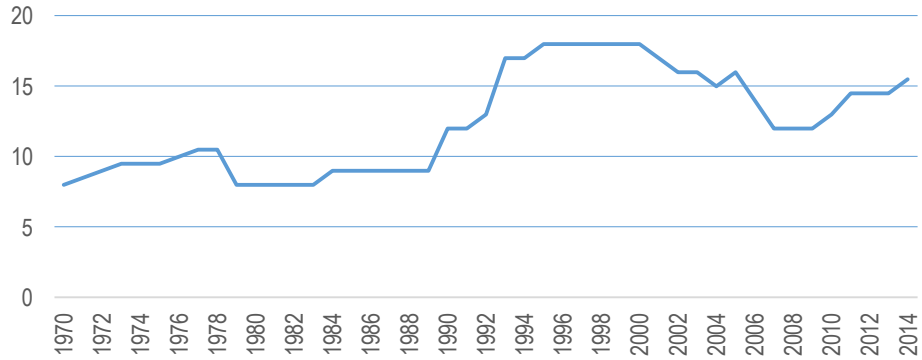

Figure 9 - Term investment deposit rate (TIDR) (%)

The semi-flat parts of the Figure 4 indicates stabilization of TIDRs over given periods. These rates change over time in the interval [8%, 18%]. Compared to mean interest rates in the world, these rates seem high. The higher TIDRs on deposits may stimulate people to deposit near banks, and this in turn provides considerable funds for banks. According to Fisher formula, the real interest rate is defined roughly as nominal interest rate minus inflation rate. Consequently, the real TIDR on deposits is calculated by subtracting inflation rate from nominal TIDR. During 1970-2014, the mean inflation rate is 20.6%, while nominal TIDR is 12.4%, on average, hence the real TIDR will be negative for the most periods under study.

In the developed countries, the nominal interest rate is considered as a proxy for opportunity coat of holding money. This is not the case among developing countries (Dornbusch, Fischer, and Startz, 2010), because the nominal interest rate in the majority of developing countries is determined by government interventions, and it is usually fixed lower than market clearing interest rate. Therefore, real interest rates become negative. Aghevli (1977), Khan (1980), Treadgold (1990), Chaudhary, Ahmad and Siddiqui (1995) have proposed using expected inflation rate, or real inflation rate as proxy for interest rate in the developing countries. In this study, the current inflation rate is used as a substitute for opportunity cost of holding money, or interest rate.

4. Model estimation and results

After introducing the data and variables, now we proceed with estimation stages. In order to avoid spurious regression, testing time-series against unit root is necessary. There are various ways to stationary tests in the econometric literature. Among them, the Augmented Dickey-Fuller (ADF), Phillips-perron (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), Elliott-Rothenberg-Stock (ERS) and Ng-Perron tests are widely used by applied econometricians. When there is structural break in time series, the researcher should take into account the unit root test under structural breaks (Gregory and Hansen, 1996). This is more important about dependent variable under consideration. Following Vogelsang and Perron (1998), this study applies the unit root test under structural break for the real net exports, *nx*, as dependent variable.

Using Eviews 9, the unit root test on *nx* is presented in Table 1. This table indicates unit root in the level form and stationary in the first difference form, i.e, *nx* is integrated of degree one, or I(1). In addition, the 1973-1975 period is considered as breakpoints. This finding is not surprising, since the first oil price shock occurred in 1973.

Table 5- Unit root test under structural break for dependent variable: nx

Assumptions	Break Date	ADF Test Stat.	Prob*.	Result
Level form	1973	-3.827	0.224	I(1)
First Differenced form	1975	-7.334	<0.01	

Source: Research findings

Note: the unit root test based on these assumptions: Trend and intercept terms in trend specification; Breaks in intercept only, and innovational outlier model. Break selection by minimize Dickey-Fuller t-statistic, and lag selection through Schwarz information criterion. *. Vogelsang asymptotic one-sided p-values in Perron-Vogelsang (1993).

The explanatory variables including real money supply ($\frac{M^S}{P}$), hereafter *rms*, real GDP (*y*), and inflation rate (*inf*), as a proxy for interest rate, or TIDR, are tested against unit root by using the ADF test. The results are reported in Table 2.

Table 6- Unit root tests for explanatory variables (period: 1970-2014)

Variables	Level: Constant& trend		First difference: Constant& trend		Level: Constant& trend		First difference: Constant& trend		Result
	ADF Test Stat	Prob	ADF Test Stat	Prob.	PP Test Stat	Prob	PP Test Stat.	Prob.	
rms	0.106	0.996	-6.712	0.000	0.382	0.998	-6.734	0.000	I(1)
y	-1.656	0.754	-4.472	0.005	-1.337	0.865	-4.439	0.005	I(1)
inf	-4.684	0.003	-7.745	0.000	-3.412	0.063	-14.346	0.000	I(1)

Source: Research findings

Since all variables are integrated of degree 1, thus a co-integration relationship can be found by using Johansen-Juselius co-integration test (Johansen and Juselius, 1990). According to co-integration theory, when two arbitrary variables X and Y are I(1), there may exist a linear combination of X and Y, which will be I(0). The VAR-based Johansen - Juselius co-integration test provides two trace and the maximum eigenvalue statistics. If these statistics imply different number of co-integrating vectors, then we will select vectors in terms of the interpretability of the co-integrating relations.

Before testing for co-integration, we should consider proper dummy variables. Since the structural break was affirmed by unit root test for dependent variable, and inflation rate in Iran has recorded a maximum rate, 49.1% in 1995, consequently, we include d1 for dependent variable and d2 for inflation rate as dummy variables, so that d1=1 for period 1974-2014, and d1=0, otherwise. In addition, d2=1 during 1995-2014, and d2=0, otherwise. By these assumptions, the results of co-integration test are reported in Table 3. Trace test indicates 2 co-integrating equations at the 0.05 level, while max-eigenvalue test indicates 1 co-integrating equation at the 5% level of significance.

Table 7 - Unrestricted co-integration rank tests (period: 1970-2014)

	Trace Test			Maximum Eigenvalue Test	
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Prob.**	Max-Eigen Statistic	Prob.**
None	0.590	99.086*	0.0004	38.377	0.0179
At most 1	0.483	60.708*	0.0114	28.357	0.0535
At most 2	0.422	32.352	0.0981	23.606*	0.0327
At most 3	0.163	8.746	0.7597	7.642	0.5909
At most 4	0.025	1.104	0.9376	1.104	0.9376

Source: Research findings

Note: CE refers to co-integrating equation; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values.

The normalized co-integrating vector is reported as follows:

$$nx_t = \underset{(626115)}{1075094} - \underset{(601602)}{2918172d1} - \underset{(1.015)}{2.468rms_t} + \underset{(0.735)}{3.548y_t} - \underset{(14980.4)}{39584.49d2 * inf_t} \quad (8)$$

In equation (8), the standard errors are in the parentheses, so at 1% level of significance, the coefficients of right-handed variables are statistically significant. In addition, the signs of all coefficients are consistent with theoretical expectations. Thus, there is a long-run relation among variables under consideration.

According to the results, and with reference to use dummy variables, we face with 3 versions of Eq. (8) as follows:

- Period one: 1970-1972, d1=0, and d2=0,

$$\mathrm{nx_t} = 1075094 - 2.468\mathrm{rms_t} + 3.548\mathrm{y_t} \quad (8.1)$$

- Period two: 1973-1994, d1=1, and d2=0,

$$\mathrm{nx_t} = -1843098 - 2.468\mathrm{rms_t} + 3.548\mathrm{y_t} \quad (8.2)$$

- Period two: 1975-2014, d1=1, and d2=1

$$\mathrm{nx_t} = -1843098 - 2.468\mathrm{rms_t} + 3.548\mathrm{y_t} - 39584.49\mathrm{inf_t} \quad (8.3)$$

Now, we interpret the Eq. (8.3). If real money supply, *rms*, increases by one unit, for instance one billion Rials, then the real net exports will decrease 2.46 billion Rials, other things being equal. In addition, increases in real GDP, *y*, result in increase in the net exports, and surplus in current account by a factor of 3.548. Finally, if inflation rate goes up by one percent, then the net exports will go down about 39584 billion Rials.

Conclusion

This paper tried to bridge between current account and monetary policy in Iran. The interaction between current account and money market is of great importance in macroeconomic policy-making. The central bank can indirectly influence exports and imports of goods and services through managing interest rates and controlling supply of money. In Iran, the central bank is under supervision government bodies, thus it cannot adopt monetary policies without coordinating with public authorities. As a result, implementing public developmental projects, which requires enormous funds, should be financed by banking facilities.

Our findings indicate a long run relationship between monetary policy and trade balance. These are similar to results of Duasa (2007) and Gertler and Svensson (2008). According to the econometric specifications, contractionary monetary policy limits the supply money on one hand and reducer the inflation rate on the other hand. The decreases in money supply and inflation rate can boost net exports.

Based on our findings, since real GDP plays a stimulating role in trade balance, thus the proper monetary and fiscal policies must design to increase economic growth. Although fiscal and monetary instruments such as interest rate, money supply, tax rate, import tariffs can be exploited to this end, however a sound macroeconomic environment, which stems from strong social and economic institutions, helps to reach higher economic growth rates.

The final point that should be mentioned here is to consider the capital account and balance of payments. The monetary policy has close link with capital account. Thus, any change in monetary and banking system is

capable of affecting balance of payments. Consequently, the variations in the exchange rate market are affected by monetary policies, which have been ignored in this paper. It may be a matter for future researches, in the individual or cross-country level.

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