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Technique of Design for Integrated Economic and Mathematical Model for Mass Appraisal of Real Estate Property. Study Case of Yekaterinburg Housing Market

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Abstract:

There are a number of economic and mathematical models designed for mass appraisal of residential real estate at the moment, which take into account their construction and performance characteristics but do not take into account the evolving macroeconomic situation in the country and in the world. The drawback of such static models is their rapid obsolescence, the need for constant updating and unsuitability for medium-term forecasting. On the other hand, there are dynamic models that take into account the current macroeconomic situation but are designed for predicting and studying the overall price situation on the market rather than for mass appraisal of real estate with their variety of construction and performance characteristics.

This paper proposes a technique of creating integrated models with properties of such static and dynamic models, i.e. taking into account both construction and performance characteristics of residential facilities and evolving macroeconomic situation in the country and in the world. Development of the technique and creation of models is carried out with the use of neural network technology on the basis of statistical data for the period from 2006 to 2016. In addition to its main purpose – the mass appraisal of urban apartments, the model is suitable for medium-term forecasting and identification of the patterns of the housing market. For example, the model was used to study the effect of the state financial policy on the housing market in Yekaterinburg. Computer experiments have shown that in case of growth in housing lending, the apartment prices will rise, and the rate of growth of luxury apartments with larger area will be about 2.2 times higher than the growth rate of cheaper apartments with smaller area. It was found that an increase in housing construction in Yekaterinburg up to 2,550 thous. sq.m. would lead to a further increase in value of apartments. However, with the increase in new housing above the 2,550 thous. sq.m. mark, the model predicts market saturation, prices growth cessation and their further decline. Similar studies and forecasts can be made for the real estate market in other countries and cities using the proposed technique.

Keywords: regional real estate market, mass appraisal, macroeconomic indicators, appraisal, forecasting, neural network.

JEL Classification: L70, L74, O12.

1. Introduction

According to the analysis of the literature, there are a lot of papers that note the importance and relevance of designing precise techniques of mass appraisal of real estate. For example, the paper (Hefferan and Boyd, 2010) provides an overview of the international literature, as well as interviews with government officials and appraisers from many countries, from which it follows that the systems of mass appraisal and property taxation are "an important and solid basis for increasing state revenues." The paper (Davis *et al*. 2012) notes that the existing property appraisal systems based on economic and mathematical models are "a useful tool for tax computation in a number of developing and emerging countries. The paper (Manganelli *et al*. 2014) reports that such models are "useful in the field of taxation and in supporting decision making in the planning of territorial transformations."

Reports of successful attempts to create systems of mass appraisal of real estate property on the basis of the new mathematical tool – neural networks – emerge in Western literature in the 1990s. Apparently, one of the first studies in this direction could be the 1991 publication of Tay and Ho (1991), who applied the multilayer perceptron trained by back propagation to determine the market price of real estate property in Taiwan. It was an alternative to the method of multivariate regression.

Evans, James and Collins (1991) used neural networks to appraise the residential property in England and Wales in the same year. As a result, they concluded that "the neural network model is best for appraisal of real estate."

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Do and Grudnitski (1992) published a report in 1992 that they used a perceptron with eight input neurons to input characteristics of the real estate property to appraise the US real estate property: building area, number of floors, area of land, etc. The perceptron had one hidden layer with three sigmoid neurons. It is reported that "the neural network model had twice the accuracy of the predicted values than similar regression model" on the test set of 105 houses. As a result, it was concluded that "the neural network is better suited for appraisal of real estate property than the multivariate regression model."

Further, since the mid-1990s to the present time, there have been a series of publications devoted to the development and application of neural network models for mass appraisal of real estate property, and many studies note the benefits of this advanced technology compared to regression modeling techniques. For example, the paper (Borst 1995) reports that its author has successfully trained a neural network to predict the value of real estate in New York. His neural network included 18 factors, including area of housing, availability of the fireplace, sanitary equipment, air conditioner, months since the last sale, etc. Results of 217 deals over the period from 1988 to 1989 with the price varying in between $103,000 to $282,000 were used for training.

McCluskey *et al.* (1997) notes that "the neural network, in contrast to the multivariate regression, ensures excellent predicative ability in predicting the Northern Ireland market." The paper of Curry *et al. (*2002) reviews the possibilities of a neural network approach to building the systems of property appraisal by its characteristics. The mentioned advantages of neural network approach include the neural networks using objective data rather than subjective assessment of the purchase and sale intentions. Guan *et al. (*2008) describe the attempt to implement an adaptive fuzzy neural network to predict the price of residential property. The data set consists of information on past deals in the US market and includes characteristic parameters of real estate properties and the relevant market price. Neural network modeling results are compared with the data obtained using the regression analysis systems. Kontrimas *et al. (*2011) carried out a comparative analysis of the application of techniques of mass appraisal of real estate in Lithuania and showed that "the best results were obtained using a multilayer perceptron." Mao *et al. (*2014) reported that in relation to Hangzhou (China), a predictive model was designed that used data on the housing market during 1999-2012. The model is based on neural networks with genetic optimization. It is noted that the model has high predictive accuracy, which, however, decreased due to the impact of national policy macro-control in the housing market.

Recently, Guan *et al. (*2014) notes the relevance of the creation of property appraisal systems based on the actual results of sales deals. It is noted that the "experience of using the method of regression analysis for the creation of such systems was unsatisfactory." Alternatively, the article proposes a method based on the use of neuro-fuzzy neural networks. It is noted that "this progressive method is undeservedly underused in the creation of systems of mass appraisal of real estate." Also, Zhang *et al. (*2015) reports on the use of neural network models for the study of China's real estate market cycles.

The first neural network system of mass appraisal of real estate in Russia was created in 2008 by L. N. Yasnitsky, and its description is set forth in the collective monograph (2008, 10-15). Multilayer perceptron allowed to create a system that provides an appraisal of apartments in Perm (Russia) with a highest relative error of 16.4%. The following were used as the model input parameters: area of the apartment, its condition, floor, house type, and distance from the city center. The studies of the neural network mathematical model revealed some patterns of practical interest for homeowners, realtors and investors operating on the housing market. For example, it was shown that the price for expensive apartments falls much faster than that of the cheap ones as the distance from the center increases. Examples were given showing that renovation of some luxury apartments leads to a substantial increase in their price, while the same renovation in the house more than 20 years old has almost no impact on its commercial value and therefore is unprofitable.

In the following 2009, Borusyak, Munerman and Chizhov (2009) reported that they have developed and successfully implemented a neural network software system for non-residential property appraisal in the Moscow City Property Department. They explain their success with the use of the set of techniques that allowed to identify and eliminate the outliers at the stage of information pre-processing, as well as the use of unconventional generalized regression neural network that has provided low average relative error of 20.0%, in their view. This technique of mass appraisal of non-residential property has found further development and application in the thesis of Munerman (2011) defended in 2011.

Summing up the review of the economic and mathematical models designed for mass appraisal of real estate, let's pay attention to their common disadvantage. They all quickly become outdated and require constant updating, because they do not take into account the constantly evolving macroeconomic situation in the country and in the world. We will hereinafter call such models *static*. This lack of static models is particularly true for

Russia and a number of countries, the market of which is under development and is therefore dependent on the evolving macroeconomic factors: oil prices, dollar rate, gross domestic product (GDP), stock indices, states policies, etc.

It should nevertheless be noted that there is a series of works devoted to the creation of economic and mathematical models that do take into account these macroeconomic parameters, but are designed only for modeling and studying the dynamics of the real estate market, rather than for the purpose of mass appraisal. *We call such models dynamic*. For example, in their paper Becker *et al.* (1999) have used such macroeconomic factors as inflation, economic growth, GDP, unemployment, etc. in the study of the dynamics of the real estate market. Links between macroeconomic indicators and the behavior of the real estate market were investigated in the paper of Greenwood *et al. (*1991).

Nevertheless, in spite of the fundamental nature of these studies, we must note once again that the *dynamic* models are designed primarily for the study of the dynamics of the market as a whole, rather than for mass appraisal of specific properties. Indices of value of apartments calculated in such models (average unit costs of apartments normalized to a square meter) can of course be translated into the cost of specific apartments based on their construction, operational, environmental and other parameters. However, such conversion can be done only using additional techniques, which are not usually used for the purposes of mass appraisal of real estate because of their inefficiency. The problem is that the unit price of apartments of the same type located in the same area, or even in the same building, may differ from each other. Therefore, it requires the use of a more differentiated approach.

Thus, on the one hand, we have a number of *static* models designed for mass appraisal of real estate property, which take into account their construction, operational, geographical, environmental, climatic, economic characteristics, but do not take into account the evolving macroeconomic situation in the country and the world, and therefore quickly becoming outdated, requiring constant updating and not suitable for medium-term forecasting. On the other hand, there are *dynamic* models that take into account the overall state of the economy but are designed to predict and study the overall price situation in the real estate market, rather than for mass appraisal of individual residential units. In this regard, the aim of this paper is to develop the technique of creating *integrated* neural network economic and mathematical models that have properties of *static* and *dynamic* models described above, *i.e.* taking into account both construction and performance characteristics and evolving macroeconomic situation in the country and in the world. The development of the technique and creation of the model is carried out by the example of the residential real estate market of Yekaterinburg, which refers to the developed cluster of Russian cities with the highest incomes and relatively high prices on the housing market.

2. Formulization of a mathematical model and its testing

The following factors that characterize the static construction and performance factors were included as input parameters in creation of the model of mass appraisal of residential property in Yekaterinburg: total area of the apartment, number of rooms, floor, number of floors, house type, walls type, availability of a balcony/loggia, district, distance to the city center, as well as a number of macroeconomic indicators: GDP, RTS quotes, Brent crude oil price, dollar rate, new housing supply, housing loans issued.

The output variable of the *y* model corresponds to the declared price of the property. Many examples for training and testing the neural network were formed on the basis of statistical data of the real estate market of Yekaterinburg over the last 10 years: from 2006 to 2016. Selling prices of apartments were taken from open sources. Thus, many instances included the data during economically calm times for Russia (2006), period of economic growth (2007 – mid-2008), crisis and turning point of the Russian and world economy (2008 – early 2010), period of recovery after the crisis (2010 – 2012), growth retardation (2013 – early 2014), strong fall in the background of Russian foreign policy, imposition of western sanctions, sharp drop in oil prices and ruble rate relative to dollar and euro, financial blockade and closure of access to international capital (2014 – 2016). During this decade, the RTS quotes have varied from 625 to 1,733, the price of Brent oil – from $40.11 to $126.90, the US dollar exchange rate –from 23.45 to 66.49 rubles, housing construction in Sverdlovsk region – from 1284.2 to 2483.7 thous. sq.m. issued mortgage loans – from 4,369 to 59,829 mln rubles, GDP – from 26,916 to 80,4125 bln rubles.

Overall, data on 2,360 properties was collected and processed. This set was divided into training, which contained 2,160 examples, and testing, which contained 200 examples. Optimal structure of the neural network was a perceptron shown in Figure 1.

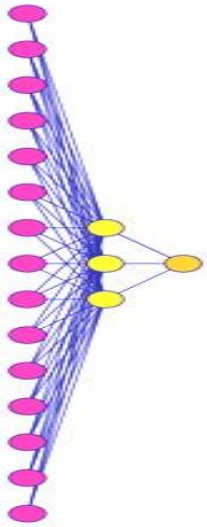

Figure 1 - Neural network – a perceptron with fifteen input neurons, one output neuron and three neurons in the hidden layer

Sigmoid functions were used as the activation functions of neurons in the hidden layer and the output neuron, so that computations of each i -th neuron (Figure 2) were carried out using the formulas:

$$S_i = \sum_{j=1}^{J} w_{ij} x_{ij}, \tag{1}$$

$$y_i = \frac{1}{1+e^{-S_i}}, \tag{2}$$

where: J – number of inputs of the i -th neuron, x_{ij} – input signals to the i -th neuron, y_i – its output signal, w_{ij} – weighted coefficients (also known as forces of synaptic connections), computed as a result of training the neural network.

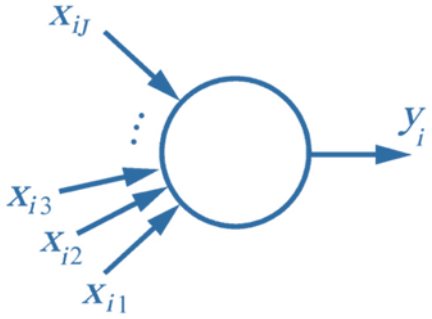

Figure 2 - Neuron of the perceptron performing conversion of x_{ij} input signals into y_i output signal using formulas (1) and (2)

To assess the quality of the neural network, the mean square relative error was used calculated using the formula:

$$E = \frac{\sqrt{\frac{\sum_{n=1}^{N}(d_n - y_n)^2}{N}}}{\left|\max(d_n) - \min(d_n)\right|} 100\%, \tag{3}$$

where: N – number of sample units, d_n – declared value of the n-th apartment, y_n – its value appraised by a neural network.

Moreover, this error was calculated both on training and testing sets.

Initially, the error of training the neural network was 11% and the testing error was 12%. Therefore, a technique was applied to the original data based on the fact that neural networks, which have a small number of degrees of freedom (hidden neurons), show the greatest error of training on the examples that are outliers (Yasnitsky 2005).

When applying this technique, we drew attention to the fact that the neural network filter often recorded the apartments located on the lower floors of buildings, as well as exclusive apartments worth more than 10 million rubles, as outliers. The reason is that the apartments located on the lower floors are often used for commercial activities in Yekaterinburg – for shops, offices, etc. The price of these commercial apartments is usually much higher than the apartments intended for housing, in view of the specificity of their purpose and, as a consequence, other pricing factors. Since the objective of research was to develop the technique of mass appraisal of real estate, as well as due to the fact that the information of purpose of the apartments (apartments for commercial purposes or for housing) was generally absent, we have decided to exclude all of these apartments located on the first and second floors of the buildings and marked as outliers from the set. In addition, data on the apartments with stated value exceeding 10 million rubles have been deleted from the set, as we do not attribute them to the mass market objects.

After removing these examples, the training error amounted to 6.2%, and testing error – to 6.5%. Moreover, additional checks on the quality of the network using multi-fold cross-validation method did not show any significant increase in training and testing errors. The coefficient of determination R^2 on the test set (between the predicted and observed values) was 0.87, which suggests that the constructed approximating model describes the market by explaining the input variables by 87%.

Education, optimization and testing of neural networks were carried out according to the procedure of the Perm scientific school of artificial intelligence (www.PermAi.ru). One of the results of testing performed on two hundred of test cases is graphically presented in Figure 3 (for clarity, the figure shows only 70 of the 200 test cases), which shows that the appraisal of apartments made by the neural network slightly differs from the actual (stated) values of apartments. Figure 4 shows another way to visualize the network test results – a scatterogram: the horizontal axis is the real values of the test set of apartments, the vertical axis is their appraisal performed by a neural network. This figure also shows that the neural network has learned the laws of the real estate market in Yekaterinburg and is quite acceptable, though not ideal.

Once again, we must note that the data about the apartments from the test sets were not used for training the neural network*, i.e. t*hey are new, and therefore the prognostic properties of the neural network are tested on them. Besides, the attention must be paid to the fact that the number of examples of the training set satisfies the requirement of representativeness (Yasnitsky 2005): it is much more than $7N_x+15$, where N_x is a number of input parameters.

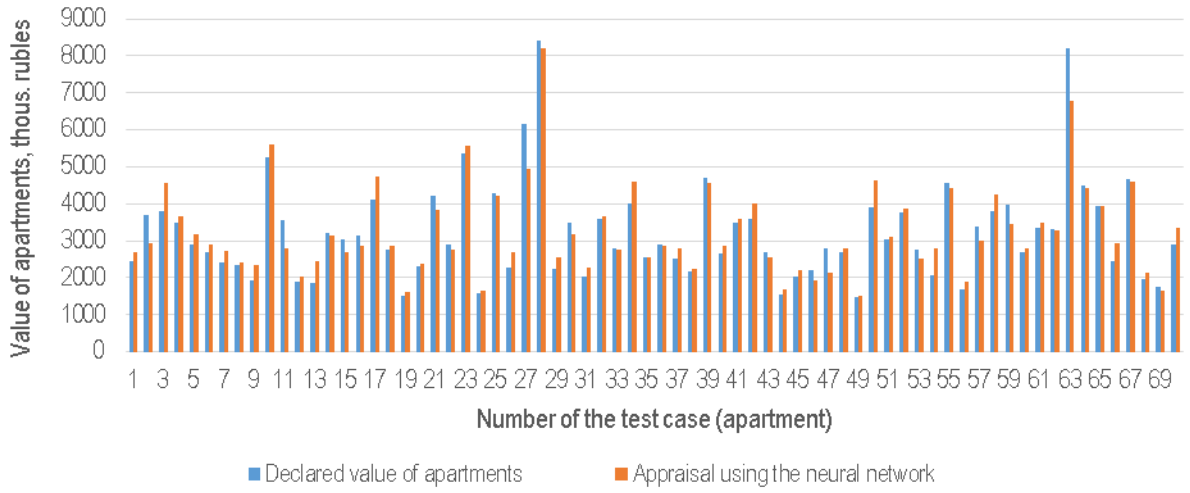

Figure 3 - Network test example: comparison of the declared values of apartments and those appraised using the neural network

Figure 4 - Scatterogram

3. Computational experiments and discussion of results

After the work of the neural network has been checked in the test cases, and thus the adequacy of the mathematical model of neural network has been proved, we can begin to study it. The trained neural network model responds to changes in input variables and behaves in the same way as the subject field itself. Therefore, the dependence of the predicted values on the input parameters of the model can be explored using the neural network of the model.

The first question that can be answered using the models is to determine the degree of influence of its input parameters on the simulation result – the value of apartments in Yekaterinburg. The objective assessment of this influence can be obtained, for example, by the technique (Yasnitsky 2005) using the same neural network by alternate exclusion of input parameters and observation of the error of its testing. The higher the testing error is, the more significant the excluded parameter is. The histogram constructed in this way is shown in Figure 5. The height of the columns corresponds to the testing error obtained with the excluded parameter marked under the column. Moreover, the values of the column heights are scaled so that their sum totals 100%. The height of the columns is interpreted as the value of the parameter, which corresponds to the column. As can be seen from the figure, the following parameters were the most significant: GDP: 26.5%, Total area: 23.7%, New housing supply: 17.5%, Issued housing loans: 13.8%, Dollar exchange rate: 11.1%, Oil price: 4.8%, Distance to the city center: 1.2%.

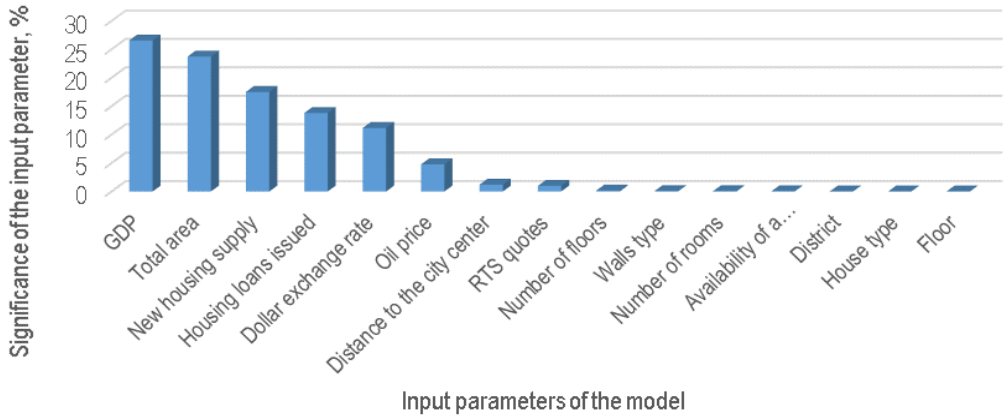

Figure 5 - Significance of the input parameters computed using neural networks

Figure 6 contains a histogram showing the value of Pearson coefficient module. Comparing the histograms in Figures 5 and 6, it can be seen that the distribution of the significances of the input parameters determined using a neural network quite significantly differs from the distribution of Pearson coefficient modules, which apparently is a consequence of a significant non-linearity of the studied patterns, which are not captured by the techniques of relevance assessment based on calculation of correlation coefficients.

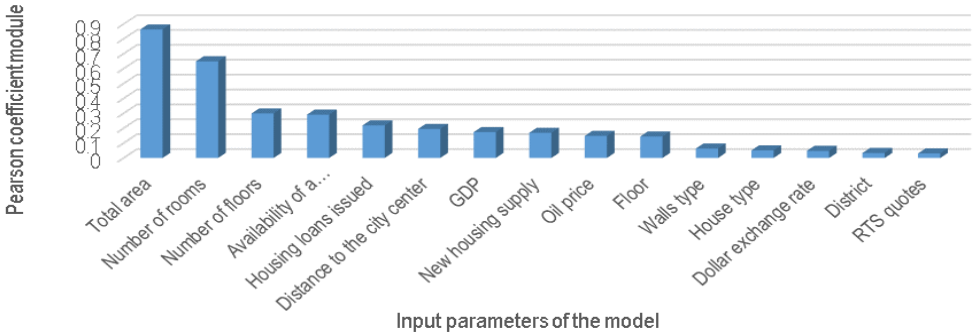

Figure 6 - Values of the modules of Pearson correlation coefficients between the input parameters and the value of apartments

As noted above, the neural network model is adequate to the modeled topical area, so it can be used to study the laws of the market of real estate in Yekaterinburg. This can be done, for example, through computations using the trained neural network along with a gradual change of either one of the input parameters and observation of computational results. Four apartments, which differ in their technical characteristics and district, were selected to perform computer experiments:

- one-room apartment with total area of 33 sq.m., located on the 8th floor of a 10-storeyed panel building with improved layout, with a loggia, the building is located in "Elmash" district of Yekaterinburg at a distance of 9.6 km from the city center.
- two-room apartment with total area of 59 sq.m., located on the 6th floor of a 9-storeyed panel building with the full-length layout, with a loggia, the building is located in "Uralmash" district at a distance of 9.9 km from the city center.
- three-room apartment with total area of 67.3 sq.m., located on the 6th floor of a 13-storeyed building of "gray panel" type, "Monolith" walls type, with a balcony, the building is located in "Avtovokzal" district at a distance of 3.7 km from the city center.
- four-room apartment with total area of 118 sq.m, located on the 7th floor of a 16-storeyed panel building with improved layout, with a loggia, the building is located in "Uralmash" district at a distance of 8.4 km from the city center.

The apartments were appraised at the time of the market condition in the 1st quarter of 2016, when the macroeconomic indicators had the following meanings: RTS quotes were 876; oil price was 42.93 US dollars; US dollar exchange rate was 66.49 rubles; new housing supply in Sverdlovsk region was 2,483.7 thous. sq.m.; issued housing loans were 40,822 mln rubles; GDP was 80,412.5 bln rubles.

Figure 7 shows the results of the virtual computer experiments performed in order to study the value of apartments depending on their location in the city. As can be seen from the figure, the value of all four apartments uniformly decreases with their virtual distancing from the city center. Moreover, the patterns are different in nature: the curve related to the 4-room apartment has a negative second derivative at all points, whereas the curves corresponding to one-, two- and three-room apartments have a positive one. This means that the rate of decrease in the prices of the 4-room apartment increases when distancing from the city center, whereas for the other considered apartments it decreases.

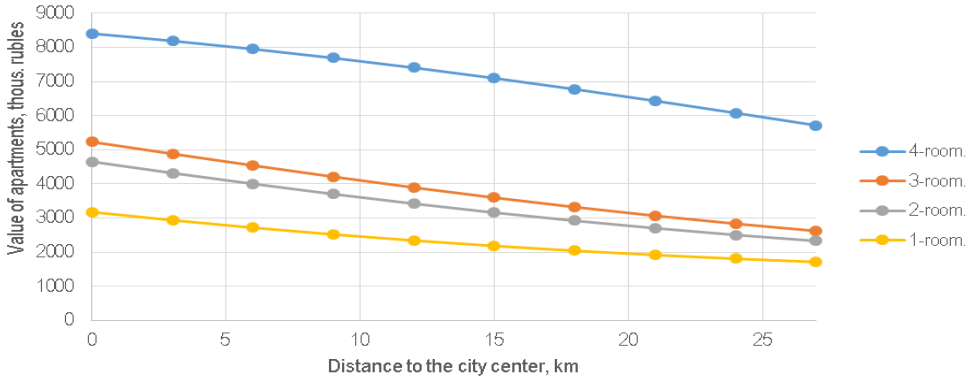

Figure 7 - Dependence of the value of apartments on their location in the city

Figure 8 shows the results of calculations obtained by changing the area of apartments. It can be seen that the computer experiments revealed an almost linear dependence of the value of all four apartments on their area. Moreover, the curves corresponding to one- and two-room apartments merged into a single line, and the curve corresponding to the three-room apartment located above the curve corresponding to the four-room apartment. This is explained by the fact that three-room apartment is located in a more modern house located much closer to the city center than the four-room apartment.

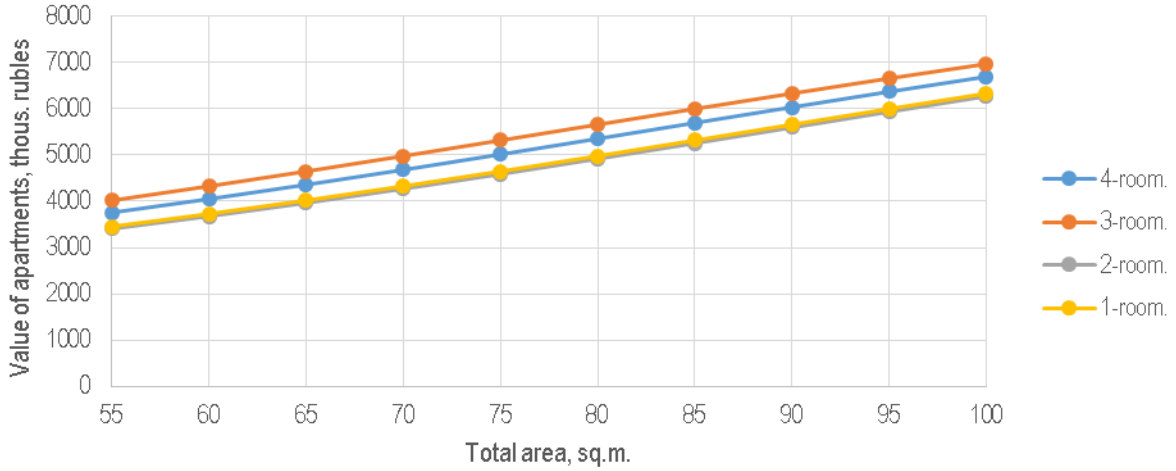

Figure 8 - Dependence of the value of apartments on their area

The next series of experiments is devoted to the study of the impact of the lending program implemented by banks on the residential real estate market in Yekaterinburg. This time, the computer experiments on neural network mathematical model were carried out through a virtual change of the input parameter "Issued housing loans", all other input parameters remain unchanged. Figure 9 shows the value of apartments in 2016 corresponding to the volume of loans issued in 2015, which amounted to 40,822 mln rubles, with the enlarged marker. As the figure shows, the simulation results predict an increase in the value of all four apartments with an increase in housing lending. In particular, for example, if the banks increase the volume of existing housing lending from 40,822 to 41,000 mln rubles, the value of the one-room apartment will increase from 2,249,000 to 2,550,000 rubles, *i.e.* by 2.4%, while the value of the four-room apartment will increase from 7,745,000 to 7,833,000, *i.e.* by 1.1%.

Thus, it can be concluded that an increase in housing lending in Yekaterinburg will lead to the rate of luxury apartments with a larger area growing about 2.2 times faster than the cheaper apartments with smaller area.

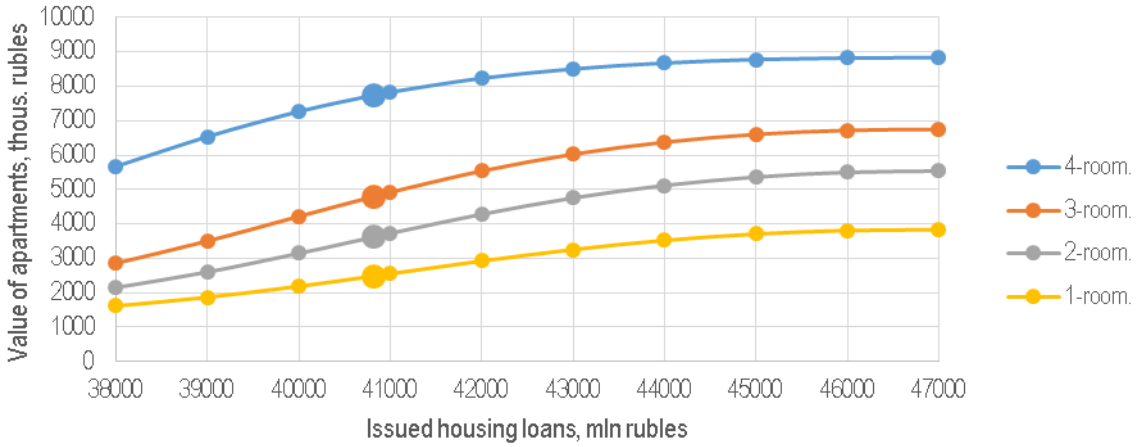

Figure 9 - Dependence of the value of apartments on the volumes of mortgage lending

Figure 10 shows the dependences of the value of the apartments under study on the volume of housing construction, obtained in a similar manner. The results are obtained through neural network computing by gradually changing the input parameter "New housing supply" and the preservation of all other input parameters unchanged. As before, the enlarged marker shows the value of apartments corresponding to the condition

existing by the I quarter of 2016: level of new housing supply in Sverdlovsk (Yekaterinburg) region amounted to 2,483.7 thous. sq.m. As can be seen from the figure, with an increase in housing construction by about 2,550 thous. sq.m. there is an increase in the value of all four apartments under study. This is explained by the fact that the apartments in new buildings, as a rule, are more expensive than in older buildings. However, as follows from the figure, with an increase in new housing supply above the mentioned figure, the prices cease to grow, and then their decline begins. Thus, the results of mathematical modeling predict the saturation of the housing market in Yekaterinburg, which will occur if the volume of housing construction exceeds the mark of 2,550 thous. sq.m.

We shall note that this series of computer experiments was performed using the "freezing" technique – the volume of housing construction was virtually increased, while all the other macroeconomic parameters, and hence incomes, remained unchanged. We can therefore expect that in the case of non-compliance with this condition, the prediction results would have turned out different.

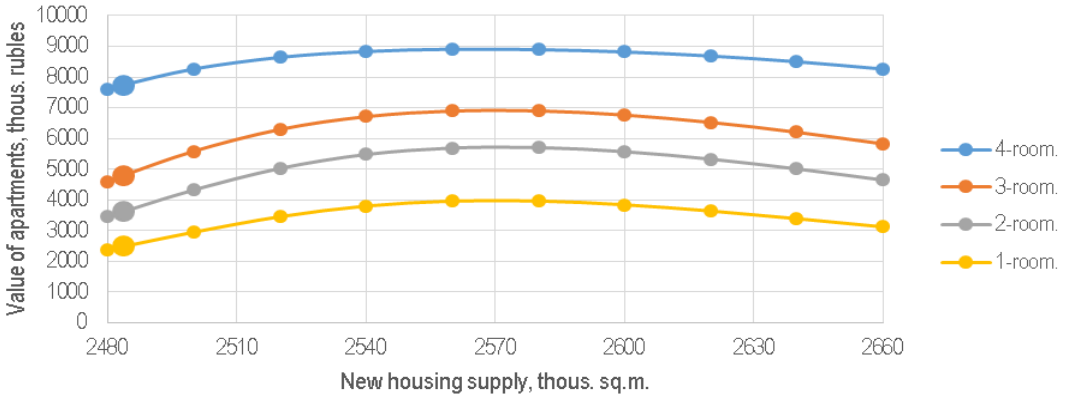

Figure 10 - Dependence of the value of apartments on the volume of housing construction

The developed neural network model could be used to study the effect of other macroeconomic factors on the real estate market in Yekaterinburg as well. For example, it can be used to see how the values of apartments calculated by the neural network will change following the change in oil prices, dollar exchange rate, RTS quotes, GDP, etc. However, you must remember that many macroeconomic indicators have a strong correlation between each other.

As is well known (Yasnitsky 2005), in contrast to the classical methods of regression analysis, which do not allow the presence of linear correlations between the input parameters, this requirement is not mandatory for the neural network technologies. It just requires to ensure that the values of variables applied to the neural network input comply with the proportions between them. For example, when changing the input parameter "Oil price", the input parameter "Dollar exchange rate" must also change (Pearson correlation coefficient -0.38), "RTS quotes" (0.45), "Issued housing loans" (0.35). Thus, in order to get a believable forecast using our neural network model, it is necessary to change not one, but several input macroeconomic parameters – not arbitrarily, but according to the existing interdependencies between them, which is a challenge. Therefore, in order to study the dependence of the investigated market on the values of the parameter "Oil price", it was decided to exclude all input macroeconomic parameters in which the Pearson correlation coefficient module with input parameter "Oil price" is more than 0.29. After exclusion of these input parameters, subsequent design, training and optimization of the neural network, its errors on the training and testing sets are 7.5% and 7.7%, respectively, and the coefficients of determination are 0.83 and 0.82.

Discussing the results of the computational experiments presented in Figure 11, we should note that, in the opinion of many experts, the situation on the oil market is an essential factor for the real estate industry as an integral part of the Russian economy. Oil prices determine the effective demand and the value of housing through a combination of factors: from the volume of housing lending and money supply of the population to the level of income and employment indicators. However, due to the fact that property prices in Yekaterinburg are not pegged to the US dollar (share of ruble deals in Yekaterinburg is more than 95%), we haven't considered the link between oil prices and the real estate prices in US dollars.

According to the analysis given in Figure 11, we can say that this dependence is not linear, and this non-linearity mostly refers to expensive apartments with large areas. In this case, it can be seen that the sharp drop in the value of the apartments is observed in the case of a sharp decline in oil prices from $100 to $90. Apparently, the cases of non-linearity found by mathematical modeling are the result of the crises of the Russian economy in 2008 and especially in 2014. The sharp fall in oil prices from $100 to $90 and the following devaluation of the

ruble have caused panic among the holders of ruble assets and the desire to convert the latter into a more stable form. In particular, there was an increased demand for real estate, which has spurred the growth of housing prices.

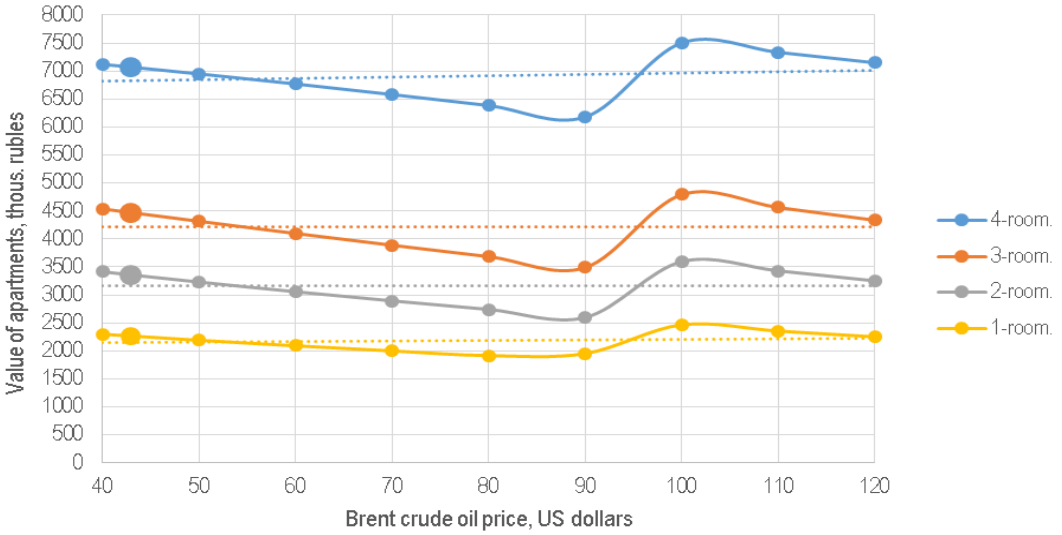

Figure 11 - Dependence of the value of apartments on oil prices

The predicting curves built in Figures 12-14 were obtained in a similar way.

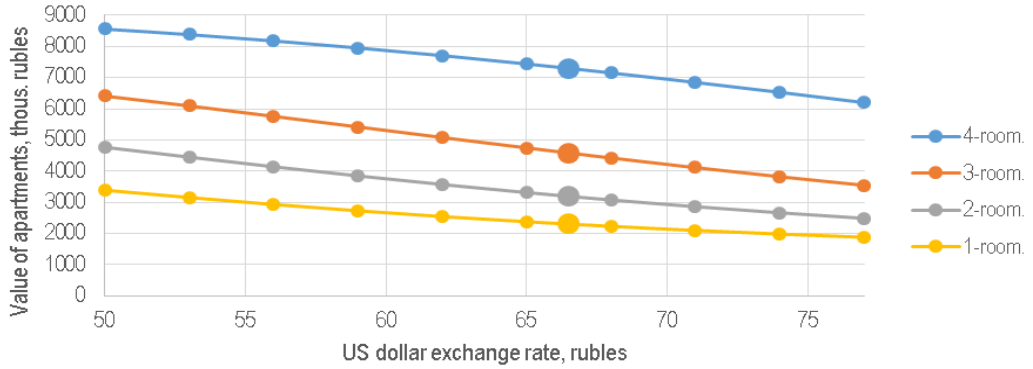

Figure 12 - Dependence of the value of apartments on the US dollar exchange rate

As seen in Figure 12, the growth rate of the US dollar is accompanied by a decrease in the value of apartments in Yekaterinburg, indicating a significant dependence of the Russian economy on currency.

Figure 13 shows the results of forecasting of prices for apartments in Yekaterinburg depending on GDP, the growth of which, as is known, was 16% over the past decade. As can be seen from the figure, an increase in GDP is followed by a smooth growth in prices for apartments, which indicates that in general, the growth pace of prices and turnover of property in Yekaterinburg have synchronized with the pace of overall economic growth.

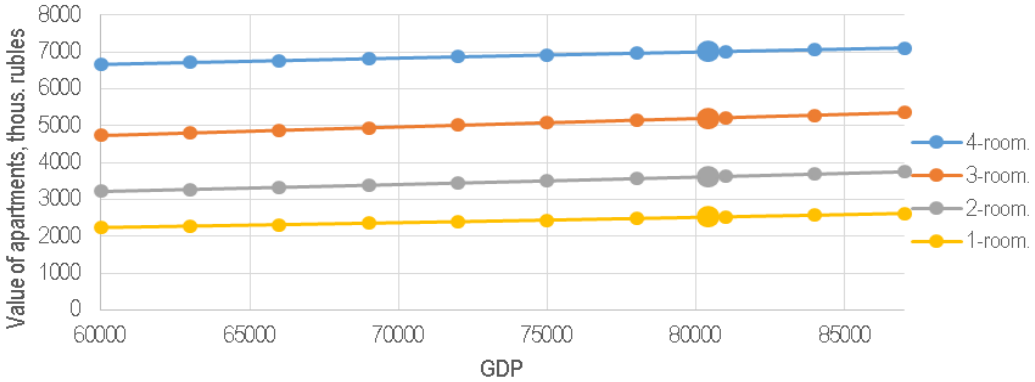

Figure 13 - Dependence of the value of apartments on GDP

The result of the analysis of the stock market impact on the real estate shown in Figure 14 reveals a weak dependence, which is a consequence of the lack of development of the Russian stock market and the lack of significant impact of this indicator on the prices of real estate in the regional market.

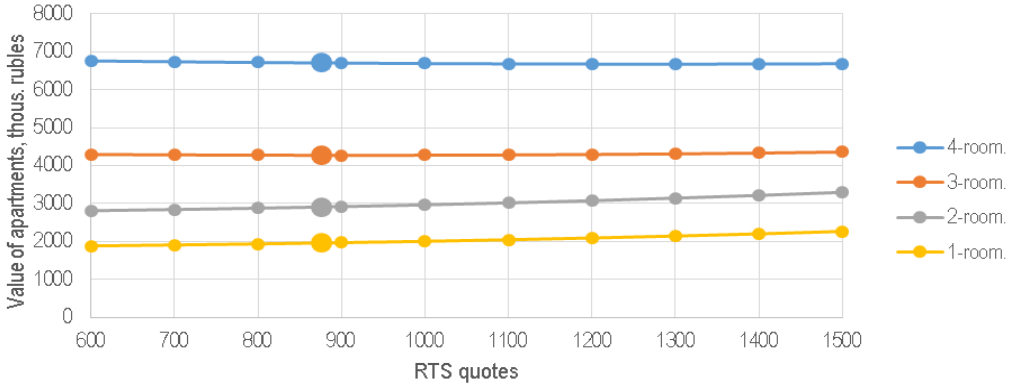

Figure 14 - Dependence of the value of apartments on RTS quotes

Concluding remarks

Thus, an integrated economic and mathematical model of mass appraisal of residential real estate in Yekaterinburg was created, taking into account both construction and performance parameters of apartments and the evolving economic situation in the country and the world. In contrast to the *static* economic and mathematical models that take into account only construction and performance parameters, the developed model does not require frequent updating and is also suitable for medium-term forecasting of the behavior of the real estate market in order to extract useful knowledge.

The developed integrated model has allowed us to conduct research of the residential real estate market in Yekaterinburg, identify patterns and perform some forecasts, the most interesting of which are the onset of market saturation effect with the increasing housing construction (Figure 10) and the effects of the increase in mortgage lending volumes (Figure 9).

In conclusion, we shall note that the proposed technique was demonstrated by the example of appraisal and prediction of the residential real estate market of Yekaterinburg, which refers to the developed cluster of Russian cities with the highest incomes and relatively high prices on the housing market. Similar studies and forecasts using the proposed technique can be made for other countries and cities.

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The Impact of Electoral Cycle Upon Local Public Expenditures in Case of Romanian Municipalities

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Abstract:

This paper addresses the link between level and structure of Romanian local government expenditures and electoral cycle, as well as spending interactions among Romanian municipalities. We have obtained the research results using general linear models with cross fixed-effects and time fixed-effects. We have also included mayors' political affiliation and some socio-economic factors in the proposed models. We have noticed increased public spending during election years, preceded and respectively followed by decreased spending in pre- and post-election years. Others findings revealed that mayors' political affiliation, other local administrative units' public spending policies and some socio-economic factors have had a significant influence upon Romanian municipalities' public expenditures.

Keywords: public interest, local public expenditures, electoral cycle, local spending externalities, mayors' political affiliation.

JEL Classification: C31, C58, H72.

1. Introduction

The public spending – electoral cycle relationship is a continuous subject of research, given that previous studies demonstrated both positive and negative inter-correlations. The allocation and use of public funds at central and local levels are a major concern for the public at large and individual researchers, as well as for politicians. The ongoing debate over the size, structure and efficiency of central and local government spending intensifies in the pre-election and election years. Taxation and resource distribution at a certain administrative level generate externalities upon other local jurisdictions.

The query we intend to answer is whether electoral cycle and mayors' political affiliation have influenced Romanian municipalities' public spending level. We have used a general linear model on a sample of 38 municipalities having a population of more than 50,000 inhabitants (excluding Bucharest Municipality) over a period of 14 years (1999-2012). To our knowledge, this is the first study ever done for Romania concerning the relationship between electoral cycle's phases and local expenditures, hereby contributing to the field literature.

Besides the introduction part, the paper is structured in five more sections. In section two we review the local government spending and electoral cycle concepts, in section three we introduce the Romanian local government sector's institutional structure, in section four we address research design and empirical models, in section five we are presenting the main results of our analysis, while section six concludes.

2. Local government spending and electoral cycle

The scholarly literature addresses both the link between changes in size and structure of government spending and elections and the relationship between one local authority's taxation and spending options and neighboring entities' related decisions.

In a study analyzing 106 countries for the 1960-2001 period, two economists revealed that election years' government spending growth characterizes new democracies rather than consolidated ones (Brender and Drazen

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2005). However, the same study revealed that increased pre-election public expenditure will lead to a diminished probability of re-election.

In a study made on a pool of developing countries, one of the findings was that the pre-election years feature current expenditures, rather than capital expenditures' share growth (Vergne 2009). Employing a linear regression, two researchers studied the relationship between local spending and the re-election probability of existing local parties in Brazil, during a four years period (Litschig and Morrison 2011). The results showed that a 20% growth in local public spending per capita leads to a 10 percentage points' growth in the re-election probability of existing local political parties. The link between elections and changes of government expenditures structure was researched recently by Brender and Drazen on a sample pool of 71 democratic states for the 1972-2009 period of time. The results showed that, in the short term, political leaders' change does not have any significant effect on the government spending (Brender and Drazen 2013).

Another venue of scholarly literature follows the externalities generated by the taxation and expenditure options of one local administration upon neighboring administrations. Using cross-sectional models and data panels, it was proved that in the United States one state's average per capita public expenditures is directly and strongly correlated with neighboring states' public spending policies (Case *et al.* 1993 and Figlio *et al.* 1999).

Baicker created an econometric model based on the dynamics of local public spending in the United States. It revealed that a dollar spent by any given state triggers 37 to 88 cents neighboring states' increased public expenditures (Baicker 2001).

Fiscal externalities were also studied using a global approach Generalized Method of Moments (GMM), on a sample pool of 1,000 local jurisdictions from Germany for 21 years. The results suggest fiscal externalities affect only relatively small municipalities (Buettner 2003).

A generalized spatial two-stage least squares (GS2SLS) procedure was also applied to analyze local German jurisdictions' reaction functions to a neighboring jurisdiction's public spending variations. For the aggregate level, the authors concluded that one Euro's increase in neighboring county's expenditures leads to a 0.22 Euro original county's public spending increase (Borck *et al.* 2006). At a disaggregated level, the reaction functions differ according to public expenditures' type.

Veiga and Veiga have analyzed existing authorities' behavior along the electoral cycle, studying whether they reduce taxes, increase or manipulate the structure of municipal expenditures in pre-election phases in an effort to signal mayor's competence and benevolence. Their results showed opportunistic mayors' behaviors of tax cuts, public spending increases (mainly investments) close to election's time (Veiga and Veiga 2007).

Researchers also studied the politicians' behavior. Hiring increased by 0.6 employees at 1000 inhabitants during election years as compared to the other years (Dahlberg and Mörk 2008).

Politicians' behavior around election periods was also approached from fiscal policy's perspective (Shi and Svensson 2006, Ehrhart 2010). In 2006, Shi and Svensson found that during election years budgetary deficit increases by approximately 1% of the GDP, whereas, four year later, Ehrhart argued that during the same period politicians reduce direct taxation to get a boost of popularity.

At the sub-national stratum, other economists studied possible correlations between French municipalities' spending decisions. The results confirmed an interaction with regard to primary and investment expenditures between neighboring municipalities (Foucault *et al.* 2008). Furthermore, the study revealed local authorities' opportunistic behavior, increasing public spending in pre-election years.

Guillamón and his colleagues have analyzed the effects of electoral cycles upon Spanish municipal police expenditures. Their results show that especially conservative parties are associated with increased spending on public safety and that it usually occurs one year before the elections. The authors found that population has a positive and significant impact upon police expenditures per capita, indicating the existence of scale diseconomies (Guillamón *et al.* 2013).

The electoral timing's effect upon municipal public cultural spending was analysed for all municipalities from the Spanish Region of Murcia for the 1995–2008 period of time. Their results reveal that mayors adopt opportunistic behaviours, increasing cultural spending in the election year and reducing it in the second year after the election. Regarding political leadership, the magnitude of the electoral cycle is influenced by mayors' political ideology rather than mayors' political strength and re-election willingness (Benito *et al.* 2013).

During 2013, there were several economists who studied the municipal financial transparency's effect upon the magnitude of political budget cycles. For instance, in a study conducted for 1999-2009, the authors show that municipalities with lower levels of financial transparency display an electoral cycle for their total spending, whereas highly transparent municipalities do not register an electoral impact upon their total spending

(Vicente *et al.* 2013). They also found that the magnitude of cycles in capital spending and taxes does not vary across low-transparency municipalities and high-transparency municipalities.

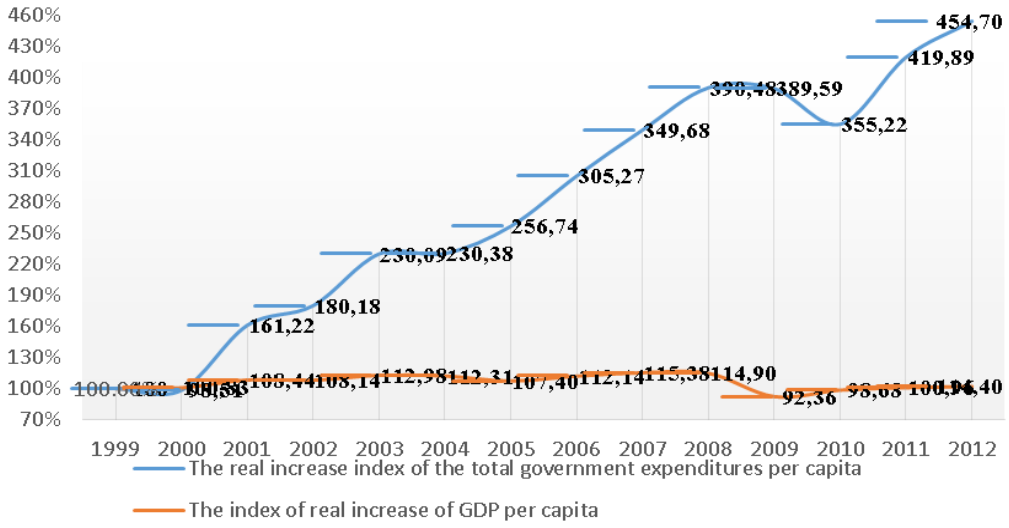
Scholarly literature both confirmed and contested a clear link between a given administration's spending and taxation policies and those of its neighboring entities, respectively between public expenditures' structure and re-election. Based on these findings, the present study aims to estimate and test Romanian municipalities socio-economic and political characteristics' influence upon public expenditures in electoral cycle's context.

3. Romanian local government's institutional structure

Romania is structured on three sub-national administrative tiers. The base of the pyramid includes 2,861 communes, 217 towns and 103 municipalities. Less than 20% of the municipalities have smaller populations, up to 20,000 inhabitants, while 43% have a local population of 20,000 to 50,000 inhabitants. Only 11 municipalities (of the remaining 37% ones, with a population greater than 50,000), are considered top tier, with population in excess of 130,000 inhabitants. Metropolitan areas have been generated around these 11 entities. The subsequent levels are represented by the forty-one counties and the Bucharest Municipality (NUTS 3) and the eight development regions (NUTS 2). The first level of the Nomenclature of Territorial Units for Statistics is the central tier, the unitary state.

Romania signed the European Charter of Local Self-Government on October the 4th, 1994, which was subsequently ratified by the Romanian Parliament through the Law no. 197/17-th of November 1997. The European Charter on Local and Regional Services of General Interest adopted in March 2009 by the Council of European Municipalities and Regions, represents a guarantee for the implementation of local self-government, abiding proportionality and subsidiarity principles. The underlying notion was that strong local and regional authorities are needed in order to appropriately address European public needs. These, in turn, are free to decide on those local services that best serve individual citizen's interests. The Charter states that the principle of local and regional autonomy is the cornerstone of local self-government.

To analyze the evolution of local government expenditures with regard to electoral cycles we have assigned the *t* symbol to election years (2000, 2004, 2008, 2012), (*t – 1*) to pre-election years (1999, 2003, 2007, 2011) and (*t+1*) to post-election years. In Figure 1 below we present the analyzed municipalities, respectively Romania's GDP per capita real indexes for the 1999-2012 period of time.



Note: The real indexes have a fixed basis – year of 1999
Source: data processed by the authors

Figure 1 - Romanian municipalities per capita expenditures and Romania's GDP/capita real indexes, 1999-2012

The analysis of per capita public expenditures' evolution for the 38 municipalities reveals an upward trend for the entire 1999-2002 period. Figure 1 highlights significant expenditures growth during election years (*t*) versus the precedent (*t – 1*) years. Years following election displayed less spectacular growth rates. The analyzed municipalities' overall upward expenditures trend can also be attributed to the decentralization process started in 1998. This process included a multitude of duties and competencies transferred from the central to the local administrative level.

Table 1 below presents disaggregated public expenditures according to the economic classification introduced in 2006 in Romania for local budgets.

Table 1 – The economic classification of the Romanian local government's expenditures, 2006-2012

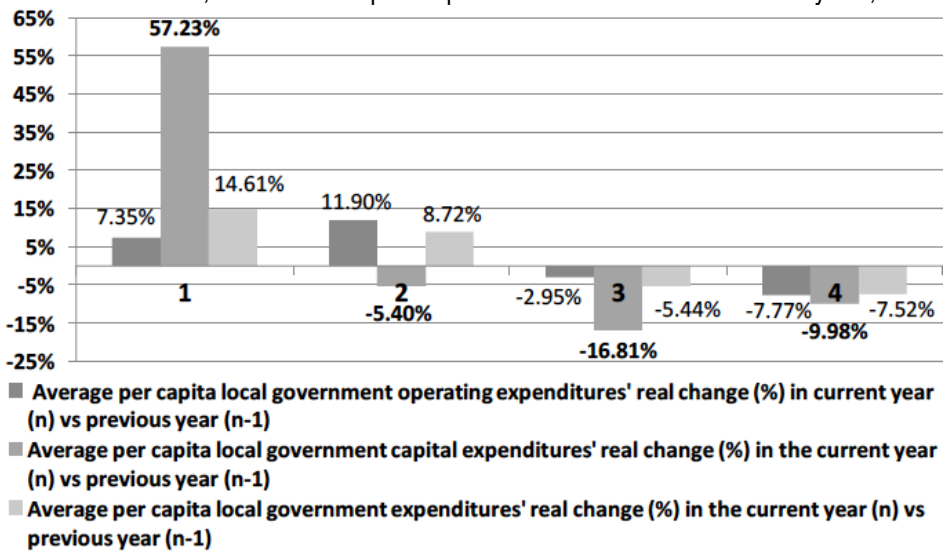
Measures / Years	Current expenditures		Capital expenditures		Other expenditures	
	Million Lei in current prices	Weight into TLE (%)	Million Lei in current prices	Weight into TLE (%)	Million Lei in current prices	Weight into TLE (%)
2006	21606.3	85.09	3620.7	14.26	165.8	0.65
2007	26868.5	79.07	6943.3	20.43	170.5	0.50
2008	34824.5	82.50	7210.7	17.08	254.8	0.60
2009	35627.4	84.68	6323.5	15.03	349.9	0.83
2010	34799.1	84.45	6028.1	14.63	570.4	1.38
2011	35152.5	79.89	8334.5	18.94	516.8	1.17
2012	37506.8	80.95	7973.5	17.21	853.1	1.84

Source: The Romanian National Institute of Statistics, local public budget's closure accounts

Pre-election years are characterized, throughout the analyzed time period, by a higher level of capital expenditures (investments). This category of public spending is more prone to generate political influence for the incumbent parties, eager to maintain their electorate and thereby securing a re-election bid. In 2007, a pre-election year, capital expenditures rose by 43% compared to the previous year. However, in the electoral year of 2008 capital spending dropped 16% compared to previous year. This downward trend can be observed in the following two years as well. The 2011 pre-election year features a new bout of investment spending's growth, as share into total local public expenditures. This was 4.31 percentage points (or almost 30%) higher than the level of 2010. The last year included in our analysis is 2012, an election year typically characterized by a diminished investment volume.

Local elected officials usually change the structure rather than the overall level of local public expenditures as a mean of electoral influence (Drazen and Eslava 2005, Drazen and Eslava 2010, Brender and Drazen 2008, Foucault *et al*. 2008).

Taking into consideration the timeline and its report to local elections, Figure 2 below confirms the existence of a certain cyclical evolution of local expenditures' structure. This figure presents the average yearly variations of Romania's local total, current and capital expenditures for four local electoral cycles, 1999 to 2012.



Note: 1 – the pre-electoral year (*t-1*), 2 –the electoral year (*t*), 3 –the post-electoral year (*t+1*), 4 –the post-electoral year (*t+2*)

Source: data processed by the authors

Figure 2 - The annual average local public expenditures' variation according to the local electoral cycle's year

The *t–1* pre-election years (year 1 on the horizontal axis of the graph) show a 57.23% average annual capital expenditures' growth, followed by a negative evolution (of -16.81%), especially in post-election years. Hence, we can infer capital expenditures' cyclical nature. Current expenditures display similar evolutionary cycle as capital spending, albeit not that impressive. Election years, with a downward capital expenditures' evolution,

are exceptions from this pattern. At the same time, the other spending categories register positive growth rates. These processes can be encountered for the most part in all 38 analyzed municipalities. The overbearing burden of current expenditures (staff expenses especially) and their minimal fluctuation (79% to 85% as weight into total expenditures) generated diminished political factors' interest over this category compared to capital spending.

4. Research design and empirical models

For our research, we have used a general linear model for a sample of 38 Romanian municipalities (with a population of over 50,000 inhabitants) studied over the 1999-2012 period. For homogeneity and relevance reasons our model excluded Bucharest Municipality as the Romanian capital can be considered both a municipality and a county.

In our study, inspired by the research of Foucault *et al.* (2008), we analyze the correlation between different Romanian municipalities' public expenditures, accounting for eventual horizontal externalities that may occur. Mayors' political affiliation and electoral cycle's influence upon the level and structure of local public expenditures were also accounted in our analysis.

The dependent variable is per capita local public expenditures (*TE*), denominated in Romanian currency's (Lei) and adjusted into 2012 constant prices via consumer goods' price index. We have gathered dependent variable's data mostly from the Mayor offices' web sites, using the respective years' budgetary closure account. The missing data were obtained upon formal requests addressed to Mayors' offices.

The independent variables $(X_{i,t})$ reflect, for the most part, the socio-economic and political characteristics of each *i* municipality at the *t* moment in time. The first explanatory variable is the auto-regressive component of the time series ($Y_{i,t-1}$), symbolized with *TElag*. We have considered a one-year lag. Since one of our objectives was to test the existence of interactions between a given municipality's expenditures and the ones of other municipalities, we have considered the average public expenditures for each *t* year of the other municipalities$(Y_{j,t}), j \neq i$, symbolized with *AE*. This measure assumes each municipality responds in the same way to remainder municipalities' expenditures weighted average.

Taking into account the two described variables (the auto-regressive vector and the remaining 37 municipalities' public expenditures weighted average), Eq. (1) becomes:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \varepsilon_{i,t}, \quad \text{with } j \neq i. \tag{1}$$

The political factors appear as dummy variables and reflect the political affiliation (*PA*) of the respective municipalities' mayors, as well as the possible existence of a certain cyclical pattern in the levels of yearly local public expenditures. To account for this latter factor, we have introduced three variables which reflect the pre-election year (*elect0*), election year (*elect1*) and post-election year (*elect2*).

Mayors and local councils' elections take place every four years in Romania. Our analysis revealed that presidential elections (every five years) almost always reflect local elections' results. For most municipalities, the national political parties' successions have influenced the local election results as well, with a majority of elected mayors having the same political affiliation with national winning parties.

For example, the first analyzed year (1999) was a pre-election year, in which a coalition of right-winged parties ruled at the national level. Most mayors (26 out of 38, or more than two-thirds) had the same political affiliation with central national government. In 2000's local elections the anticipations of central government's change and existing authorities' negative perception caused half of the 26 mayors to surrender their mandates to different political affiliation candidates. In this context, local elections' result can be considered as a feedback send by citizens to national level elected representatives.

The dummy variable political affiliation takes the value *1* if the mayor has a right-wing political affiliation and the value *0* if the mayor is left-winged politically affiliated.

In Romania, the political parties or political alliances constituted according to the Law of the political parties no. 14/2003 submit candidacies for local councils, county councils as well as for Mayor's office. Also, electoral alliances, national minorities organizations, as well as independent candidates can depose candidacies. Political parties or political alliances can constitute electoral alliances at local or county level. A political party can simultaneously be part of only one electoral alliance at any given level (national, county or local).

Besides political affiliation we have introduced three other binary variables. The value of *1* was associated to prior scrutiny's year, whereas the value of *0* was used for the following three years for the *elect 0* symbolized variable; for election years, symbolized by *elect1,* we have attributed the value of *1* for the years when we had mayors' office's elections and the value of *0* for the rest; the variable *elect2* was given the value *1* for the year following the scrutiny and the value *0* for the rest of the years.

Unemployment rate (*UE)* is a significant socio-economic measure for the proposed model, respectively the ratio of unemployed persons (registered with the County Agencies for Employment) into each municipality's total stable population, age 18 to 62 years.

The final measure included is population density (*POP*), as a ratio between total municipality population (as of July, the first 2012, according to National Institute for Statistics – the TEMPO online database) and municipality's area (in square kilometers).

Taking into account all the proposed variables, the model can be expressed as seen in Eq. (2).

$$TE_{i,t}=\beta_0+ \beta_1 TElag_{i,t-1}+ \beta_2 AE_{j,t}+ \delta_1 UE_{i,t}+\delta_2 POP_{i,t}+\delta_3 PA_{i,t}+\delta_4 elect0_{i,t-1}+ \delta_5 elect1_{i,t}+\delta_4 elect2_{i,t+1}+\varepsilon_{i,t} \quad (2)$$

where: i = 1,…,38; t = 1,…, 14 and j≠1; $TE_{i,t}$ – *t* year's per capita budgetary expenditures of *i* municipality (2012 constant prices' Romanian Lei); $TElag_{i,t-1}$ – (*t – 1*) year's per capita budgetary expenditures of *i* municipality (2012 constant prices' Lei, one year lag); $AE_{j,t}$ – *t* year's per capita budgetary expenditures of other *j* municipalities (2012 constant prices' Lei), *j≠i;* $UE_{i,t}$ – *t* year's unemployment rate (as in %) for *i* municipality; $POP_{i,t}$ – *t* year's average population density of*i* municipality (inhabitants per square kilometer); $PA_{i,t}$ – dummy variable for mayor's political affiliation. It takes values of *1* when the mayor of the *i* municipality has a right-wing party affiliation for the *t* year and *0* for left-winged party affiliation; $elect0_{i,t-1}$ – prior election year's dummy variable for *i* municipality. It takes the values of *1* for the (*t – 1*) year and *0* for the rest; $elect1_{i,t}$ – election year's dummy variable for *i* municipality. It takes the value of *1* for the election year and *0* for the rest; $elect2_{i,t+1}$ – election following year's (*t+1*) dummy variable for *i* municipality. It takes the values of *1* for election's following year and *0* for the rest; $e_{i,t}$ – the error term of the model.

To increase model (2) estimators' accuracy, we have decided to use model (3), which includes time fixed-effects (time differences) as well as individual fixed-effects, which can appear across municipalities at public expenditures' level:

$$TE_{i,t} = \beta_0 + \beta_1 TElag_{i,t-1} + \beta_2 AE_{j,t} + \delta_1 UE_{i,t} + \delta_2 POP_{i,t} + \delta_3 PA_{i,t} + \delta_4 elect0_{i,t-1} + \delta_5 elect1_{i,t} + \delta_4 elect2_{i,t+1} + \text{Cross-municipalities fixed effects}_i + \text{Years-time fixed effects}_t + \varepsilon_{i,t} \quad (3)$$

At the same time, to study *TElag's*, *UE's* according to mayors' political affiliation, as well as *AE's* influences over different electoral cycle's stages (*elect*), we introduce Eq. (4):

$$TE_{i,t} = \beta_0 + \beta_1 TElag_{i,t-1} + \beta_2 AE_{j,t} + \delta_1 UE_{i,t} + \delta_2 POP_{i,t} + \delta_3 PA_{i,t} + \delta_4 elect0_{i,t-1} + \delta_5 elect1_{i,t} + \delta_4 elect2_{i,t+1} + \gamma_1 PA_{i,t} TElag_{i,t-1} + \gamma_2 PA_{i,t} UE_{i,t} + \theta_1 elect0_{i,t-1} AE_{j,t} + \theta_2 elect1_{i,t} AE_{j,t} + \theta_3 elect2_{i,t+1} AE_{j,t} + \text{Cross-municipalities fixed effects}_i + \text{Years time fixed effects}_t + \varepsilon_{i,t} \quad (4)$$

To estimate the parameters of Eq. (3) and Eq. (4), we have decided to use a general linear model, which allows customizing the ANCOVA model to capture the independent variable × covariate interaction (Field 2013)

5. Results and discussions

Our study's main objective was Romanian municipalities local public expenditures' analysis for the 1990-2012 period under the determining factors' influence for the *pre*-, election and *post*-election periods. The main results refer to descriptive statistics, correlations between variables, existence of some variables' time-significant differences, using the ANOVA method (Jaba *et al*. 2012) and regression models parameters' estimation. In table 2 below we present the descriptive statistics of analyzed models' variables for the 1990-2012 period of time.

The results show that on average, during a one-year period, a Romanian municipality incurred 1,458.1016 Lei of per capita public expenditures *(TE)*, a slight increase over previous year's 1,387.9043 Lei average value. At the same time, a given municipality's one-year average per capita public expenditures (*TE*) is higher than other municipalities' average per capita public expenditures (*AE*, of 1433.1536 Lei).

Table 2 - The analyzed variables' descriptive statistics

VARIABLE	N	Minimum	Maximum	Mean	Std. Deviation
TE	532	136.7400	3802.1400	1458.1016	686.8963
TElag	494	136.7400	3802.1400	1387.90430	745.3854
AE	532	307.8500	2778.6500	1433.1536	617.9798
UE	532	0.6900	16.8800	4.2703	3.0075
POP	532	334.1700	5291.6400	1794.9592	1198.3996

Source: data processed by the authors

Also for the 38 Romanian municipalities the average annual unemployment rate was 4.27%, whereas the annual average population density is of 1,794.959 inhabitants per square kilometer.

Table 3 below presents the main results obtained using the ANOVA method to test for the existence of significant time-differences for the analyzed quantitative variables. Also, the table shows each year's averages, specifying its affiliation to a certain electoral cycle's phase (*pre*-, election and *post*-election).

Table 3 - Analyzed variables' means for the 1999-2012 period

Year	TE	TElag	AE	UE	POP
1999 – pre-election year	514.6166	514.6166	499.2532	8.7795	1971.1105
2000 – election year	500.4779	514.6166	465.2655	8.6671	1962.0579
2001 – post-election year	832.3603	500.4779	814.5139	7.0350	1962.0161
2002 – post-election year	942.2421	832.3603	904.4434	5.2924	1807.4726
2003 – pre-election year	1207.1539	942.2421	1158.5432	4.5805	1835.8913
2004 – election year	1206.3205	1207.1539	1138.8697	3.8250	1823.0566
2005 – post-election year	1345.3068	1206.3205	1281.7497	3.0434	1816.9063
2006 – post-election	1599.2284	1345.3068	1613.5808	2.4308	1811.5484
2007 – pre-election year	1814.7192	1599.2284	1819.2063	1.8505	1801.1813
2008 – election year	2026.8182	1814.7192	2043.9634	1.8837	1788.5839
2009 – post-election	2024.1926	2026.8182	2012.9455	4.3850	1785.2266
2010 – post-election	1845.0050	2024.1926	1830.3858	3.4805	1779.4203
2011 – pre-election year	2184.3142	1845.0050	2154.6197	2.2703	1492.4779
2012 – election year	2370.6661	2184.3142	2326.8103	2.2605	1492.4779
TOTAL	1458.1016	1387.9043	1433.1536	4.2703	1794.9591
ANOVA F test (year influence)	115.757	103.877	640.374	55.845	0.551
Sig.	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.892)*

Source: data processed by the authors

For our analyzed sample and period, we can notice a gradual increase of per capita local public expenditures (*TE*). However, we can notice that electoral cycle's phases have significantly influenced *TE's* evolution. Using the ANOVA generated data, we can observe significant differences over the time regarding *TE*. Until 2007 (the year Romania joined the European Union) the Romanian municipalities' average *TE* displayed much higher values for pre-election compared to election years (for example 514.6166 Lei/capita in 1999 – pre-election year, higher than 500.4779 Lei/capita in 2000 – election year). Starting with 2007, a pre-election year, the situation gets reversed, respectively a level of 1,814.7192 Lei/capita, lower than 2,026.8182 Lei/capita in 2008 – election year.

Also until 2007 the election years' *TE* were inferior to the post-election years' levels (500.4779 Lei/capita in 2000 – election year, lower than 832.3603 Lei/capita in 2001 – a post-election year), whereas the situation reverses after 2007: election years get superior levels of *TE* compared to post-election years (2,026.8182 Lei/capita in 2008 – election year, higher than 2,024.1926 Lei/capita in 2009 – a post-election year). This can be explained by Romania's EU accession hence the need of harmonizing and complying local public expenditures with EU directives' requirements. Another explanation might be the decentralization of certain expenditures

The correlations between determining factors (numerical, scale-type) also reveal their influences upon *TE*. Table 4 presents the Pearson correlation coefficients' values along with the associated *Sig.* values.

Table 4 - Variables correlations

		TE	TElag	AE	UE	POP
TE	Pearson Correlation	1	0.934**	0.926**	-0.553**	-0.103*
	Sig. (2-tailed)		*(0.000)*	*(0.000)*	*(0.000)*	*(0.017)*
TElag	Pearson Correlation	0.934**	1	0.884**	-0.514**	-0.096*
	Sig. (2-tailed)	*(0.000)*		*(0.000)*	*(0.000)*	*(0.027)*
AE	Pearson Correlation	0.926**	0.884**	1	-0.649**	-0.089*
	Sig. (2-tailed)	*(0.000)*	*(0.000)*		*(0.000)*	*(0.040)*

UE	Pearson Correlation	-0.553**	-0.514**	-0.649**	1	-0.023
	Sig. (2-tailed)	*(0.000)*	*(0.000)*	*(0.000)*		*(0.600)*
POP	Pearson Correlation	-0.103*	-0.096*	-0.089*	-0.023	1
	Sig. (2-tailed)	*(0.027)*	*(0.420)*	*(0.040)*	*(0.600)*	

Note: **. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).
Source: data processed by the authors

Table 4 data reveal that annual level of any given Romanian municipality's *TE* is directly and positively influenced by precedent year's expenditures (*TElag*), as well as by the other municipalities' expenditures (*AE*). At the same time, unemployment rate and population density negatively influence *TE*'s. As such, an unemployment ratio increase determines *TE's* decrease.

This can be explained in relation with Pearson correlation values used for analyzing the *TE – POP* relationship, as an unemployment ratio increase (in relation with the increased density of unemployed persons – POP) leads to a decrease of the number of taxpayers, hence of future public expenditures. At the same time, increased population density (POP) can determine a decrease of *TE* (especially public utility services, as they do not increase at the same pace with the number of taxpayers).

Once we have established the correlations between variables, we can estimate regression models' parameters. Table 5 below presents the calculations for the three proposed regression models, as well as their associated test-statistics.

Table 5 - Parameters estimates for proposed models

FACTOR	Model 2	Model 3[a]	Model 3[b]	Model 4
Intercept	96.018	-797.770	-913.483	-1365.209
$TElag_{i,t-1}$	0.548*	0.625*	0.444*	0.479*
	(0.000)	(0.000)	(0.000)	(0.000)
$AE_{j,t}$	0.517*	0.856*	1.031*	1.230*
	(0.000)	(0.000)	(0.000)	(0.000)
$UE_{i,t}$	4.755	7.654*	2.162	1.126
	(0.215)	(0.045)	(0.677)	(0.827)
$POP_{i,t}$	-0.005	-0.005	-0.069	-0.037
	(0.526)	(0.416)	(0.249)	(0.548)
$PA_{i,t}$	7.889	-3.669	-4.777	27.846
	(0.675)	(0.670)	(0.831)	(0.610)
$elect0_{i,t-1}$	-82.262*	-181.533*	-67.491	-593.108*
	(0.001)	(0.000)	(0.159)	(0.023)
$elect1_{i,t}$	-22.717	-7.887	75,173	99.436
	(0.350)	(0.870)	(0.153)	(0.731)
$elect2_{i,t+1}$	-60.315*	-14.426	11.711	-567.680**
	(0.022)	(0.720)	(0.763)	(0.089)
$PA_{i,t} \cdot TElag_{i,t-1}$	-	-	-	-0.019
				(0.470)
$PA_{i,t} \cdot UE_{i,t}$	-	-	-	-0.847
				(0.894)
$elect0_{i,t-1} \cdot AE_{j,t}$	-	-	-	0.265*
				(0.045)
$elect1_{i,t} \cdot AE_{j,t}$	-	-	-	0.354*
				(0.011)
$elect2_{i,t+1} \cdot AE_{j,t}$	-	-	-	0.355*
				(0.037)
Municipality-cross fix effects$_i$	No	No	Yes	Yes
Years–time fix effects$_t$	No	Yes	Yes	Yes
R^2	0.920	0.943	0.952	0.953
Adjusted R^2	0.919	0.941	0.947	0.948
Observations	532	532	532	532

Note: in the brackets are presented the values for the significance level of the estimates. ** Significant values at the 0.01 level; * Significant values at the 0.05 level.
Source: data processed by the authors

From Table 5 we can identify each variable's influence upon *TE's*, for the three proposed models. The inclusion of the fixed time and individual effects (cross-effects) was justified as they increased model's explanatory capacity with regard to *TE's* variation: R^2= 0.920 for model (2), R^2= 0.943 for (3a) model, R^2= 0.952 for the (3b) model and R^2= 0.953 for model (4). The year time fixed-effects show the existence of significant time differences between each year's *TE* levels. The fixed time-effects (*Year time fixed-effects*) establish the existence of significant differences between each year's *TE* levels. The individual fixed-effects (*Cross-municipalities fixed-effects*) showed the existence of *TE's* differences between the 38 municipalities.

Based on parameters' estimation we can determine each variable's individual influence upon *TE*. A 1 Leu increase of precedent year's per capita local public expenditures (*TElag* – and mainly previously initiated investments) leads to a significant current year per capita expenditures' (*TE*) increase, respectively by 0.548 Lei/inhabitant for model (2), by 0.625 Lei/inhabitant for model (3a), by 0.444 Lei/inhabitant for model (3b) and by 0.479 Lei/inhabitant for model (4).

A 1 Leu of other municipalities local per capita expenditures' (*AE*) increase leads to a significant *TE's* increase, respectively by 0.517 Lei/inhabitant in model (2), by 0.856 Lei/inhabitant in model (3a), by 1.031 Lei/inhabitant in model (3b) and by 1.230 Lei/inhabitant in model (4).

We can also notice that unemployment rate (*UE*) influences *TE*, respectively a 1% unemployment ratio increase determines *TE's* increases of 4.775 Lei/inhabitant in model (2), of 7,654 Lei/inhabitant in model (3a), of 2.162 Lei/inhabitant in model (3b), respectively of 1.126 Lei/inhabitant in model (4). This can be explained in the context of socially related expenditures' increases. We can observe that population density (POP) has a significant inverse influence upon *TE*, especially public utility ones, common for all inhabitants. As such, a 1 inhabitant per square kilometer (POP) increase leads to *TE's* decreases of 0.005 Lei/inhabitant in model (2), of 0.005 Lei/inhabitant in model (3a), of 0.069 Lei/inhabitant in model (3b), respectively by 0.037 Lei/inhabitant in model (4).

The table also reveals different influences of mayors' left or right-wing's political affiliation, when using fixed individual or fixed time effects. For model 2 we can see that a right-wing affiliated mayor will generate 7.889 Lei/inhabitant higher *TE's* especially investment expenditures as compared to left-wing affiliated mayors. At the same time, right-wing affiliation can generate lower social insurance expenditures compared to left-wing mayors. As such, in case of model (3a) when we include fixed time-effects, a right-wing mayor's affiliation leads to a 3.669 Lei/inhabitant *TE's* decrease, compared to municipalities headed by left-winged mayors.

In case of (3b) model the right-wing affiliated mayors have determined a 4.777 Lei per inhabitant *TE's* decrease, whereas for model (4) the same affiliation generated a 27.846 Lei/inhabitant *TE's* increase. The electoral cycle's phases (prior-election year *–elect0*, election year *–elect1*, post-election first year *–elect2* and post-election second year – reference category) induce *TE's* significant differences as table 5 reveals. Model 2 shows that post-election second year has 82.262 Lei/inhabitant, respectively 60.315 Lei/inhabitant higher expenditures, compared to *elect0*, respectively *elect2* years' expenditures. There are no significant differences between election and post-election second year *TE's* levels.

To study the influences of variables' interaction upon *TE's* evolution we will determine model (4) γ_i and θ_i parameters' estimators. Table 5 data reveal indiscriminate the political affiliation of the mayors, precedent year's local public expenditures (*TElag*) have had a similar influence upon current *TE's.* The same was valid for unemployment rate, which had a similar influence upon *TE's*, indiscriminate the mayor's political affiliation.

The other municipalities' local expenditures (AE) had a different impact upon *TE's* of a given Romania's municipality according to electoral cycle's phases. Model 4 data, presented in Table 5, reveal that a 1 Leu/inhabitant *AE's* increase induced *TE's* increases of 1.230 Lei/capita in the post-election second year, of 0.265 Lei/inhabitant in the pre-election year, 0.354 Lei/inhabitant in the election year, respectively of 0.355 Lei/inhabitant in the post-election first year.

Conclusion

As we proved in this article, the motivation for our research was related to several aspects. Firstly, we have tested the general perception that Romanian local elections where more or less influenced by precedent and election years' local public expenditures increases, either investment-oriented (usually for right-wing affiliated mayors) or socially-oriented (usually for left-wing affiliated mayors). Secondly, we consider this study important as it can assist Romanian voters in exerting their constitutional right with a better knowledge about the interests and motivations behind the actions of former and current mayors. Thirdly, the results can be of interest to local and

foreign investors, as they can identify patterns of increase or decrease for public investments/consumption during different phases of the electoral cycles and have a better planning of their activity/investments.

Our paper has explored possible correlations between local public expenditures and the electoral cycle, as well as externalities generated by one public local administration's spending policy upon other administrations. Other researchers' findings confirm the existence of a connection between (local) public expenditures and political elections, generally for unconsolidated democracies. In what concerns the modification of public expenditures' structure according to electoral cycle, the results are notably different, with investment spending perceived as having the biggest electoral impact. The results generated allowed us to reach the objectives of our study. As such we have estimated and tested the influence of determining factors during various electoral phases of the 1990-2012 period upon Romanian municipalities' local public expenditures.

The ANOVA method allowed testing for the existence of significant differences in *TE's* level over time. Subsequently, based on the general linear model, we have estimated and tested factors' influences upon *TE's*, for different electoral cycle's phases and according to mayor's political affiliation.

One important result indicates a significant influence of precedent year's local public expenditures (indiscriminate of mayor's political affiliation) as well as of the other municipalities' expenditures *(AE)*. Also, we have found that *AE's* influence upon *TE* differs over time, according to electoral cycles' phases, being especially visible during the pre-election year, election year and post-election first year.

At the same time, we have discovered that unemployment rate determines an increase of local public expenditures, especially due to social security expenditures. The increased population density generates a decrease of the *TE*, as public utility expenditures do not increase at the same rate with population increase. This is normal due to the economies of scale.

The mayors' political affiliation revealed that the right-winged affiliation supports local public expenditures' increase (especially new public investments or continuing previously started ones) as compared to the left-wing mayors. Inclusion of fixed time-effects and cross-municipalities' effects revealed that right-winged affiliated mayors sometimes determined the decrease of local public expenditures (probably decreasing social protection expenditures.

The decentralization process started in Romania in 1998 has determined the transfer of certain responsibilities to local authorities with an obvious impact upon the local public expenditures' increase. The process has not yet resulted into a real democratization of the allocation and spending process at local governments' level as, quite often, the authorities send important amounts of funds towards dedicated voters and constituents as subsidies, social security and other forms of direct and indirect financial support. The practice of organizing referendums for important investment projects has not broken yet into the habits of Romanian local governments.

Our study main limitation refers to studying local public expenditures at an overall level rather for the different categories of budgetary expenditures (investments, social protection, and current expenditures). Our future line of study relates to differentiating for these types of budgetary expenditures and deepening the analysis of *TE's* determining factors' influences. Another direction refers to increasing the study sample, including the communes which match the number of inhabitants' criteria (corresponding to the municipalities' population threshold) in order to test *TE's* differences according to the urban or rural environment.

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Directions of Transformation of Labor Relations in the Modern Conditions

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Abstract:

Modern stage of development of society is peculiar by deep changes in all spheres of life activities. Relations between labor and employment are characterized by high level of uncertainty which requires full analysis and study, as well as development of adequate state policy of management. The purpose of this paper is to study directions of transformation of labor relations in the modern conditions and to develop recommendations for improvement of state policy in the sphere of labor and employment. These goals were achieved with the help of economic & statistical methods and methods of economic and comparative analysis. The practical developments were based on the following approaches: complex and structural & logical, expert, methods of comparison and modeling. The performed research determined directions for transformation of labor relations at the modern stage of development of society, change of labor motives and forms of population's employment. The process of formation and development of non-standard forms of employment in economy of the Russian Federation is studied, and recommendations for development of state policy of employment management are given which take into account the growth of "flexibility" of modern labor market as an objective process.

Key words: labor, labor relations, population employment, non-standard forms of population.

JEL Classification: J23.

1. Introduction

Development of society at the modern stage is characterized by fundamental changes that take place in all spheres of its life activities and in economy, in particular. It is considered that as of now, the global society has entered the stage of post-industrial development. This radical transformation is caused by significant increase of the role of innovations, new knowledge, and information. Intellectualization of economic environment, innovational entrepreneurship, and possession of information flows has become a basis for existence of highly efficient and competitive market economy.

Transition to post-industrial society influenced all aspects of labor activities. Human labor, as main production force, stops playing the leading role in the process of production. Deep transformations take place in individual's psychology, its labor, life values and needs, as well as conditions of life activities.

Under these conditions, forms of interaction between key subjects of labor suffer deep changes. Subject of labor is actively working, perceiving, and transforming individual or social group with conscience and will. In the modern conditions, subject of labor should conform to the following requirements: high level of development of professionally important qualities of personality; satisfaction with labor; adequate reflection of object of labor; development of self-regulation system; acquisition of socially developed methods of activities; development of the skills of self-evaluation, sense of self-esteem and self-respect.

The above requirements are caused by influence of transition of modern economy to innovational, post-industrial stage of development. Novelties in society lead to changes in economic relations, including labor relations. Labor relations are relations arising between people in the process of labor. However, it should be noted that during the whole historic way of human society development, labor relations and labor itself played the key role. Human constantly changes the conditions of his existence in labor, transforms them according to his developing needs, and creates the world of material and spitirual culture which is created by human to the same extern to which a human is formed by culture (Dorokhova, 2012)

Besides, labor is very important in the process of establishment and development of personality (Figure 1)

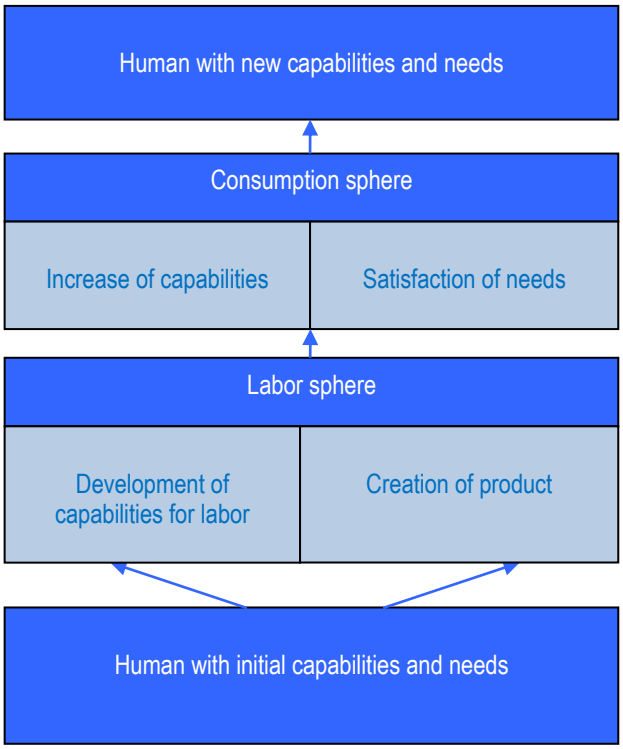

Figure 1 - Scheme of promotion of needs and capabilities of human in the process of labor (Dorokhova 2012)

Initially, labor plays an important role in the process of formation of personality depending on activities chosen by human; besides, the final results of labor determines well-being of society and satisfaction of own needs, including professional activities (Drobizheva *et al*.). Thus, it is difficult to overestimate the importance of the possibility to work for a particular human. Taking this possibility from human and perspective of transition to the status of unemployed leads to negative associative sense with human: absence of work, idleness, uncertainty in tomorrow, famine, and poverty.

Change of labor relations in the modern conditions and appearance of new forms of labor relations is expressed in the labor market in development of non-standard forms of employment.

Non-standard forms of employment are the form of labor relations with non-standard conditions of labor, work in the part-time regime on the basis of term contract at enterprise or organization. Non-standard employment includes such types of employment as: partial employment; temporary employment; casual employment; part-time employment; underemployment; overemployment; secondary employment; self-employment; employment in informal sector; borrowed labor (outsource, outstaffing, personnel lease) remote employment (Dashkova and Dorokhova 2013).

In the modern conditions, change of labor relations and employment and diversity of their forms turn into an important competitive advantage. With the development of society and economy, new forms of employment arise, which determined the capability of labor market to adapt to constant changes in economic, social, and institutional environment. Directions of transformation in the sphere of labor and employment are the key ones in development of economy and society and require thorough study.

2. Research methods

Theories of post-industrialism and informationalism use as the most important empirical proof of change of the way of historical development the appearance of a new social structure characterized by shift from goods to services, increase of the number of jobs for professionals and managers, reduction of jobs in industrial production and agriculture, and growing informational content of labor in the most developed economies. Intellectualization of economic environment, innovational entrepreneurship, and possession of information flows became a foundation of existence of highly effective and competitive market economy. Information and knowledge, as its ordered form, are produced, used, and sold like any other product, which leads to formation of single global informational and communicational system. Development of electronics and informational technologies changes

the content of labor in a range of productions, turning it into creative and cognitive. In certain spheres of production, there was transition from labor aimed at object to labor aimed at the system and including significant economic and managerial component. Human labor, as the main production force, goes to the background.

These tendencies became a foundation for emergence of new forms of relations of labor and employment adequate to socio-economic realia, which differ from the previous ones by their flexibility.

It should be noted that certain role in development of flexible forms of employment in industrially developed countries belonged to economic difficulties, among which special place is occupied by the economic crisis of late 1970's – early 1980's. As one of the tools of fighting the crisis phenomena in economy, the scientists and practitioners used measures for reduction of "roughness" of employment forms. These measures include: distribution of regimes of half-day and half-week and wider involvement of temporary employees. Surely, realization of such policy had positive and negative consequences. On the one hand, flexible forms of employment allowed involving into the production sphere the persons with limited competitiveness in the labor market. On the other hand, increase of the share of temporary employees in the total number of the employed made the procedure of hiring and firing less difficult for employers. At that, the system of usual social guarantees for hired help was ruined. Ambiguity of social consequences of flexible forms of employment led to huge discussions in the Western countries, but the necessity for their application was proved by economic practice, determining the new long-term tendency in the sphere of labor and employment.

At that, the process of globalization of socio-economic relations, which took place alongside informatization, influenced the transformation of the forms of relations of labor and employment.

Modern society in developed countries is peculiar for domination of the share of the employed in the sphere of production of services and information. Structural changes of population employment stimulate growth of qualified employees, changes in character of population employment and regarding employers' attitude to intra-organizational policy of employment which supposes orientation at structural shifts in organization, involvement of scientific & technical novelties and educational novelties which increase labor efficiency and quality of technologies and issued products (Khorev, Salikov and Serebryakova, 2015). That's why a large competitive advantage in labor market belongs to employees who constantly increase their qualification and develop intellectually. A separate social and professional group includes workers of intellectual labor the share of whom in the number of employed population of the developed countries grows quickly.

Researchers think that modern economy is peculiar for the following tendencies: reduction of share of agricultural employment; reduction of share of traditional industrial employment; development of social services, with domination of healthcare services, and services provided to manufacturers, with emphasis on business services; growth of the level of diversification of the service sphere as a source of jobs; high rates of growth of the number of managerial, professional, and technical jobs; formation of "white collar" group; relative stability of a significant share of employment in retail sphere; simultaneous growth at upper and lower levels of professional structure; relative modernization of professional structure in time, with higher growth of share of jobs that require high qualification and high level of education, as compared to growth of categories of lower level.

Due to globalization and informatization, there are significant changes in social and labor mentality of society:

- labor activities become individual more and more. Modern features acquired by population employment, related to level of individualization of labor processes, are expressed in the fact that role of specialists who have a wide specialization and are capable to combine various functions and operations grows, which, in its turn, requires return to universalization through increase of qualification and constant study;
- professional mobility grows. Nowadays, a person has to change his job many times during his labor life, and it is considered to be a norm;
- social and labor environment of employee is extended. This means that jobs with full-time employment will be replaced by flexible labor agreements from the point of view of space and time. Employees are peculiar for new mode of social and labor relations, and necessity for office work and submission to tough rules of labor activities disappears.

The main quality of employment is its flexibility, which leads to new forms of employment: employment with short-term labor contract (or without it), employment without set social guarantees (Serebryakova *et al.* 2015). Thus, social and labor relations are characterized by a higher level of uncertainty.

Deep changes take place in personality's psychology, its labor, life value, needs, and conditions of life activities. According to Dashkova "Values of human life change. Model of human economy as ideal rationality of its activities, capability to adapt to current changes, is replaced by creative activities at which a large role belongs

to striving for achievement of unusual result on the basis of realization of individual capabilities and talents. Such quality of life includes not only successful level of material goods consumption but fuller satisfaction of spiritual needs, good health, large span life, and favorable conditions of environment" (Dashkova 2007). Improvement of quality of life and conditions of life and labor is pre-determined by scientific & technical and social progress.

Thus, human's attitude towards labor changes. As of now, labor is a means of self-expression and self-esteem, realization of own experience, intellectual and creative potential, and moral honor. According to cross-cultural research conducted by R. Inglehart in 43 countries of the world, the share of followers of higher values constitutes 21-22% in the USA and Austria, 12-16% in the countries of Eastern Europe, and 11% in Russia (Dashkova and Dorokhova 2013).

In the Russian Federation, tendencies for transformation of forms and motives of employment are negative, as transformation of forms and motives is a means of adaptation to unfavorable and unsustainable character of external environment.

In the economy of the Russian Federation, development of non-standard forms of employment is related to growth of scales of its shadow sector. In early 1990's, when deep recession of production and closure of many industrial enterprises led to reduction of demand for labor, terms of population employment also change. Against the background of growth of instability in labor relations, emergence and growth of unemployment, emergence of real threat of loss of constant labor income, there began spontaneous re-distribution of employees between enterprises, spheres, and sectors of economy. The structure of employment for ownership forms changed during the analyzed period.

Quick denationalization of property in the first years of reforms, aimed at development of entrepreneurship and private initiative, "started" the process of transformation of forms and motives of employment. At that, there were no conditions for reducing consequences of quick release of employees during crisis decline of production, the process of bankruptcy of non-profitable enterprises slowed down, which led to hidden unemployment, underuse of work time, reduction of the level of wages, and delays of payment of wages. On the whole, conditions and possibilities for realization of labor potential of economy complicated. The system of value and labor motives became complicated and the life mode that had established over many decades fell down.

Transformational period of Russian economy and corresponding processes stimulated expansion of boundaries of private sector and enrichment of organizational forms of employment in addition to traditional system of termless hiring. Entrepreneurship started to develop in the form of self-employment and with attraction of hired labor. Informal employment became widespread, and its scales grew constantly (Serebryakova *et al.* 2014). Growth of informal employment became a natural result of the delay with formation of legal field for legalization of small and medium business. Bureaucratic hurdles and corruption with registration of necessary documents for receipt of the official status of entrepreneur led to those wishing to do small business going into "shadow".

As a result, labor relations with clear tendency for growth of informal employment established. Its distribution was stimulated by deficit of possibilities of secondary employment in formal economy. However, secondary employment became an important adaptation resource that performed a role of a buffer for employees' dissatisfaction caused by large reduction of real labor income, popularization of the practice of unpaid mandatory leaves, and late payment of wages.

During the reforms period, there was a tendency for gradual narrowing of scales of full-time employment and growth of the share of people with part-time employment. Part-time jobs in the system of network marketing grew. Shuttle business, seasonal jobs, and other non-standard forms of employment became popular.

According to Rudenko G. and Merko A. the process of globalization led to negative consequences over this period (Rudenko and Merko 2009). Russia faced globalization of employment in 1990's when under the conditions of total socio-economic crisis, there emerged and developed the process of "brain drain". This process was a mass outflow of highly qualified and perspective workers from the Russian labor market. This process acquired huge scale in Russia at the end of the 20th century, and only stabilization of socio-economic state in the country in 2000-2008 decreased this problem. However, Russia was largely damaged by that. The losses caused by underproduction of GDP due to specialists' outflow are huge. This damage was felt in 2004-2007 when Russian economy developed very quickly, and many regions and spheres had "personnel hunger". Also the losses were caused by Russia's providing jobs to migrants from the CIS countries: very often, the loss was caused by growth of crime level – from illegal hiring and tax evasion to growth of criminal offences. Professional and qualification structures of employees who left by the "brain drain" program and those who arrived from the CIS countries to work in the sphere of manual labor are totally different. However, competent management of

human resources in the scale of the country might have solved the problem of lack of unqualified workforce in the largest cities by means of national labor resources. Lack of highly qualified workers in Russia in the period of economic growth led to organizations of all ownership forms closing the vacancies by applicants whose professional and personal characteristics did not correspond to jobs' requirements. Rudenko G. and Merko A. think that this situation led to "incompetence wave" that filled Russian economy and "personnel bulb" – growth of the labor payment level is higher than the level of expenses of individual human workforce (Rudenko and Merko, 2009).

At the same time, diversity of employment forms in Russia raises the flexibility of market labor but also leads to gradual blur of moral and ethical values and motives. Thus, development of non-standard forms of employment not only expands citizens' experience in the sphere of labor relations and makes their economic behavior more variative but direct them for additional employment, which is connected to sustainable physical and psychological overburdens, as well as the risk of depreciation of accumulated qualification potential in case when additional work does not correspond to main specialty or is much lower according to the qualification level.

Full-scale expansion of informal sector threatens the quality of human capital. Neglecting the legal registration of labor relations gives employers a possibility to ignore legal norms and often leads to employees' losing their rights and a possibility to protect them. As a result, there are conditions for reduction of labor cost, violation of requirements of labor protection, its use in the regime of increased intensity and the length of work day that does not correspond to the set norms, absence of day-offs, paid leaves, etc. This leads to aggravation of indicators of health of employees, violation of the regime of labor and rest, gradual professional degradation, and reduction of labor quality and its results (Serebryakova *et al*. 2014).

A person "loses peace" due to deformation of foundations of personality, formed by the previous system of public order. Emptiness and dissatisfaction with life appear. This carries the threat to upbringing and quality of life of youth and development of creative components of human potential of Russia.

At that, it should be noted that in the period of economic stabilization and growth, Russia had positive changes in formation of forms and motives of employment. Thus, a vivid example of the above transformation is the process of adaptation of virtual (remote) employment to the situation when labor force offer exceeds the demand, which happened in Russia at the end of 2008. Virtual (remote) employment, as a phenomenon of market labor, appears under the influence of such factors as globalization of economy and technical progress, the rates of which in late 20th – early 21st centuries are unprecedented in the history of human civilization. Development of computer technologies, which takes place under the modern conditions, allows a lot of employees involved in intellectual labor to perform their labor functions beyond the working premises of the employer. Other forms of employment of hybrid type also develop.

Thus, the very tendency for transformation of relations labor and employment is obvious; it is impossible to change the course of historical development. We consider that bans and limitations are of no effect here. Such jobs appear and "multiply" in Russian economy, despite existing limitations and even direct bans. It is obvious that diversification will continue and grow. Russian economy already became a part of the global economy, and it cannot hide from these universal tendencies. The earlier this is understood by politicians the better. Still, under the conditions of realization of the Strategy 2020, the goal of which is entering the trajectory of sustainable and well-balanced growth for the purpose of modernization and overcoming development, transition to innovational stage of economic development, and creation of corresponding infrastructure of post-industrial society, the issues of effective management of population employment are especially actual. In the modern conditions, globalization of economic space and formation of non-standard forms of employment turn into an important competitive advantage.

This process determines the market labor's capability to adapt to constant changes in social and institutional environment. But formation of non-standard forms of employment, as we tried to show, is connected negatively to toughness of labor law. Recurrent attempts of the state to "push" labor relations within the frames of standard employment lead – with all other terms being equal – to obvious reduction of competitiveness of labor force.

In the Russian economy, diversification of employment forms is not yet sufficient. For its development, the very institutional environment should become more "friendly" as to innovational types of labor contracts. Diversity is a condition for existence and source of market economy's power; it also applies to relations of employment, which are formed in labor market, as "modern labor market is a complex, dynamically changing system of relations, norms, and institutes in the regional socio-economic system" (Azarnova, Popova and Leontyev 2013).

3. Analysis results

Economic basis for labor relations in the Russian Federation undertook serious transformation over the recent fifteen years. Labor relations also changed. In particular, the role the employment forms that had been prohibited or had been in their initial stage of development grew.

As a result of globalization of labor market and transformation of forms and motives of employment, "non-standard" labor relations appeared which could be viewed from two perspectives. Firstly, it is non-standard nature of labor agreement, *i.e.*, deviation of formal conditions of labor agreement from the set standard and, secondly, non-standard nature of factual conditions of employment. "Standardization" of Russian labor market followed industrialization, being a part of socialist economy and stimulating planning and mobilization of labor resources and political and ideological control over employees. Before the start of market reforms of 1990's, almost all Soviet citizens worked in such a way.

Possibilities of deviation from "standard" in the planned economy were very limited, though there were also employed in the informal sector – temporarily or by accident – who worked part-time or at several enterprises at the same time. Some of them developed narrow niches within the Soviet law or at the brink of its violation, and others existed beyond the current laws.

Due to start of systemic transition from the planned economy to the market one in post-socialist countries, including Russia, there appeared conditions for significant increase of flexibility of labor relations. Flexibility of market labor became one of several really accessible tools of adaptation of economy to changing conditions of its functioning.

Personnel are influenced by many factors that belong to various groups: technical & technological, economic, marketing, social, physiological, legal, and psychological which are then divided into subgroups. Strategic analysis of influence of factors on the job helps determining the level of factors' influence on personnel – management of organization during formation of a job and taking into account necessity for changes in personnel (Isaenko 2014).

At the stage of economic recession of 1992-1999, non-standard employment – as studies of many Russian scientists show – ensured "even" and "painless" transition to the market, without social "explosion". At the stage of economic growth (from 2000 till now, excluding the 2008-2010 crisis), it became a mechanism of society's adaptation to new socio-economic realia which take place in the global labor market. Let us view the processes that take place in these two periods in detail.

The first stage (1991-1999) became a reflection of deep transformation recession. Reduction of industrial production caused cardinal changes in sectorial structure of Russian employment. In the period of reforms, the share of the employed in the service sphere reached 60% of the total number of the employed (one of the highest indicators among all countries with transitional economy). This structural shift was achieved by means of full cut of employment in the sphere of material production (more than 10 million people), while the growth of employment in the service sphere is not that significant (around 2-3 million people). So the scale of real "transfer" of work force from secondary sector into the tertiary one was small. Such active "removal" of jobs that require highly qualified labor increased absence of demand for human capital and led to increase of intellectual emigration and degradation. At that, society adapted, agreeing to work under the conditions of non-standard employment. The service sphere was a generator of non-standard jobs. Scale of work in the part-time regime and forced administrative leaves, secondary employment and employment in informal sector, late payment of wages, shadow payment of wages, natural payment of wages, and manufacture of goods and services in population's households grew. As a rule, these mechanisms took the first blow, and the whole adaptation of the more stable forms took place later, acquiring more even character.

In this period, some years were peculiar for the fact that around 25% of employees of Russian large and medium enterprises had part-time regime or forced administrative leaves. Approximately 10-15% of the employed had additional jobs – according to various sources; 15% of employees were involved in informal labor activities (outside the sector of enterprises and organizations). In the most difficult years, 75% of the employed experienced late payment of wages, and scale of unofficial labor payment reached 50% of official payments, according to estimates of the State Statistics Committee of Russia. A peculiar characteristic of Russian labor market is employment in the sector of private households, in which more the 40% of adult population of Russia work at the peak of agricultural season. It should be noted that with the start of economic rise, various "non-typical" forms of employment began to be used not so actively (for example, the level of forced part-time employment dropped below 1%). However, they still cover a significant part of Russian workforce. All these "non-typical" mechanisms have an important common feature – their informal or half-formal character. As a rule, they

act past the laws or other formal limitations, or even contradict them. Untimely and hidden payment for labor, part-time and secondary employment predetermined personalization of relations between employees and employers, due to which obvious labor agreements gave way to obscure ones.

Over the large part of transitional period, Russian labor market was regulated by the laws inherited from the Soviet Union. Thus, until the end of 2001, the Labor Code which had been passed in 1971 was effective in the Russian Federation. Thus, at the most important and complex initial stage of reformation of Russian economy, the laws that had been developed according to peculiarities of planned economy were effective.

As a result, flexibility of labor relations necessary for market economy was ensured past the current laws. Under such conditions, labor agreement has only formal character. Norms of labor law (including the ones regarding employment regime) were very tough, but they got "deregulated" with the help of various informal institutes and tools.

Modern business organization is a dynamically developing system, development of which is influenced by large number of factors, among which – according to many leading Russian and foreign specialists – the most important is personnel. Priority of this factor is caused by the fact the personnel's work determines efficiency of different resources of organization (material, financial, information, etc.). Accordingly, in the structure of economic security of organization, a priority among its various directions should be given to the direction related to provision of personnel security. At that, main functional components of this direction should be opposing economic espionage, protection of enterprise's objects, protection of corporate secrets, *etc*. (Khorev, Salikov and Isaenko 2015).

New Labor Code, developed and passed in the Russian Federation, was a result of compromise between various political forces. As a result, the norms that correspond to market realities are combined in it with limitations inherited from the Soviet period. This statement is fair for the Labor Code on the whole and for its provisions that directly regulate various employment regimes.

The second period (2000 – until now, excluding the period of 2008-2010 crisis) is related to energy post-transformation rise, accompanied by positive dynamics of basic indicators of labor market. Thus, according to the statistical data in the table, it is possible to see that from 2004 the number of temporary employees, self-employed, and involved in secondary employment grew. Growth of temporary employment could be a sign of negative and positive tendencies.

Table 1 - Levels of non-standard employment in Russian economy, 1992-2014, % of the total number of the employed

Types of flexible employment	1992	1993	1994	1995	1996	2004	2008	2010	2012	2014
Temporary	2.5	2.5	2.5	2.6	4.2	11.1	12.3	12.2	12.0	12.1
Part-time	1.9	2.2	3.1	3.4	3.7	1.9	2.0	2.1	2.0	2.0
Underemployment	1.3	1.8	3.3	3.4	4.1	0.7	0.6	0.5	0.5	0.5
Overemployment	9.7	12.2	7.1	8.1	6.1	8.7	9.1	9.0	8.8	9.1
Secondary employment	2.4	1.6	1.4	1.4	1.3	4.1	12.3	14.1	14.6	14.5
Self-employment	0.7	1.0	1.5	1.9	2.1	5.8	12.3	13.3	14.5	16.5
Employment in informal sector	1.8	2.7	2.9	4.2	3.4	14.3	15.7	19.5	16.6	18.3
Employment in population's households						0.7	0.8	0.9	0.9	1.2
Total number of the employed	66.7	67.7	68.7	68.1	67.9	66.5	68.3	69.0	69.2	69.7

Negative moments include the fact that a lot of employees have to combine the period of employment with unemployment due to lack of guarantees of employment in small business or seasonal character of the job. On the other hand, such character of employment is voluntary and convenient for a certain share of employees.

Increase of the number of self-employed should be characterized as a positive phenomenon. This category includes independent small entrepreneurs and people of free profession. Independent employment is preferable for highly qualified people who possess sufficient skills for independent regulation of business relations.

Increase of the number of employees with secondary employment proves that most of population have additional jobs, and it is a norm as of now. Also, employees with secondary employment include part-time working youth who study full-time.

The only negative phenomenon is still the growth of the number of employees involved in information sector of economy. Scale of informal employment in Russia is higher than in most of developed countries, and could be compared only to Italy where, according to some estimates, 30% of GNP are manufactured by shadow economy. Thus, in 2008 – 2014, the share of the employed in the informal sector of Russian economy grew by 1.5 times – from 15.7% to 18.3%.

At that, when Russian economy began developing with growing rates and service sphere expanded, various modern types of non-standard employment, peculiar for the Western economy, became widespread: virtual (remote) employment and borrowed labor.

The term "remote labor", or "telecommunication access" was introduced by the American Jack Niles in 1970's for denoting remote work by a contract, and later the labor outside the office premises began to be called "telework". Virtual (remote) employment got distributed in Russia due to development of computer technologies, which allows workers of intellectual labor performing their labor functions outside of office premises.

The main purpose of creation of virtual organizations – according to a range of Russian researchers – is going beyond the existing stereotypes in building the mechanisms of interaction between economically active citizens that strive for achievement of common business goals. As to the formation of virtual employment, a significant feature of virtual organization is the fact that its members work outside the office, having the connection with the center through telecommunication technologies (e-mail, web-interfaces, online-cooperation, etc.). An employee performs activities via the Internet and works online. As a result, all special and time limitations have no effect here. Synonyms of work outside of office are remote work and telework. Employees who work remotely are remote workers or teleworkers (Rudenko and Merko 2009).

In 2000, the European organization of telework distinguished the following types of telework:

- *Home-based telework.* These activities are peculiar for employees who work at home at least once a week. For that, they use a computer and telecommunication connections for the purpose of interaction with colleagues from home. At that, if remote work accounts for more than 90% of the whole work time, these workers are considered to be permanent teleworkers, if remote work accounts for less than 90% but no more than one day per week – they are considered to be alternative teleworkers. If a person works at home less than one full day per week, telework is classified as supplementary.
- Mobile telework. It requires an employee to be beyond his workplace at not at home at least for ten hours per week – as a rule, it is business trips. Actually, it is no secret that such conditions of labor have become traditional; in order for them to turn into telework, it is necessary for the employee to use computer communications.
- Telework in special centers – telecottages, which provide possibilities of studying and efficient Internet and communicational technologies. It is very effective if home and office are far from each other: each employee chooses the office (telecenter) that is most convenient for him. Disadvantages of this convenient and perspective type of telework include the fact that its realization requires first-class infrastructure, which is actually what telecottage is. Constant cheapening, growing accessibility, and improvement of ICT (*e.g.,* creation of broadband) reduce this drawback.
- Telework by self-employed in SOHOs. Combination of self-employment and telework, which supposes independent workers' (company's owners or managers), with their workplace being at home or small office, using ICT and cooperating with customers or business partners.

In a special report for the European commission "Remote work and equality of sexes", Ursula Hughes gives the following types of employment:

- remote employment, scattered in several places: partly at home and partly in premises which are employer's property. Usually, such work is performed by highly qualified and trustworthy professional personnel. Most of such works are regulated by collective agreements;
- home work. It is performed fully at home. In often includes unqualified work of simple recurring operations. Payment is conducted by the final results; work being performed exclusively by women;
- freelance remote work. Based on home work. but performed by freelance workers who perform various tasks on the basis of contracts with customers. Writing, editing, design, and computer programming;
- mobile remote work. Application of capabilities of new technologies in traditional forms of activities – *e.g.*, trade commissioners, inspectors, and ground engineers;
- work in specially equipped office. Remote work is performed at employer and subcontractor's premises. Work areas are equipped with the latest telecommunications.

Borrowed labor is labor performed by worker of certain qualification, hired and provided by borrowed labor agency for a third party, which is user, for performance of work in favor of the latter. An important aspect is that contract labor relations usually exists only between borrowed employee and borrowed labor agency. In most sources, devoted to application of new non-traditional forms of labor relations, borrowed labor is treated as totality of new non-standard forms of employment: outsource, outstaffing, and personnel lease.

Outsource – attraction of additional workforce, apart from existing one, by means of transferring certain functions to another organization (enterprise) that specializes in corresponding sphere.

Outstaffing – use of personnel that is available at staffing company (provision of workforce to an enterprise via staffing agencies). Technically, outstaffing is performed through taking a part of employees out of personnel list and transferring them to a private agency or providing company.

Personnel lease – provision to an enterprise that needs workforce of personnel that is within the agency's staff for a certain period. Personnel lease supposes that employees of one company are used in projects of another company, *i.e.,* they are "rented" temporarily. After finishing the works, personnel return to the agency that pays for their labor.

Borrowed labor has serious negative consequences: weakening collective safety, scattering labor groups, reduction of the number of professional union members; strengthening of social dumping, as labor of borrowed employees is cheaper, and emergence of a threat of dismissal for full-time employees; complication of conduct of collective negotiations due to multi-profile nature of activities types and lack of transparent schemes of cooperation of employees and employers; freezing and reduction of the level of wages and social guarantees for full-time and borrowed employees; reduction of responsibility of employers for observation of labor safety rules, reduction of allocations to the Social Security Fund, envisaged for payments for employees damaged at production; discrimination of borrowed employees, lack of their social protection and possibility to increase qualification or retrain.

In Russia, virtual employment develops gradually and there are organizations with hybrid structure. Hybrid structure combines traditional methods of organization at the level of management with different structure of the whole company, consisting of dynamic virtual groups of employees-performers. As for borrowed labor, its distribution is slower due to roughness of labor law (Serebryakova, Gryshchenko and Syroizhko 2014).

Conclusions

It is possible to state that in Russian economy employment relations are not sufficiently diversified, and it determines labor market's capability to adapt to constant changes in economic, social, and institutional environment. Diversification of employment relations is negatively related to roughness of labor laws. The more the state tries to put labor relations into strict limits of standard employment, the lower is the competitiveness of labor force. For that, institutional environment should be more "friendly" regarding innovational changes in labor market.

It is obvious that under the conditions of growing processes of в globalization and informatization, the policy of regulation of employment should take into account inevitable development of various types of non-standard employment at domestic labor market.

The following measures will help Russian Federation's transition to civilized relations in the sphere of non-standard employment.

Firstly, it is necessary to form common legal field for regulation of non-standard forms of employment. This will lead to amendments to the Constitution, Civil, Labor, Tax, and Criminal Codes, and a large number of other normative acts. Improvement of laws should be combined with support for scientific research as effective practices and perspectives and problems related to new characteristics of population's employment. There's necessity for support for Internet forums on these issues, as well as printed media.

Secondly, as a consequence of legal transformations, change of employment's institutional environment.

Thirdly, realization of a complex of measures aimed at transformation of motive in favor of increase of significance of moral and ethical values, namely: popularization of moral and ethical foundations of labor activities through realization of corresponding projects in mass media and the Internet; reduction of bureaucratic barriers in labor sphere; development of professional orienting work with the youth.

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The Influence of Regional Revenue on Government Investment and Its Implication to the Regional Economic Growth

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Abstract:

The aim of this study is to identify the determinants of the influence of regional revenue (RR) on government investment and its implication to the regional economic growth. Economic growth in Bekasi, Indonesia, is always above national economic growth such investment preparation linked to the RR. This research is limited on RR and its impact on economic growth in Bekasi. Variables studied focused on RR, government investment, and economic growth, was modelled based on Path Analysis approach. Then, the effectiveness of RR management in achieving sustainable economic growth in Bekasi enable to be evaluated economically, through local government investment.

Key Words: regional revenue, government investmen, economic growth.

JEL Classification: E22, H71.

1. Introduction

In the year of 2013, the Indonesian Gross Domestic Product have reached Rp 2770.3 trillion (US$. 245,259.2 million/estimately) or about 5.78% increased than the previous year achiievement. The highest economic growth was contributed by the transport and communication sectors with 10.19%; growth while the lowest growth experienced by mining and quarrying sectors as 1.34% (CBS 2011). By GDP total analysis, Java is still the highest contributing zone to Indonesian economy growth, then raised relatively as 57.99% in 2023 as well. Followed by Sumatra as 23.81%; Borneo as 8.67%; Sulawesi as 4.82%; Bali and Nusa Tenggara as 2.53%, and the remaining 2.18% contributed by Maluku and Papua.

There are three provinces in Java with the largest contribution to economic growth such as Jakarta, East Java and West Java. On the expenditure side, the highest economic growth was contributed by goods and services exports amount of 5.30%. Then successively by 5.28% of household consumption component; 4.87% of government expenditure components, 4.71% of Gross Fixed Capital Formation component 4.71%, as well as 1.21% of imported components as a deduction aspect.

As one of the highest economic growth province in Indonesia, West Java has a unique position in the national economic growth. This successful is certainly influenced by the strong government role, which succeed to coordinate all of its resources, even though at the other side there are many problems that challenging. Those are related with the opinion of Millner, Ollivier and Simon (2014, 84) that said "Many of the most important public policy problems require democratic country face cumulative effort by successive Governments to be successfully managed". Relavance opinion comes from, Gelb A *et al* (1999) stated that Governments in developing countries should, and do, provide valuable goods and services which generate a derived demand for production factors. However, public sector differs from private sector in the extent to which it is subject to political pressures for employment.

Besides having the largest population in Indonesia, West Java province is also directly adjacent to the capital of the country, namely Jakarta. Among the 27 districts/ cities in West Java province, 6 areas were located in the *Jabodetabekjur* area namely: Bogor district, Bogor city, Depok city, Bekasi district, Bekasi city, and Cianjur district. Similarly, among 11 autonomous administrative regions located in *Jabodetabekjur* regions, West Java province contribution is relatively larger than Jakarta and Banten. Overall, those administrative autonomous regions, consisting of 3 Provincials Government (DKI Jakarta, West Java and Banten) and 8 Regencies/Cities Government (Bogor regency, Bogor city, Depok, Tangerang regency, Tangerang City, Bekasi regency, Bekasi city, and Cianjur Regency.

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Source: Google Map

Figure 1 - District of Bekasi, Province of West Java, Indonesia

In the year of 2013, West Java Province experienced economic growth of 6.06% over the previous year (Statistic Bureau Center/BPS of West Java Province 2011). This growth was relatively higher than the national economic growth. Growth occurred in all sectors, except mining and quarrying, which felt down by 0.66%. The highest growth occurred in the transport and communications sector, which amounted to 9.66%. On the expenditure side, the highest economic growth was contributed by goods and services exports, which amounted to 10.06%.

Then successively, followed by components of Gross Fixed Capital Formation 6.60%, 5.51% of government expenditure, 4.02% of household consumption; 0.61% of inventory change and imported components as a deduction instruments, grew by 12.65%. Relatively, its appears that the growth of government spending components in West Java Province is larger than the growth of the national component of government spending. Similarly, it appears that the growth of government spending components in West Java province is greater than the growth in household consumption component. This show that government contribution in West Java in promoting region economic growth is relatively higher than the contribution of other economic actors.

As the fourth largest city in Indonesia, Bekasi City has an important position in development cooperation in the *Jabodetakjur* as a dynamic region as well as the highest social and economic activity issues in Indonesia. The rapid development of Jakarta as the State Capital, causing spill-over city development into the surrounding area, so there was a wide range of over the designation function in cities around Jakarta, including Bekasi city. Recently, Economic growth in Bekasi which in 2012 amounted to 6.85% (Statistic Bureau/BPS, Bekasi 2013).

Growth occurred in all sectors, except mining and quarrying. Consecutive economic growth in sectors that experienced, growth in Bekasi are: the building sector, which amounted to 12.09%; financial, rent, and services sector companies 8.64%; electricity, gas and water 8.54%; trade, hotels and restaurants 8.11%; the industrial sector 6.25%; the services sector 6.23%; transport and communications 3.27%; and the agricultural sector 0.24%.

In the last period, year to year economic growth in Bekasi is always above the economic growth of West Java province and national economic growth. This is due to local governments' intervention to facilitate trade activities, proved to be the biggest growth in the service and trade sector. As Hornok and Koren (2015: S110) discloses that "They hope to increase of trade volumes without endangering government revenues by reducing inefficiencies", bring the authorities idea to develop trade sector to boost economic growth in Bekasi City.

In promoting economic growth, local governments have a very important role which is conditioned by how do local governments could be able to manage the region financial potentialily. Jhingan (2003, 67) argues that one of the factors that may affect economic growth is capital accumulation or investment, whether by government or society. If there is greater investment program, it will encourage an increasing production of goods/services activity then will stimulate national or regional production.

One of investment instrument is capital expenditure (Mankiw 2003, 453), government investment was sourced from revenues excess over government investment as government saving. Thus, government savings show the government investment capacity that potentially could be done. While government investment shows the investment amount that realized by the government.

The economy of our state and the related health and social processes have been extremely deeply impacted by the ongoing globalization and the global crisis, which exposed the so-called "unsustainability" of various concepts with elements of minimal state involvement (Gavurova and Grof 2016). Region economic growth strongly related with variety of factors, inter alia, an investment in the certain regions, in particularly local governments investment. Local government investment which is not well prepared neither implemented by consistently and effectively as well, will impact on unexpected economic growth. Based on the region financial potential outlook, investment preparation by local governments investment closely linked to the local income, particularly RR and the Government Investment

In order to stimulate RR, required an effective local financial potential management so that can increase RR and allocate it base on economic development plan priorities and expected targets economic growth There is no define how RR could be able to influence government investment as well as the effect of both variables on regional economic growth, particularly in Bekasi city.

This research is limited on RR and its impact on economic growth in Bekasi, directly or indirectly through government investment. Variables studied focused on RR, government investment, and economic growth. As for influence between variables was modelled based on the structural model approach through Path Analysis. By using Path Analysis, the effectiveness of RR management in achieving sustainable economic growth in Bekasi enable to be evaluated economically, through local government investment, either directly or indirectly.

2. Literatur review

2.1. Government finance

Goode (1984) said that in State administrations, there are three main actors in economic activity, namely government, companies and households. In government sector, those activities are directed by political decisions. Government revenues and expenditures are controlled through the process that set out in government budget. Essentially, state financial covering state revenues sector were descriptively available in the revenue budget. Similarly, state expenditure, which the details are quantitatively arranged in state spending items.

In another part, Goode (1984) described that almost all government policies require financial support programmed in government spending, with a variety of objectives that have been outlined. But it all (in the context of the Sate financial management) based on law and other various operational rules. In addition, temporarily mechanism inherent and has specific attention. Musgrave and Musgrave (1984) said that budgetary flexibility is limited and cannot be separated from the drafting process of political element. The role of the executive and legislative policy making has been started since the beginning, which later resulted in the decision as a result of the mechanisms that have been programmed.

2.2. Government revenue sources

As stated by Goode (1984). State revenue include: taxes; interest and Income Property; proceeds on sale of land and other capital wealth; assistance from other Governments and International Institutions; loans; issuing money. For that purposes, tax is a major contribution in the structure of state revenues, so that the proportion of RR receipts dominating element of state revenues. In another section, Goode (1984) also describes that the amount of local revenue is typically calculated by Gross National Product (GNP) or Gross Domestic Product (GDP) ratio. Potential taxation can assist the government in formulating policies relating to state finances management.

Rosen (2005) said that tax levied by the government such central tax and regional tax. According to the category of taxpayer, the tax may be personal income tax and corporation income tax. Generally, (particularly in developed countries) state revenues sources, is more dominant derived from taxes, especially direct taxes, which includes personal income and corporate income tax.

2.3. Government expenditures

Rosen (2005) said that essentially government expenditures include: national defence, the proportion tends to fall down from 47% in 1965 to 17.3%; social security, which tends to be large; health, including health

insurance system; welfare program; payment of interest on the debt. These elements constitute the general classification. Meanwhile, for each state, generally adjust to the conditions of the country concerned.

According to Goode (1984), expenditure includes: expenditure goods or services, or so-called unused spending; payments transfer or spending unused spending; loan, including procurement.

Purchases of goods and services are expected to support government activities for providing services to the public. In developing countries, transfer payments (non-cash) is done in the form of direct payments without remuneration.

2.4. Government budget (APBN)

Musgrave (1984, 210) said that budget preparation is intended to create efficiencies through various alternatives (as a product of the executive and legislative) in the context of the use of public funds. State revenues and expenditures basically reflect the government activities that measured quantitatively. Therefore, in the context of accountability to society, a budget revenue and expenditure preparation should be through a transparent mechanism and approved by the legislature.

Referring to above statements, it means that revenue and expenditure budget is essential instrument of government activities/guidelines to carry out the tasks of government activities. In national budget (APBN) will be described on the action plan for public services/development in order to improve society welfare.

According to macroeconomic concepts, schematically state budget can be formulated as follows:

Table 1 - National Budget Structure

Revenue	Expenditure
Tax	Government Expenditure
	Government Transfer

Noted: T*ax* means tY, where as: t = *tax rate* (*single tax rate*) and Y = *income*

Tax means personal income tax and a corporate income tax. Government Expenditure (G) and government transfers (Tr) is the exogenous variables (not depend on other variables). By the above structure, surplus or deficit of a state budget is:

$$\text{Surplus (defisit)} = T_x - (G + T_r) \quad (1)$$

Generally, in practicing the above structure is developed with more varied. As an example, shows that Indonesia current structure state budget (Statistic Center Bearue/ BPS: *Monthly Statistical Bulletin* Dec., 2003, p.33-34) is as follows:

- revenues and Grants, which are include: domestic revenue (revenue and non-tax revenues); the grant.
- expenditure, which include: the central government expenditure (recurrent expenditures and development expenditures); regional budget (equalization and special autonomy funds).

Based on composition of the government budget elements, the surplus/deficit of the government budget can be formulated as follows:

Surplus/Deficit = Revenues and Grants – Expenditure

In the concept of spending, according to Mankiw (2003; Q25) national income can be formulated as follows:

$$GDP = C + I + G + NX \quad (2)$$

Provided that G is the state budget (government expenditure).

Thus, the role of G cannot be ignored in GDP formation. Even in several developing countries, G role is still quite significant as the economy driving force of the certain country (including Indonesia). Therefore, it is understood that the growth of government expenditures affected the GDP growth in related countries. The budget deficit, in general, be addressed from overseas loans. There fore the bigger the deficit, can create a greater state dependence on the creditor countries (who joined in a specific institution*, e.g.* CGI).

Another cases in Brazilian, related not to ignore GDP formation, Anselin in Ricardo *et al* (1988) said that apart from this problem of adequately consider both the influence of human and physical capital on Brazilian regional GDP growth, the evidence about the impact of these factors obtained from growth regression barely considers the presence of spatial dependence of the variables, which makes the estimative potentially biased. Then Özyurt and Daumal in Ricardo *at al* (2013) stated in regional growth regression in Brazilian case and these

works confirm the importance of explicitly taking into account spatial dependence. None of these works for Brazilian regions, however, simultaneously use a spatial panel data and interpret adequately the estimated effects of the variables on regional per capita GDP or Income growth.

2.5. Government savings

According to Musgrave (1985, 786), the government saving equals with the surpulus thus defined in the current budget. So, that government saving is an surplus of savings over the routine expenditures. Thus it can be formulated as follows:

$$Sg = tY - aY \quad (3)$$

Referring to the above formulation, basically government savings influenced by:

- the amount of government revenue, particularly from taxes (tY). The larger of PAD (RR), provides government opportunity to increase government savings;
- while the budget (aY) precisely on the opposite effect. If the budget is getting larger, it will tend to reduce local government savings.

Implementation Formula:

$$S_G = tY - aY \quad (4)$$

So, that:

Government/regional revenue (RR), positively will affect government saving level (state /regional). On the other hand, the greater revenue, will encourage government saving. Implicitly, Hakim (2002, 170) formulated that government savings include budgetary savings (the largest share) which represents the surplus of total government revenue (taxes) for public consumption spending (G) and government enterprises saving. Thus, in general, government savings is government revenue minus government spending (public consumption).

Related to a state's economic development funds, government savings accumulation was most ideal funds sources because it will not be a pose a financial burden on the state. The use of government savings as a source of development fund will rise to two positive implications, as efficiency indicator of the domestic investment that leads to increase Gross Domestic Product (GDP).

2.6. Development fund source

Every economic development country cannot be separated from the influence factors to the development process. In accordance with Hakim (2002, 164), one important factor is capital accumulation which is essentially a number of funds required for the implementation of development process. According to the expenditure approach, national income can be formulated:

$$Y = C + I + G\,(X - M) \quad (5)$$

Under the condition of:

$Yd = Y + Tr - Tx$ = Disponsible Income;

where: Y = Gross National Product; G = Government Expenditure; X = Export; M = Import; I = Investment.

Whereas:

$S = Yd - C \longrightarrow C = Yd - S \qquad Y = Yd - Tr + Tx$

Then, it will have requisite balance:

$X + I + G + Tr = S + Tx + M \qquad I = S + \{M - X\} + \{Tx - (G + Tr)\}$

Thus, domestic investment is very dependent on public savings coupled with (M - X) as capital imports and government saving (Tx - G - Tr).

2.7. Regional finance

Davey (1988) said that, the common basic problem of regional finance is how the revenue sources excavated and distributed and who will decide it. Basically, regional finance includes the type of loan, equity participation, relief, tax-sharing, devolved taxes, local taxes, customs levies and operating profit. As set in Chapter VIII Section 78 s/d 86 of Law No. 32 of 2004 on Regional Autonomy, discuss about all details regional

financial which is covered by the regional budget (APBD). Thus, the scope of the regional financial area related to the regional income and expenses. In his statement, Davey (1988, 25) specifies that the regional government fund include: funding for the central government; taxation; levy; loans; company.

2.8. Regional revenue sources

In general, local government finance come from RR, the central government allocations, loans and other legitimate regional income. These components, are not the same between one area to another concerning the characteristics and potentialities of each region. According to the provisions of Law No. 32 In 2004, the following sources of RR, namely: revenue (local taxes, levies, regional companies and other local revenue legitimate results); the equality base funds; regional loans and d) other legitimate source revenues.

Davey (1988, 201) described that the central government budget allocations to local governments are often disclosed as government transfers, has a major role to the order of the local government. The allocation contains several goals. First: spending, whole or partly, services or programs expenses for national development concerned. Second: to encourage local governments efforts for development programs and services in accordance with national policy. Third: to stimulate regional economic growth, both in order to help the growth and as well as to reduce inequality between regions. Fourth: controlling spending and establish a regional standard of service or more equitable development. Fifth: to developed low capacity/fiscal potential region and to help the region in order to cope with emergencies. The type of central government allocation, essentially consisting of: allocation based on direct budget votes; allocation in the capitalization form.

2.9. Regional (Locally-generated) revenue (RR)

RR sources include local tax revenues, levies, regional companies, and other legitimate local revenues results.

- *Local tax*. As stated by Davey (1988, 39), local taxation can be interpreted as: First, tax levied by local governments with the setting of his own regional. Second, tax levied by national regulations, but the determination of the tariff that carried out by local governments. Third: Other legal taxes that levied by local governments.
- *Retribution*. Whereas levies as defined by Davey (1988, 132) were: First, a contribution to the direct remuneration that may be appointed, the levy may be imposed is greater than services cost rendered. The excess is characteristic for many levies to achieve the license fee. Second: a service may be only partially cost by the levy; the rest comes from a special subsidy from general local revenue.
- *Regional Enterprise Profit.* The involvement of local government in business activities such of two main objectives, means: Firstly, to present public service based on independent expenditures. Secondly, with the aim of to make profit by the excess of revenue or sales on all costs incurred. But practically, it is difficult to separate the two objectives, although enterprises do have public service, but for not to burden local governments but at the other side they have to make a profit in its operations.

Ownership of business entities which is become the government instrument in the provision of public services and in order to obtain profits can be shaped as region-owned enterprises, which is a wholly-owned by local government. While another type is a joint venture entity, but for the ownership will to involving private capital. It is attractive for private investors if the local government may provide land space, infrastructure, recommendations on plan and the bureaucracy.

2.10. Regional spending

According to Kunarjo (2002, 160), regional spending, principally shall be in accordance with the expenditure planning purposes. This is to ensure that any appropriateness concerning with limited funds allocations have considered, such as: First: requirement priority. Second, arising consequences (from the perspective of the overall economy). If the more detailed, the spending plan includes the following activities: needs identification; analysis and Forecasting; evaluation.

Barata and Hartanto (2004, 90) said that regional spending principle was all local government liabilities that recognized as a reduction of net worth. Regional spending is specified by: the organization which is adapted to the composition of the regional/engineering institutions; the functions of public services, security, environment, housing/public facilities, health, tourism, culture and so on, regional spending items such as employee, goods, capital, interest, subsidies, grants and social assistance budgets.

The elements of regional expenditure (BPS: Government Finance District statistic 2002) include:

- routine expenditure, which is includes of personnel expenditure, spending on goods, maintenance cost, on duty trip cost, other expenditures, instalment of financial loan and other expenses;
- development expenses, which principally includes of Local Government activities and booked in the Regional Budget and Expenditure (RAPBD).

2.11. Local government savings

Hakim (2002, 170), implicitly to formulating that government savings include budgetary savings (the largest share) which represents the excess of total government revenue (taxes/tax) for public consumption spending (G) and government enterprises saving. Thus, in general, government savings is government revenue minus government spending (public consumption) in line with that sense can be defined that the Local Government saving is revenues excess over Local Government expenditures. The greater Local Government income the more savings increase potentiality.

Kunarjo (2002, 102) indicated that taxes role in capital development in developing countries is relatively significant. With reference to above formulation that local government savings is:

- surplus of revenues over routine expenditures, then the increase in local government savings (can be done by) increase in revenues as local government funding source;
- improving the efficiency of routine expenditures. Such things should be local government concern as an effort to increase savings for a source of development fund sources.

2.12. Local government investment

Hakim (2002, 164) implicitly formulated that local government investment is a government allocation of savings (total excess revenues over expenditures of local government public consumption) to finance development spending. As the inclusion of local government in domestic investment, local government investment plays a role in encouraging the improvement of Gross Domestic Product. In accordance with the provisions of BPS (Central Bureau of Statistics), development expenditure includes: Industry (Industry); Agriculture and Forestry (Agriculture and Forest); Water Resources and Irrigation (Natural Water Resources and Irrigations); Power work (Manpower); Trade, Regional Business Development, Regional Finance and Cooperative (Trade, Unfolding Regional Initiative, Regional Financial and Trade, Unfolding Regional Initiative, Regional Financial and Cooperatives; Transportation; Mining and Enegry; Tourism and Regional Communications; Regional Development and Resettlement; Environment and Lay Out; Education, National Culture, Credentials, Youth and Sport; Demography and Family Welfare; Health, Social Welfare, Women Participation, Child and Adolescent, Dwelling and Residence; Religion; Science and Technology; Law (Law); Civil Servants and Control; Politics, Information, Communication and Mass Communication; Security and Public Order; Development subsidies to Lower Level Government.

2.13. Investment theory

According to Mankiw (2003, 453), there are three types of investment. Namely, Business fixed investment, including equipment and structures that purchased by the company for the production process. Residential investment, including new homes that bought by people for residential and purchased by landlord for rental business. And the last is Investment stock, covering goods stored in the warehouse, including materials and supplies, goods in process and finished goods.

2.14. Investment criteria in economic development

According to Jhingan (2002, 636), there is a relation between investment criteria in economic development, among others:

- *Capital Turn Over Criteria.* Polak J. J. and Buchanan N. S. (Jhingan 2002, 636) put forward the criteria which is based on the logic reason such capital stock in developing countries relatively rare, so chosen technique should be able to produce a maximum output per capital unit. Thus, the project is selected high capital turn over. Limitations in these criteria are, first: devotion element of time (short-term yields an initial low output). Second: devotion to the supplementary benefit that flows from investment projects. Third: specifically, the agricultural industry, the capital ratio to o low output, but if the working capital (eg fertilizer) entered into fixed capital, the ratio becomes higher. Fourth: the higher rotation, shrinkage could be higher, but the output is not higher. Fifth: work maximization argument that contained in this concept can be done for short term only. Sixth: capital intensive and efficient investment, making labor

productivity remains low without generating additional total output. Seventh: the implementation of labor-intensive techniques can actually reduce output, and often results in low standard products.

- *Social Marginal Productivity (SMP) Criteria. SMP criteria were firstly proposed by AE Kahn enhanced by* Chenery H. B. (Jhingan 2002, 638). The more capital is used in a project by combining with a number of other existing input, after a certain period, the marginal product will decline until the marginal capital productivity in the same variety using. The goal of this purpose is by allocating limited investment resources, but could be able to produce maximum national output (the capital must be used in a productive project sector). In these criteria, taking into account the overall contribution of net marginal unit of the national product and not just contributions portions of private investors. Thus, this criterion also can be applied to the economy atmospheres as a whole. In this connection Chenery (Jhingan 2002, 639), constructed a quantitative measurement formula SMP concept. By assuming that balance of payments on balance position, then:

$$SMP = \frac{X + E - L - M - O}{K} \quad (6)$$

The formula can be changed to:

$$SMP = \left(\frac{V - C}{K}\right) + \tau\left(\frac{aB_1 + B_2}{K}\right) \quad (7)$$

For simplicity, it can be changed to:

$$SMP = \frac{V - C}{K} + \frac{B\tau}{K}$$

If B < 0: import ; then B > 0: eksport.

Some limitations, among others:

- *First*: is not true that the marginal capital productivity must be the same at all consumption.
- *Second*: SMP criteria only consider to current result. In short-term, adjusted to the conditions of demand and supply conditions that exist, while the long term is influenced by current investment.
- *Third*: SMP criteria are uncertain (difficult to obtain correct judgments) in order to predict the benefits and cost of products currently as well as in the future. Fourth: This criterion is only concerned with investment impact in national income is just once time, regardless on the future impact.

2.15. National income

Sukirno (2000, .31) said that there are three ways that can be used to perform these calculations, that means spending, revenue and production approach.

- Expenditure approach. This approach is done by adding up the expenses/expenditures value made by the household, company (investors), government and foreign sectors. According to Mankiw (2003, 27), National Income on the expenditure side can be formulated as follows:

GNP = GDP + Payments factor from LN - Payments factors LN

Then (Mankiw 2003, .25):

$$GDP = C + I + G + NX \quad (8)$$

Thus, showing that the expenditure approach is clearly seems as a national income of such citizens:

- *Income Approach.* Basically, national income with income approach is the sum of productive income factors that include: salaries and wages, rent, interest and company profit. According to BPS (2002, .2), national income (GDP), based on income approach is “remuneration received by production factors which participate in the production process of the country in a certain period (usually one year)". Thus, mathematically can be formulated as follows:

$$Y = Y_r + Y_w + Y_i + Y_p \quad (9)$$

- *Net Production Method* or *Value Added Value Approach*. According to BPS (2002, 1), by production approach "GDP is total added value of the goods and services produced by various production units in given time period of a country territory.

In presenting the Indonesian National Revenue issued by BPS, there are nine sectors that calculated, namely (1) Agriculture, livestock, forestry and fisheries; (2) Mining and quarrying; (3) Processing industry; (4) Electricity, gas and water supply; (5) Building; (6) Trade, hotels and restaurants; (7) Transport and communications; (8) Finance, leasing and business services; (9) Services.

From the output aspect of, GDP can be formulated as follows:

$$Y = PDB = P_iQ_i \text{ or } Y = P_iQ_i = P_1Q_1 + P_2Q_2 +... + P_nQ_n \quad (10)$$

In principle, the calculation result by using 3 above methods will generate the same number (National Revenue) although it's done by adjustment process. According Partadiredja (1998, 18), the adjustment calculation was seen in the calculation of national income accounting.

ased on the the formula (Mankiw 2003, 25):

$$Y = C + I + G + NX \quad (11)$$

where: G = *Government Expenditure,* which is includes government investment. Then: I_G is one of the indpendent variables that influence Y (GDP) or (PRRB).

Thus, the greater the IG to boost GDP. Conversely, if the IG decreases, it can lead to the decline of GDP.

2.16. Economic growth

According Sukirno (2000, 56), basically, economic growth rate measures the increase in real national income, that calculated at constant prices.

Thus, for a given year can be measured by the formula:

$$gt = (Y_t - Y_{t-1}. 100\%)/ Y_{t-1} \quad (12)$$

With the provisions of g_t is economic growth rate in year t expressed in percent; Yt is real national income year t and yt-1 is previous year real national income. According to Schumpeter, Ursula Hicks and Madison A. (Hakim, 2002, 12), the term of economic growth is defined as economic growth in quantitative performance such as GNP, GND per capita etc,

The real economic growth of a country is:

$$G_t^* = g_t – P_t \quad (13)$$

where as:

$$gt = (PNR_t – PNR_{t-1}) / PNR_{t-1} \quad (14)$$

Description: gt = Growth National Income; PNR = National Income; Ppt = Population Growth.

2.17. Models of economic growth

As a reference, the following analysis will describe two kinds of economic growth models according to Harrod, Domar and Kaldor (Jhingan 2002, 229-251).

Model Harrod – Domar

Both Harrod and Domar interested in finding the required income level for the economic atmosphere running smoothly and not halting. Despite of their models differ in the details, but they are almost come at the same conclusion. Harrod and Domar give a key role to investment in economic growth process, particularly on the dual investment character owned. First: it creates revenue. Second: it enlarges the economic production capacity by increasing capital stock. The first can be referred to as "the impact of demand" and the second "the effects of supply" investment.

Domar Model

Domar build a model around the following question: Such of the investment on the one hand generate revenue and on the other hand raise the productive capacity, then at what level investment rate must be increased to make increasing revenue equal to the increasing capacity productive, so that full employment can be maintained.

The increase aggregate demand is needed. Demand side in Domar system explained the multiplier as Keynesian (Jhingan 2002, 231). Suppose the average increase revenue call by ΔY, increase in investment by ΔI

and the propensity to save with the α (alpha) (= ΔS/ΔY). Then the increase in revenue will be the same as the multiplicators (1/α) times the increase in investment.

$$\Delta Y = \frac{\Delta I 1}{d} \quad (15)$$

Equilibrium. To maintain the equilibrium level of income at full employment, aggregate demand must be equal to the aggregate supply. So, we come to the basic equation model as:

$$\Delta I = \frac{1}{\alpha} = I\sigma \quad (16)$$

By dividing both sides of the equation with **I** and multiplying it by **α**, then we will get:

$$\frac{\Delta I}{I} = \alpha\sigma'' \quad (17)$$

This equation shows that to maintain full autonomous investment growth rate of net (ΔI/I) should be equal to ασ (MPS times the productivity of capital). This is the speed limit investment pace needed to ensure the use of potential capacity in order to maintain steady economic growth rate at full employment. To maintain these are, income should rise ασ rate per year. This is an equilibrium rate of growth. Any differences from the "golden path" will lead to cyclical fluctuations. When ΔI/I is greater than ασ, the economic atmosphere will experience a "boom", then will be depressed if ΔI/I is less than ασ.

Harrod Model

Harrod (Jhingan 2002, 232) tried to show how steady growth model (*i.e.* equiibrium) may occur in the economy. Once a steady growth rate was interrupted and the economy fell into dis-equilibrium, cumulative forces tend to ignore these differences will lead to bias in long-term as well as long-term inflation. Harrod model is based on three kinds of growth rate. First: actual growth rate, represented by G, which is determined by the savings ratio and capital-output ratio. This rate indicates a short-term cyclical variation in growth rate. Second: guaranteed growth rate, expressed by Gw, which is a revenue growth rate of an at full capacity economy. Third: The natural growth rate, represented by Gn, which by Harrod considered "optimal welfare". It can also be referred to as a potential growth rate or full employment growth rate.

Actual Growth Rate.

In Harrod model, the first basic equation is:

GC = S (18)

where: G is the growth rate of output in a given time period and can be expressed as ΔY/Y; C is a net addition to the model which is defined as the ratio of investment to revenue growth, the I/ΔY; and S is the average propensity to save that S/Y.

By entering these ratios into the above equation, we get:

$$\frac{\Delta Y}{Y} x \frac{I}{\Delta Y} = \frac{S}{Y} \text{ or } \frac{I}{Y} = \frac{S}{Y} \text{ or I = S} \quad (19)$$

Secured Growth Rate. According to Harrod, secured growth rate is the growth rate "*where the producers were satisfied over what is done"*. It's a "equilibrium business" that if the progress achieved will satisfy the recipient's income such they have done something right. The equation for the secured growth rate is:

GwCr = s (20)

where Gw is "secured growth rate" or revenue growth in full capacity which fully will use capital stock that is being inflated so then to satisfy the employers on their investment. So, in this case, Gw is the value of ΔY/Y. Cr or the capital required, indicating the capital amount that required to maintain the secured growth rate, such as the output model ratio are required. D.K.C. Cr are a value of I/ΔY, or C; s is equal to **s** in the first equation, namely S/Y.

Natural Growth Rate. Natural growth rate "is progress rate, where growth population and technological experience slow improvements". This rate depends on macro variables, such as population, technology, natural resources and capital equipment. In other words, it's an output rate in full which is determined by the population growth rate and technological advances rate. The equation for the natural growth rate is:

Gn.Cr = or ≠ S (21)

where: Gn, what is called as full employment or natural growth rate?

Distribution Model According to Kaldor

Harrod-Domar model based on strict assumptions regarding with constant savings ratio revenue. Model Kaldor (Jhingan, 2002, 243) is an attempt to make capital savings ratio as a variable in the growth process. This model is based on "classical savings function" which states that the savings is equal to the ratio between profits and national income, in this case S = P/Y. With Sw indicated as overall savings set aside from the FMU, and Sp as the overall savings of the profit, then the formula obtained as:

Y = W + P (22)

but if: I = S and S = Sw + Sp.

Since the investment has given and by assuming that saving functions are a simple proportional, such as:

Sw = swW dan Sp = spP, then we will get

I = spP + swW = spP + sw(Y – P) karena W = Y – P = spP + swY – swP = (sp – sw)P + swY

With investment ratio to national income:

$$\frac{I}{Y} = \frac{(sp - sw)P + swY}{Y} \text{ or } \frac{I}{Y} = (sp - sw)\frac{P}{Y} + sw \quad (23)$$

but if: I = S and S = Sw + Sp and from equation (1), profits ration to national income, can be obtained in the following ways:

$$(sp - sw)\frac{P}{Y} = \frac{I}{Y} - sw$$

$$\frac{P}{Y} = \frac{1}{(sp - sw)} x \frac{1}{Y} - \frac{sw}{sp - sw} \quad (24)$$

So based on the marginal propensity to save, of all the wage earners and capital owners, the role of profits in national income depends on the ratio of investment to total output. If there is a rise in investment income ratio I/Y, the increase would raise profits role in national income P/Y, as long as sp> sw.

Further more, Kaldor (1966) in André Nassif, Carmem Feijó and Eliane Araújon (2013) also recognized that as soon as economic development reaches maturity – that is to say, the stage in which countries, by having already caught up, are able to exhibit high levels of income per capita and well being, a relatively significant loss of participation of the manufacturing industry in total real GDP is accompanied by a major participation of the service sector; and second, one could argue that, since a lot (but not the majority) of the new ideas, knowledge and dynamic economies of scale are now being generated in the tradable service sector, the effects of the microelectronic and telecommunication revolution (for most, the third industrial revolution) on the representative role of the manufacturing sector for economic development

2.18. Framework

Theoretically, the most influences of RR, such as government investment, and economic growth are based on government savings of Musgrave theory and government expenditure of Mankiw's theory in national income formation argues that government saving is the excess routine revenues over routine expenditures. Thus, the government savings are affected by the government's revenue, especially from tax (tY) and government spending (aY). The larger the RR, provides an opportunity for the government to increase government savings. Similarly, government spending affects by contrary, where were the government spending grew, it will tend to

reduce government savings. Further more, Arsyad (1999, 146) said that in general government savings almost entirely from the advantages of revenue (as a whole) on government investment expenditure. Then, according to Walter W. Heller as Kunarjo (2002, 102) said that in developing countries, taxation more positive role in the process of capital formation and technology development. It is caused by low people's incomes then capital formation is carried out by the government, while the said development funds come from taxation sector.

Mankiw (2003, 25) formulated that government expenditure was one important factor in the formation of national income. Government expenditure consists of government investment and public investment. Government investment is sourced from the excess of revenues over government investment that can be treated as government saving. Government consumption and investment increased contributed to economic growth that is indicated by the increasing in national income. Economically, government investment has a more decisive role than government investment, such government investment is able to increase production of goods/services activities and private investment trigger which will further increase further national or regional products

3. Research method

This research uses explanatory research design that aims to clarify the relationship between variables and test hypotheses (Singarimbun 1995, 4). Described of relationship between causal relationships variables (influence) of RR with government investment and RR with government investment to economic growth. The data used in this research is quantitative data in the form of secondary data that have been processed and presented from a variety of sources. Formation of data studied were time series data (time-series) between observation years.

Target population in this study are all local financial book period in Bekasi, since the enactment of Constitutio Act No. 22/1999 of Regional Administration on Local Government and regional autonomy in 2001. The research sample was taken by purposive sampling technique (sampling considerations) based on the completeness of the research data that can be obtained, Limited sampling period studied between 2001 to 2013 (13 years) corresponding period of regional autonomy since 2001.

Data collection techniques used were documentary study on the variables studied. Documentation studies conducted at the Central Bureau of Statistics (BPS) Center, West Java BPS, BPS Bekasi, and Bank Indonesia, as well as on other sources. The necessary documentation accessed directly at each office, and indirectly, through documents as well as internet neteork that have been published.

In relation with th explanation purposes, the analysis method used to test the influence between variables are Path Analysis (Path Analysis). Path analysis technique have chosen with towards consideration the discussion of the test influences aresults, both direct and indirect effect, and it's comparison in determining the dominant variable. Path analysis is a linear regression analyzes development that focus on parameter regression coefficients (standarized coefficient).

Under the influences of between variables that are relevant, linkages between RR, Government Investment and Economic Growth can be described as follows:

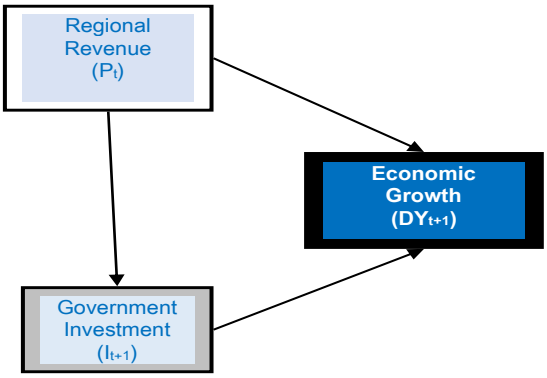


Figure 2 - Framework chart

In path analysis as linear regression analysis, there are assumptions regarding with residual or error term (disturbance term) that must be met. The assumptions that were tested include: normal distribution residue; no multi co-linierity that could destruct the model; no autocorrelation; there is no situation heteroskedastisitas

The formulation of the proposed analytical model is as follows:

$$I(t+1) = p11.Pt + e1t \quad (25)$$

$$DY(t+1) = p12.Pt + p22.I(t+1) + e2t \quad (26)$$

where: P = Regional Revenue; I = Governement Investment; DY = Economicc growth.

Structural equations in the above model was tested with a significance test path coefficients, either simultaneously or partially. The effect of simultaneously tested using F test. The result will significant if F count> F table (at significance level α = 0.05 and degrees of freedom db1 and db2 = k * = nk * -1; where: n = sample size and k * = number of causes variables) or if the statistical probability value (p-value) <α = 0.05. The effect of partially tested by using the t test. Significant if t count > t table (at significance level α = 0.05 1-sided test types and degrees of freedom db = nk * -1) or if the statistical probability value (p-value) <α = 0.05.

4. Results and discussion

4.1. The Influence of RR to the government investment

The following is equations model as path analysis results of t local revenue (Pt) model effect to the Government Investment (I (t + 1)) in Bekasi. The influences of local revenue to the government investment is assumed will occur in the next year.

$$I(t+1) = 0{,}948Pit + e1t \quad (27)$$

Pt

p11 0,948; t 9,373; p-value Sig./2 = 0,000/2 = 0,000

The results of revenue (Pt) influence test to the Government Investment (I (t-1)) are presented in the table below. Analysis results model have met required assumption, namely normal distribution and do not contain heteroskedasticity and autocorrelation that could destruct the models.

Table 2. - Test results effect of local revenue against the government investment

	R	R^2			
	0,948	0,898			
Partly Effect	p_{11}	t_{hitung}	p-value	Decision	Category
PAD (Pure Regional Revenue)	0,948	9,373	0,000	Sig.	Very Strong

Notes: p11 = Path coefficient; t table = 1,812.

The above table shows that revenue (Pt) has positive and significant effect on the Government Investment (I (t + 1). As seen that path coefficient value shows strong influence of local revenue for government investment amounted p11 = 0.948. Path coefficient value describes that local revenue influence degree to the government investment is very strong (p11 was between 0.90 to 1.00). The magnitude of local revenue effect for government investment amounted to 89.8%, as indicated by determination coefficient or R2 = 0.898.

The influence of external factors that not examined is 1-R 2 = 10.2%. While the strong influence of external factors amounted p1e1 = $\sqrt{}$ (1-R2) = $\sqrt{}$ 0.102 = 0.319 with a relatively weak effect (between 0.20 to 0.40). Comparing the strong-weak, and large-small influence of local revenue with external factors which were not studied on government investment, it appears that the original income have a dominant influence on government investment than external factors were not examined.

The influence trend of RR to the government investment is positive, as shown by coefficient path (standardized regression coefficient) p11, suggesting that the higher of the RR, such other factors condition did not differ, will impact the higher of at government investment the following year. Then, empirical influence trend consistent with theoretical predictions influence trend.

The results showed that local RR has become basis decision government ininvestment which indicates financial management strengthen, especially in Bekasi City Government. In other words, the Government Investment decisions are not budgeted from allocation of equalization funds from the Central Government. RR was supposed to be the main contributors in the structure of local government revenue and in local government investment decision making. The increasing of RR allowed the government to establish greater government savings to finance government investment in the local area.

4.2. Influence of regional income and government investment to government investment

The following equation model for path analysis result of the RR effect model (Pt) and Government Investment (I (t + 1)) for Economic Growth (DY (t + 1)) in Bekasi. The influnces of Local Revenue for Economic Growth is assumed will occur in the next year. While the influnces of Government Investment to Economic Growth is assumed occur instantly in the same year

$$DY_{(t+1)} = 0{,}413\ P_t + 0{,}042\ I_{(t+1)} + e_{2t} \quad (28)$$

P_t	$I_{(t+1)}$	
p_{2i}	0,413	0,042
t	0,444	0,045
p-value	Sig./2 = 0,668/2 = 0,334	0,965/2 = 0,4825

The influnces test results of local revenue (RR) and Government Investment (I (t + 1)) simultaneously and partially on the Growth Economy (DY (t + 1)) are presented in the table below. Analysis results model have met the required assumption, namely normal distribution and do not contain multicollinearity, heteroscedasticity, and autocorrelation which can destruct the model.

Table 3. - The effect Test Results of Local Revenue and the Government Investment to Economic Growth

Simultan Effect	R	R^2	F_{count}	p-value	Decision	
2 variabels	0,452	0,204	1,156	0,357	Non-sig.	
Partial Effect	**p_{2i}**		**t_{count}**	**p-value**	**Decision**	**Category**
PAD (RR) Revenue)	0,413		0,444	0,334	Non-sig.	Strong Enough
Government Investment	0,042		0,045	0,4825	Non-sig.	Very Weak

Notes: p_{2i} = Path Coefficient ; F_{table} = 4,256; t_{table} = 1,833

The above table shows the absence of simultaneous effect of RR (Pt) and Government Investment (I (t + 1) significantly towards Economic Growth (DY (t + 1). These results suggest that the RR and the Government Investment together have not been effective in encouraging economic growth in Bekasi. The integration of all factors were examined together evidently not contribute significantly to Economic Growth achievement.

Descriptively, the strong influence of RR and government investment simultaneously on Economic Growth was fairly strength, as indicated by the multiple correlation coefficient or R = 0,452 that lies between 0.40 to 0.70. While the influence of RR and government investment simultaneously on Economic Growth amounted to 20.4%, as indicated by determination coffecient or R2 = 0.205. The influence of external not exmined factors was 1-R2 = 79.5%. While the strong influence of external factors amounted p2e2 = $\sqrt{}$ (1-R2) = $\sqrt{}$ 0,795 = 0.892 with a relatively strong influence (between 0.70 to 0.90). These results indicate that an increase economic growth in Bekasi, is predominantly influenced by external factors apart from local revenue and government investment.

The above table also shows that partial, RR (Pt) did not significantly influence economic growth (DY (t + 1) As can be seen, the value of the path coefficient which shows the strong influence of local revenue for Economic Growth amounted p21 = 0.413. The path coefficient value describes the degree of influence of regional revenue for Economic Growth is strong enough (p21 lies between 0.40 to 0.70). However, the test results show that this effect is not significant, because the sample size is relatively small. Descriptively, the direction of local revenue influence for Economic Growth was positive, as shown by the path coefficient (standarized regression coefficient) p21, suggesting that the higher the RR (on the condition of other factors did not differ), the higher the economic growth next one year. The empirical influence trend is consistent with theoretical predictions influence trend.

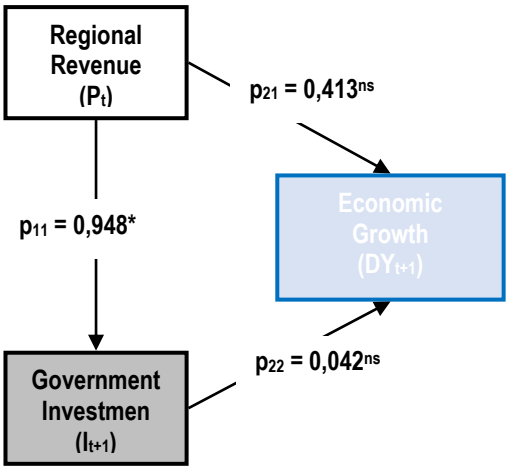
Nevertheless, the effect is still not adequate yet. These results indicate that the contribution of regional revenue to boost economic growth in Bekasi relatively ineffective. This indicates that government policies have not been fully conditioned to make economic growth as increasing local revenue target. Partially, the Government Investment (I (t + 1)) was also not significantly influence economic growth (DY (t + 1)). As can be seen, the value of the path coefficient which shows strong influence of Government Investment on Economic Growth amounted to P22 = 0.045. The path coefficient value describes the degree of influence of government investment to economic growth is very weak (P22 located less than 0.20). The test results also show that this effect is not significant. Descriptively, influence trend of government investment on economic growth is positive, as shown by the path coefficient (standarized regression coefficient) P22, which shows that the higher the government investment, (on the condition of other factors did not differ), the higher the economic growth.

The empirical influence trend is consistent with the trend of theoretical predictions influence. Nevertheless, the effect is still inadequate. These results indicate that the contribution of government investment in promoting economic growth in Bekasi relatively ineffective. This indicates that government investment has not focused entirely in an effort to boost economic growth in a sustainable manner.

These results indicate that the role of government through government revenues means the regional revenue and government expenditure, where the government investment is still very low. Increasing local revenue and government investment should contribute to boost economic growth in the region. Similarly, government investment should have more decisive role than local revenue. This is because the ability of government investment to increase production of goods/services activities and as private investment trigger which will further increase the national or regional products. Descriptively, the potential effect of government investment is weaker than the original income indicates that although inadequate, the role of RR in encouraging economic growth is relatively larger than government investment.

It also indicates inaccuracy investment objectives in moving the economic activity in the area. Hoetoro (2014, 276) said "facing the current global trend, there is a need to strengthen the entrepreneurial drive and competitive potential of small-scale firms by developing strategies that increase of economics of scale with respect to production, management, and marketing." Government investment priorities that should be required are the improvement and development of infrastructure to encourage economic activity and an increase in economic productivity in the region.

Overall, the path analysis results to regional revenue effect for government investment model and its impact on the Economic Growth Regional, in Bekasi, showed a significant effect of RR to the government investment, but no significant effect on RR and direct government investment to economic growth. Of the two effect models that analysed, obtain indirect influence path coefficient of the original income for Economic Growth through government investment, amounting p11.p22 = 0.948 x 0.042 = 0.040. Path coefficient value of 0.042 indicates that the indirect influence of the original income for Economic Growth through the Government Investment classified as very weak (<0.20). Indirect effect is not significant in the absence of a significant direct influence of the Government Investment to Economic Growth (P22 non-significant).



Notes: * = significant; ns = non-significant

Figure 3 - Path Analysis Results

By the two influence models analysed, its appears that in Bekasi, RR effective in increasing government investment, but its contribution is not sufficient to encourage economic growth, either directly or indirectly through government investment because of government investment role is still very weak.

Conclusion

- Regional Revenue (RR) is a determinant factor of the increasing government investment in Bekasi and has a positive influence on the direction of government investment. The higher RR will affect the higher Government Investment, then RR contribution influence are relatively very strong and significant.
- RR and the Government Investment are not determining growth factor in Bekasi. RR and Investment Government together as well as indiviually do not significantly influence economic growth. Contributions effect

of the two together is weak and insignificant. Individually, although the direction of the influence of both positive, *i.e* those the higher of regional revenue and government investment, economic growth, but the contribution effect is not significant.

- Overall, the high-low economic growth in Bekasi more influenced by external factors other than the Local Revenue and the Government Investment. The findings of this study indicate that RR and local government expenditure (government expenditure), the government investment, has not much role in encouraging economic growth in Bekasi. The role of government investment, potentially geting lower than local revenue.

Then, there are two suggestions be proposed, such as:

- It is recommended to the administrator of Bekasi to maintain their independence in empowering RR as government investment decisions base. The local government also advised to more intensively explore the potential of RR and increase government savings and investment through government consumption efficiency.
- It is recommended for local governments to improve the accuration of the investment objectives and autonomous investment that can drive economic growth in the region through infrastructure development priorities that facilitates regional economic activity. It also includes private investment in regional development and facilitated by developing a conducive investment climate through bureaucratic efficiency.

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*** Economic Indicator, in 2013, Jakarta.

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Application of the Analytic Hierarchy Process to Structure the Motivational Expectations of the Economically Active Population of the Republic of Crimea

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Abstract:

Based on an analysis of the dynamics of labor relations, the article studies the structure of motivational expectations of the economically active population of the Republic of Crimea. The authors have justified the use of Saaty's Analytic Hierarchy Process when constructing models of motivation under conditions of economic modernization. The results of structuring motivational expectations of the economically active population of the Republic of Crimea make it possible to perform a realistic assessment of motivational preferences in various segments of the labor market in the region. The obtained results provide possibility for the formation of a regional socio-economic policy of employment, taking into account the transformations in the Crimean labor motivation system.

Keywords: motivation, motivational expectations, analytic hierarchy process.

JEL Classification: J01, M54, O15, P25.

1. Introduction

Current transformation processes in the socio-economic development of the Republic of Crimea determine changes in the system of motivation. Implementation of the policy of modernization of the regional economy implies the structural transformations in motivational expectations of the economically active population of the Republic of Crimea. Of course, it is important to study the structure of motivational expectations of the different segments of the labor market in order to create a regional socio-economic employment policy, taking into account the transformations in labor motivation system of Crimea.

Work motivation is a phenomenon that is the subject of interdisciplinary study, as an effective increase in motivation of the economically active population is practically possible only with the use of the achievements of the psychological, sociological and economic sciences. In recent studies on motivation, the analytical issues of structuring and modeling the behavior of an individual are actively studied in order to increase the labor productivity. The relevance of the application of AHP in the study of management and economic processes is determined by the need for structuring a specific process in order to prioritize tasks and assess them afterwards.

2. Concept headings

Analysis of recent publications discussing the use of the analytic hierarchy process in the regulation of labor relations shows the usefulness of the choice of this method for the analysis of work processes. Distinguished scientists Saaty and Vargas (2013) emphasized the importance of the study of workers' conduct based on the use of analytical procedures in the decision-making process. We should note that Saaty (1980) is the author of the world-famous Analytic Hierarchy Process (hereinafter: AHP).

In the works of Samolejová, Zunk and Kim (Samolejová *et al.* 2015, Zunk 2015, Kim 2014) the authors analyze the features of the application of the analytic hierarchy process in the study of the motives of the target groups of consumers in the various sectors of the economy.

Dutch scientist, Steenge (1986) conducted an interesting research explaining the "input-output" model using the mentioned AHP from the standpoint for conservation of labor potential. The work of Croatian scientists on the possibilities of successful application of the AHP for business planning development is extremely interesting (Hell *et al.* 2013). In addition to the active use of AHP for structuring the various processes and phenomena, a number of researchers (Sedenkova and Horak 2006, Wen-Hsiang and Nguyen 2013) consider the application of this method for the study of the dynamics of the labor market.

It should be noted that the Russian researchers are also actively pursuing the issue of structuring motivational preferences. As part of the Experimental Economics, Avtonomov (2006) described and analyzed the formal models of morality as an element of personal motivation, built with modern tools of neoclassical microeconomic analysis. Bugorski, Kotlyarov and Fomin (2007) developed a set of criteria for the construction of motivation models to solve practical problems in the field of management as well as proposed a mathematical apparatus of formalization of needs and factors of individual's work motivation on the basis of motivation models used in psychology and management.

An integrated approach makes it possible to systematize the factors affecting the motivation of the individual categories of the working population, to identify the relationship and mutual influence of factors on the results of work. High requirements to experts imposed by modern labor market should be provided with an adequate motivational space on the level of individual employers implying the possibility for the fulfilment of the labor potential. Experts predict that "the greatest success in the market will be scored by those companies that will offer employees the best option to meet their needs" (Leini 2011). Leygin noted that "the results achieved by the people in the process of work not only depend on the knowledge, skills and abilities of people: efficient activity is possible only when employees have a strong motivation, *i.e.* desire to work" (Popov 2013).

The purpose of this article is to study the structure of motivational expectations of the economically active population of the Republic of Crimea in order to ensure the formation of regional economic and social employment policy.

The work is based on the hypothesis that the structuring of motivational expectations of the economically active population of the region with the use of AHP is an important prerequisite for revitalization of labor behavior of a particular category of the population.

The basis for the research has been formed by the following statistical methods:

- method of content analysis of statistical data involving the analysis of data on the dynamics of economic development of the Crimea, as well as text arrays for subsequent substantial interpretation of the revealed laws;
- AHP method, used in the construction of motivation models in terms of economic modernization;
- economic and statistical analysis method involving the economic analysis of the results of studies of the structure of motivational expectations of people involved in the economy.

3. Results and discussion

The problem of inconsistency between the motivational expectations of the economically active population types and forms of motivation implemented by employers makes it necessary to develop mechanisms to increase the level of motivation.

At the stage of identification of the designated problem, it is necessary to structure the motivational expectations of the individual categories of the working population, which will form the basis for the development of a mechanism of control of the personnel's motivation level.

Motivational expectations have a significant impact on the productivity of labor, determining the most efficient systems of motivation in terms of the working activity level. The complexity of the issue raises a number of practical problems, the consistent solution of which will form the algorithm of procedures providing the employers with the tools of control of the level of employees' motivation.

Over considerable time periods, the structure of the work motivation for individual segments of the labor market of the Russian Federation has not undergone significant changes. The studies have identified the common ground between motivational expectations of the economically active population. Thus, for most Russians "the main driving forces in their work are the career advancement and the salary increase. In addition to financial incentives important criteria in terms of the employment for the population are the presence of social protection and the company's stability" (Blyumin 2001).

As part of the research, the object of study was the motivational expectations of the economically active population in the Republic of Crimea. Polls and surveys were carried out in January-March, 2015, in eight urban districts of the following cities: Simferopol, Alushta, Yevpatoria, Kerch, Saki, Sudak, Feodosia, Yalta; in five municipalities: Bakhchisaray, Dzhankoy, Krasnogvardeysky, Saki, Simferopol. Table 1 presents data on the labor force in the Republic of Crimea in the period from 2014 to the first quarter of 2016, calculated based on data provided by official statistics of the Republic of Crimea.

Table 1 - Size and composition of the labor force in the Republic of Crimea

Period	Economically active population, thousand persons	Including		Economically inactive population, thousand persons	Level of economic activity, %	Employment level, %	Unemployment level, %
		employed	unemployed				
2014 (aged 15-70)	878.1	820.6	57.5	578.1	60.30	56.4	6.5
2015 (aged 15-72)	944.9	877.2	67.7	520.06	64.5	59.9	7.2
I quarter of 2016 (aged 15-72)	874.6	799	75.6	545.21	61.6	56.3	8.6

Table 2 - Representation of respondents in the analysis of motivational expectations of the urban and rural population of the Republic of Crimea

Locality	Urban and rural population (in persons and %)		Urban population (in persons and %)		Rural population (in persons and %)	
Simferopol	364	28.35	201	15.65	163	12.69
Alushta	100	7.79	62	4.83	38	2.96
Yevpatoriya	104	8.10	84	6.54	20	1.56
Kerch	41	3.19	41	3.19		0.00
Saki	38	2.96	38	2.96		0.00
Sudak	99	7.71	45	3.50	54	4.21
Feodosia	148	11.53	107	8.33	41	3.19
Yalta	215	16.74	113	8.80	102	7.94
TOTAL Urban district	1109	86.37	691	53.82	418	32.55
Bakhchisaray	64	4.98	25	1.95	39	3.04
Dzhankoy	29	2.26		0.00	29	2.26
Krasnogvardeysky	28	2.18		0.00	28	2.18
Saki	13	1.01		0.00	13	1.01
Simferopol	41	3.19		0.00	41	3.19
TOTAL Municipal district	175	13.63	25	1.95	150	11.68
Republic of Crimea	1284	100.00	716	55.76	568	44.24

Source: retrieved from http://crimea.gks.ru/wps/wcm/connect/rosstat_ts/crimea/resources

In the sampling population (Table 2), the following groups of respondents were identified during the study: the urban population under working age: 187 persons, of working age: 423 persons, over working age: 106 persons; rural population under working age: 213 persons, of working age: 355 persons. Of these, according to the objective of the study, for further processing, the authors selected profiles of the respondents belonging to the category of economically active population in the context of employed and unemployed persons, as well as economically inactive population (Table 3).

Table 3. - Representation of respondents in the analysis of motivational expectations of economically active population in the context of employed and unemployed persons, as well as economically inactive population

Population category	Respondents	
	persons	%
Economically active population, persons	692	88.95
among them:		
Employed	417	53.60
Unemployed	275	35.35
Economically inactive population, persons	86	11.05
TOTAL	778	100

Source: compiled by the authors

Problems of decision making under uncertainty are solved through the application of different methods, the use of which offers exciting possibilities to practitioners. Thus, Blyumin and Shuykova (2001) consider the typical methods for problem situation solving: selection of a better alternative, ranking, grouping of alternatives, providing examples of the use of methods for a number of practical problems. Novikov and Chkhartishvili (2013) develop modern approaches to mathematical modeling of reflective processes in the management by considering the reflexive games that describe the interaction of the subjects of making decisions on the basis of the hierarchy of beliefs, belief about beliefs, etc.

Ponomarev (2004) develops a theory of motivation by offering a new model of employee motivation by work, arguing that the proposed motivation model makes it possible to better understand and evaluate the correlation between man and work, and can serve as a guide for the design and redesign of work in the organization.

To study the structure of motivational expectations, we have selected the analytic hierarchy process, which is widely used in the practice of management, and provides possibility for intuitive and efficient structuring of a complex problem of decision-making in the form of a hierarchy, comparing and performing a quantitative evaluation of alternative solutions.

In this paper, the analytic hierarchy process allowed us to carry out an explication of motivational expectations in order to identify those preferred in terms of improved motivation of labor behavior of certain categories of the working population, as well as to compare them with the motivational expectations of the economically inactive population. The analytic hierarchy process is based on three principles: decomposition principle, principle of pairwise comparison and priorities synthesis principle.

At the first stage, we will evaluate the feasibility of different forms of motivation of respondents' labor activity according to the categories selected for the analysis (see Table 3). The number of respondents participating in the survey is 1284, as a result of the study of motivational expectations of the population of Crimea (by the criterion of the economically active/inactive population) 778 profiles have been processed. When processing the data, some of the respondents' opinions had to be excluded from further calculations due to inconsistent or contradictory replies received from them.

The system of analysis criteria was formed with due account of previous studies, according to which the most important choice criteria for all segments of the labor market of the Republic of Crimea are:

Criterion 1: Wages;
Criterion 2: Bonuses and allowances;
Criterion 3: Social security guarantees (social responsibility);
Criterion 4: Working conditions;
Criterion 5: Opportunities for self-realization;

Criterion 6: Training and development;
Criterion 7: Corporate culture and team spirit.

Motivational sphere of professional activity consists of both tangible and intangible work incentives. Accordingly, let us consider three possible alternatives for improving the level of motivation: use of the tangible forms of motivation (Alternative 1), use of intangible forms of motivation (Alternative 2), use of combined forms of motivation (Alternative 3). Decomposition of the problem of choosing the form of motivation into the hierarchy is shown in Figure 1.

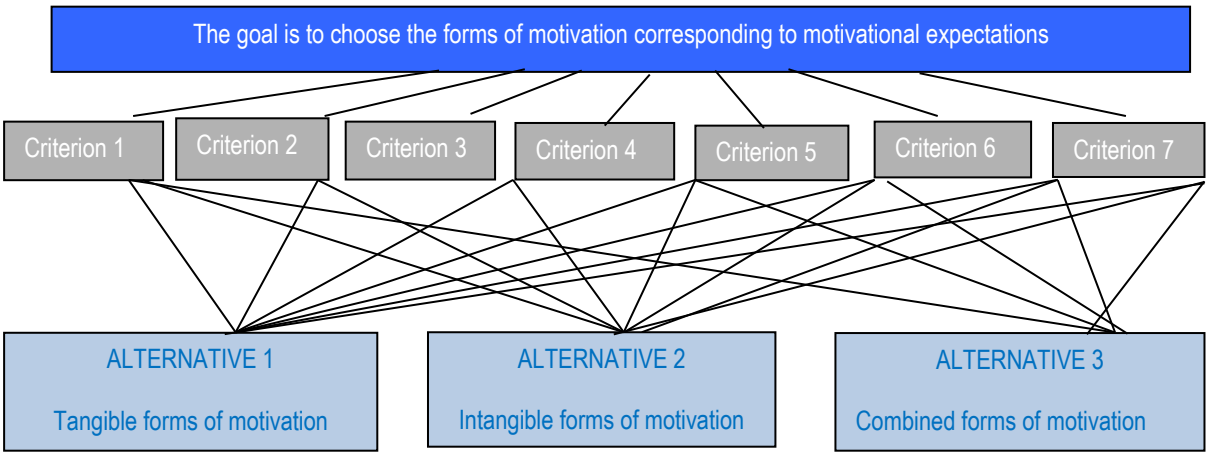

Figure 1 - Decomposition of the problem of choosing the form of motivation into the hierarchy when structuring the motivational expectations

Using the principle of pairwise comparison, we will compare by pairs all the criteria with respect to their impact on the overall characteristic, determining thereby the intensity or weight of each criterion (factor). The comparison is made with the use of subjective judgments of respondents (in the context of certain categories of the population of the Republic of Crimea in accordance with the internal structure, represented by a set of sub-criteria), evaluated according to a relative importance scale (Table 4).

Table 4 - Choice criteria relative importance scale

Relative importance intensity	Determination
1	Equal importance
3	Moderate superiority of one over the other
5	Substantial superiority
7	Significant superiority
9	Very strong superiority
2, 4, 6, 8	Intermediate decision between two adjacent judgments

Numerical estimates of pairwise comparisons matrix for the criteria are presented by the matrix (Table 2). Table 2 also shows the results of calculation of the eigenvector of matrix (A) which are executed in the following sequence: the geometric mean for each row of the pairwise comparison matrix is defined; the elements of the column are summarized; each of the elements is divided by the amount received. After that, we calculate the priority vector X which will show the importance of comparable criteria.

Table 5 - Matrix of pairwise comparisons with the calculation of the significance of compared criteria using the example of one respondent

Criterion	C 1	C 2	C 3	C 4	C 5	C 6	C 7	A	X
Criterion 1: Wages	1	1	9	7	3	3	7	3.27	0.33
Criterion 2: Bonuses and allowances	1	1	5	7	3	1	9	2.66	0.27
Criterion 3: Social security guarantees	0.11	0.20	1	1	1	1/5	1/5	0.37	0.04
Criterion 4: Working conditions	0.14	0.14	1	1	1	1/5	1/3	0.39	0.04
Criterion 5: Opportunities for self-realization	0.33	0.33	1	1	1	5	7	1.21	0.12

Criterion	C 1	C 2	C 3	C 4	C 5	C 6	C 7	A	X
Criterion 6: Training and development	0.33	1.00	5	5	1/5	1	7	1.42	0.15
Criterion 7: Corporate culture and team spirit	0.14	0.11	3	3	1/7	1/7	1	0.43	0.04
∑	3.06	3.79	25.00	25.00	9.34	10.54	31.53	9.75	1.00
Λ = 5.160696715	CR=CI/AC=3.04%								

Then the consistency of the assessments is determined by determining the consistency relation (CR).

$$CR = \frac{CI}{AC} \leq 20\% \quad (1)$$

where: CR - consistency relation, CI - consistency index, AC – average consistency of average random matrices which is determined according to Table 6 (Saaty 1980):

Table 6 - Average consistency of random matrices

Matrix size	Random consistency
1.2	0
3	0.58
4	0.9
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

Consistency index may be determined by the following equation:

$$CI = \frac{\lambda_{\max} - n}{n-1} \quad (2)$$

where: n – number of compared elements, λmax – calculated value.

To calculate λmax we shall determine the sum in each column of the matrix, which is multiplied by the corresponding component of the priority vector. Conventionally, it can be represented as follows:

$$\sum 1*x1 + \sum 2*x2 + \sum 3*x3 + \ldots + \sum N*xn = \lambda max \quad (3)$$

where: ∑1. ∑2. ∑3. … ∑N – the sum of the elements of respective columns of the matrix. The obtained values of priority vector (X) represent the system of local criteria based on which a global alternative priority is calculated for each option.

$$P_{jr} = \sum_{i=1}^{m} P_j(i) \cdot b(i) \quad (4)$$

where Pjr (i) – priority of *j* – alternative as per *i* – criterion, b (i) – priority of significance of *i* – criterion.

For the analyzed criteria, the consistency relation (CR) is significantly lower than 20%, so the obtained results can be used in further calculations. The calculations of the results of the survey of respondents of the sample in question were performed in the same way. Upon estimation of the consistency relation, the authors excluded from further calculations the opinions of respondents the value of which was over 20%. Other results were averaged and collective opinion was obtained (according to the equation of a simple arithmetic average value) (Table 7).

Table 7 - Results of the evaluation of sampling analysis of consistency of respondents' opinions

CRITERION	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Criterion 1: Wages	0.31	0.38	0.05
Criterion 2: Bonuses and allowances	0.25	0.39	0.02
Criterion 3: Social security guarantees	0.08	0.11	0.04
Criterion 4: Working conditions	0.04	0.04	0.08
Criterion 5: Opportunities for self-realization	0.16	0.03	0.48
Criterion 6: Training and development	0.15	0.03	0.31
Criterion 7: Corporate culture and team spirit	0.01	0.02	0.02

The next step is to determine the priorities of alternatives as per each criterion. The results of calculations for each of the 7 criteria using the example of one respondent are presented in Table 8. In the same way, we have filled the matrices for the rest of the respondents, and then define a generalized estimate for each sample according to the average arithmetic equation. Results are arranged in a table for each of the 7 criteria analyzed (Tables 9, 10, 11, 12, 13, 14, 15). Upon estimation of the consistency relation, we have excluded from further calculations the opinions of respondents the value of which was over 20%, which has affected the number of samples.

Table 9 - Results of pairwise comparisons by "Wages" criterion for respondents as per the criterion of the Economically active population/Economically inactive population of the Republic of Crimea

Criterion 1: Wages	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.56	0.71	0.09
Alternative 2: Intangible forms of motivation	0.17	0.11	0.68
Alternative 3: Combined forms of motivation	0.27	0.18	0.23

Table 10 - Results of pairwise comparisons by "Bonuses and allowances" criterion for the respondents as per the criterion of the Economically active population/Economically inactive population of the Republic of Crimea

Criterion 2: Bonuses and allowances	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.61	0.67	0.09
Alternative 2: Intangible forms of motivation	0.12	0.12	0.76
Alternative 3: Combined forms of motivation	0.27	0.21	0.15

Table 11. - Results of pairwise comparisons by "Social security guarantees" criterion for the respondents as per the criterion of the Economically active population/Economically inactive population of the Republic of Crimea

Criterion 3: Social security guarantees	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.18	0.22	0.09
Alternative 2: Intangible forms of motivation	0.54	0.51	0.72
Alternative 3: Combined forms of motivation	0.28	0.27	0.19

Source: compiled by the authors

Table 8 - Matrix of pairwise comparisons for the criteria 1-7 using the example of one respondent

RESULT	Criterion 1: Wages					Criterion 2: Bonuses and allowances					Criterion 3: Social security guarantees					Criterion 4: Working conditions					Criterion 5: Opportunities for self-realization					Criterion 6: Training and development					Criterion 7: Corporate culture and team spirit				
	Alternative 1	Alternative 2	Alternative 2	A	X	Alternative 1	Alternative 2	Alternative 2	A	X	Alternative 1	Alternative 2	Alternative 2	A	X	Alternative 1	Alternative 2	Alternative 2	A	X	Alternative 1	Alternative 2	Alternative 2	A	X	Alternative 1	Alternative 2	Alternative 2	A	X	Alternative 1	Alternative 2	Alternative 2	A	X
Alternative 1 Tangible forms of motivation	1	7	3	2.76	0.69	1	7	5	3.27	0.75	1	1/7	1/3	0.36	0.08	1	1/7	1	0.52	0.10	1	5	7	3.27	0.73	1	1/3	1/5	0.41	0.11	1	1/7	1/5	0.31	0.08
Alternative 2 Intangible forms of motivation	0.14	1	1	0.52	0.13	0.14	1	1	0.52	0.12	7	1	5	3.27	0.73	7	1	9	3.98	0.80	0.2	1	3	0.84	0.19	3	1	1	1.44	0.41	7	1	1	1.91	0.49
Alternative 3 Combined forms of motivation	0.33	1.00	1	0.69	0.17	0.20	1	1	0.58	0.13	3	0.2	1	0.84	0.19	1	0.11	1	0.48	0.10	0.14	0.33	1	0.36	0.08	5.00	1.00	1	1.71	0.48	5.00	1.00	1	1.71	0.44
Σ	1.48	9.00	5.00	3.98	1.00	1.34	9.00	7.00	4.38	1.00	11	1.34	6.33	4.48	1.00	9	1.25	11	4.98	1.00	1.34	6.33	11	4.48	1.00	9.00	2.33	2.2	3.56	1.00	13.00	2.14	2.2	3.93	1.00
λ	3.080299844					3.012592477					3.06488758					3.007021765					3.06488758					3.029063767					3.029063767				
CR=CI/AC	6.92%					1.09%					5.59%					0.61%					5.59%					2.51%					2.51%				

Source: compiled by the authors

Table 12 - Results of pairwise comparisons by "Working conditions" criterion for the respondents as per the criterion of the Economically active population/Economically inactive population of the Republic of Crimea

Criterion 4: Working conditions	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.18	0.23	0.09
Alternative 2: Intangible forms of motivation	0.61	0.65	0.78
Alternative 3: Combined forms of motivation	0.21	0.12	0.13

Source: compiled by the authors

Table 13 - Results of pairwise comparisons by "Opportunities for self-realization" criterion for the respondents as per the criterion of the Economically active population/Economically inactive population of the Republic of Crimea

Criterion 5: Opportunities for self-realization	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.14	0.22	0.15
Alternative 2: Intangible forms of motivation	0.52	0.47	0.61
Alternative 3: Combined forms of motivation	0.34	0.31	0.24

Source: compiled by the authors

Table 14. - Results of pairwise comparisons by "Training and development" criterion for the respondents as per the criterion of the Economically active population/Economically inactive population of the Republic of Crimea

Criterion 6: Training and development	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.08	0.08	0.11
Alternative 2: Intangible forms of motivation	0.54	0.49	0.52
Alternative 3: Combined forms of motivation	0.38	0.43	0.37

Source: compiled by the authors

Table 15. - Results of pairwise comparisons by "Corporate culture and team spirit" criterion for respondents according to the criterion of Economically active population/Economically inactive population of the Republic of Crimea

Criterion 7: Corporate culture and team spirit	Average index (X)		Economically inactive population, persons (N=86)
	Economically active population, persons		
	Employed persons (N=417)	Unemployed persons (N=275)	
Alternative 1: Tangible forms of motivation	0.18	0.06	0.06
Alternative 2: Intangible forms of motivation	0.48	0.51	0.55
Alternative 3: Combined forms of motivation	0.34	0.43	0.39

Source: compiled by the authors

The final step is to determine the priority of the alternatives considered as per all criteria, taking into account their significance. The results are shown in Table 16.

Table 16 - Global priority of studied alternatives as per all criteria in view of their importance using the example of one respondent

RESULT	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Priority
	0.33	0.27	0.04	0.04	0.12	0.15	0.04	
Alternative 1: Tangible forms of motivation	0.69	0.75	0.08	0.10	0.73	0.11	0.11	0.56
Alternative 2: Intangible forms of motivation	0.13	0.12	0.73	0.80	0.19	0.41	0.41	0.24
Alternative 3: Combined forms of motivation	0.17	0.13	0.19	0.10	0.08	0.48	0.48	0.21

Source: compiled by the authors

Table 17 - Global priority of studied alternatives as per all criteria in view of their importance to the respondents according to the criterion of Economically active population/Economically inactive population of the Republic of Crimea

RESULT	CRITERION 1			CRITERION 2			CRITERION 3			CRITERION 4			CRITERION 5			CRITERION 6			CRITERION 7			PRIORITY		
	Economically active population, persons		Economically inactive population, persons (N=86)	Economically active population, persons		Economically inactive population, persons (N=86)	Economically active population, persons		Economically inactive population, persons (N=86)	Economically active population, persons		Economically inactive population, persons (N=86)	Economically active population persons		Economically inactive population, persons (N=86)	Economically active population persons		Economically inactive population, persons (N=86)	Economically active population, persons		Economically inactive population, persons (N=86)	Economically active population, persons		Economically inactive population, persons (N=86)
	Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)		Employed persons (N=417)	Unemployed persons (N=275)	
	0.31	0.38	0.05	0.25	0.39	0.02	0.08	0.11	0.04	0.04	0.04	0.08	0.16	0.03	0.48	0.15	0.03	0.31	0.01	0.02	0.02			
Alternative 1 Tangible forms of motivation	0.56	0.71	0.09	0.61	0.67	0.09	0.18	0.22	0.09	0.18	0.23	0.09	0.14	0.22	0.15	0.08	0.08	0.11	0.18	0.06	0.06	0.38	0.57	0.12
Alternative 2 Intangible forms of motivation	0.17	0.11	0.68	0.12	0.12	0.76	0.54	0.51	0.72	0.61	0.65	0.78	0.52	0.47	0.61	0.54	0.49	0.52	0.48	0.51	0.55	0.32	0.21	0.61
Alternative 3 Combined forms of motivation	0.27	0.18	0.23	0.27	0.21	0.15	0.28	0.27	0.19	0.21	0.12	0.13	0.34	0.31	0.24	0.38	0.43	0.37	0.34	0.43	0.39	0.30	0.22	0.27

Source: compiled by the authors

According to the results of the research, it is possible to predict with a high degree of certainty which form of motivation will be appropriate for a specific respondent. Table 17 shows the results of the calculation of the priority of the alternatives considered as per all criteria in view of their importance for the economically active population in the context of the employed and unemployed persons and the economically inactive population of the Republic of Crimea, which makes it possible to estimate the prospects of the use of different forms of motivation for different categories of population. Comparison of the obtained results with the known ones leads to the conclusion that this work is relevant, as it has been implemented in the context of world scientific trends. Moreover, the literature review of this issue has confirmed the importance of further research in this field in the Crimean region.

Conclusion

Structuring of motivational expectations of the population of the Republic of Crimea in the context of economically active and inactive population has made it possible to identify among a variety of the proposed to respondents' criteria those that have the greatest impact on the motivation level: salary, bonuses and allowances, social security guarantees, working conditions, opportunities for self-realization, training and development, corporate culture and team spirit. The criteria selected for the analysis cover a complex of possible forms and methods of motivation, forming motivational environment, which has made it possible to consider the three options as alternatives: the material forms of motivation, the application of non-material forms of motivation or the use of combined forms of motivation.

In terms of certain categories of economically active and inactive population of the Republic of Crimea, the analytic hierarchy process tools have made it possible to: determine the significance of the criteria; explicate motivational expectations when determining the most preferred forms and methods of motivation to enhance the work behavior of the population category under study; identify and assess the potential of different forms of motivation to improve the motivation of categories of the population involved in the study.

The assessment of consistency of respondents' opinions has determined that the structure of motivational expectations for the categories of the employed and unemployed population is relatively homogeneous. The structure of the motivational expectations of the economically inactive population has much in common with those of the economically active population, but there are features related to the interpretation of the results of analysis of the importance of the "bonuses and allowances" criteria, the importance of which for the economically inactive population is significantly lower than for the employed and unemployed people. The "working conditions" criterion ranks second in terms of importance for the economically inactive population while for the employed and unemployed people this criterion is at the penultimate place in the importance terms.

The significance of material forms of motivation is high for the economically active population, and for employed people this value is significantly lower than for the unemployed category (0.38 and 0.57 respectively). The potential of the increasing the level of motivation for the employed and unemployed population through the use of non-material forms of motivation or combined forms of motivation is almost equal (0.32 to 0.3 and 0.21 to 0.22 respectively).

For the category of economically inactive population, the potential of the application of material motivation forms is the lowest one. Intangible forms are a top priority, combined forms of motivation rank second (0.61 and 0.27 respectively).

According to the results of the analysis, we can conclude that the analytic hierarchy process is a tool that provides possibility to get valid results when structuring the motivational expectations, as due consideration is paid to the importance of each criterion of the system formed in the first stage of the research; the opinions of respondents, the answers of which are not compatible with each other or contradictory, are not considered when performing calculation; this process make it possible to accurately structure motivational expectations for the team studied, the labor market segment or the whole society that enhances the relevance of the data in terms of further research or applying them in practice.

Acknowledgement

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Development of the Socio-Economic Characteristics and Standardised Death Rates of the European Union Member States

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Abstract:

Gross domestic product per capita and the health expenditure per capita of the European Union Member States are strongly a positively correlated. The convergence process of the GDP and health expenditure per capita was stronger before 2009, before economic crises began to influence the economies. Health expenditure (HE) per capita increased more intensively between 2000 and 2014 than the GDP per capita, which resulted to a higher ratio of the HE per capita to the GDP per capita. In countries with a high living standard and a high level of HE per capita lower standardised death rates (SDR) in total and SDR for some of the non-communicable diseases were typical. The lowest SDR for most of the non-communicable diseases (NCD) were achieved at the Mediterranean Islands of Cyprus, Malta and also Portugal. The Mediterranean diet can be one of the main factors that caused the best status of lowest death rates in selected NCD.

Keywords: cluster analysis, principal component analysis, standardised death rate, GDP per capita, health expenditure per capita.

JEL Classification: C38, I10, I15.

1. Introduction

Socio-economic development of the European Union (EU) Member States belongs to the main goals of the policy makers in the candidate countries. Gross domestic product per capita is often used as a measure of standard of living. We expect that there exists an association between the living standard and the public health outcome. Public health is a one of the components of sustainable development. Society in good health represents added value for the economy and social development (Sustainable development in the EU, 2015). Sustainable development and public health quite strongly correlate, being connected and conditioned by one another (Seke *et al*. 2013). Public health spending increased intensively in the past and healthcare spending will increase in the nearest future for example due to the population aging. Also, a bad life style of population can result in an increase of health expenditure due to increased morbidity and mortality. The non-communicable diseases (NCD) are strongly associated with the life style of population (Brummer 2009). The most risk factors of the NCD are obesity, poor diet, alcohol consumption, smoking, lifestyle with no or irregular physical activity (Liu *et al*. 2012, Cohen *et al.* 2006, Hu *et al.* 2001). The impact of NCD in population extends beyond mortality with large financial consequences (Muka *et al.* 2015). The aim of our paper is to discover the association between the selected socio-economic variables and standardised death rates of some diseases.

2. Gross domestic product per capita versus health expenditure per capita

The values of gross domestic product (GDP) per capita in PPP (constant 2011 international $) varied from 8945 to 80732 in 2000. Lowest living standard according to the GDP per capita was typical for the "new" EU Member States: Bulgaria (8945.4), Romania (10249.8), and Latvia (10990.8). The highest living standard was achieved in the same year in Luxembourg with an extremely high level of GDP per capita (80732.2, see Figure 1). High living standard in 2000 was observed also in the Netherlands (42013.0), Denmark (41692.7), Ireland (39837.0). The real GDP per capita grew steadily till 2008. The recession of the economies was reflected also due a real decrease of GDP per capita in almost each of the EU Member States. Only in Poland the real GDP per capita increased by 2.6 % in 2009. In all other Member States, a decline of per capita GDP was achieved in 2009. The sharpest fall was attained in the Baltic countries: Estonia (-14.6 %), Lithuania (-13.9 %), Latvia (-12.9 %). One year later the positive development of the economies reflected in a real per capita GDP growth. Only in the most problematic countries the decline proceeded also in the next periods. For example, in Greece the GDP per

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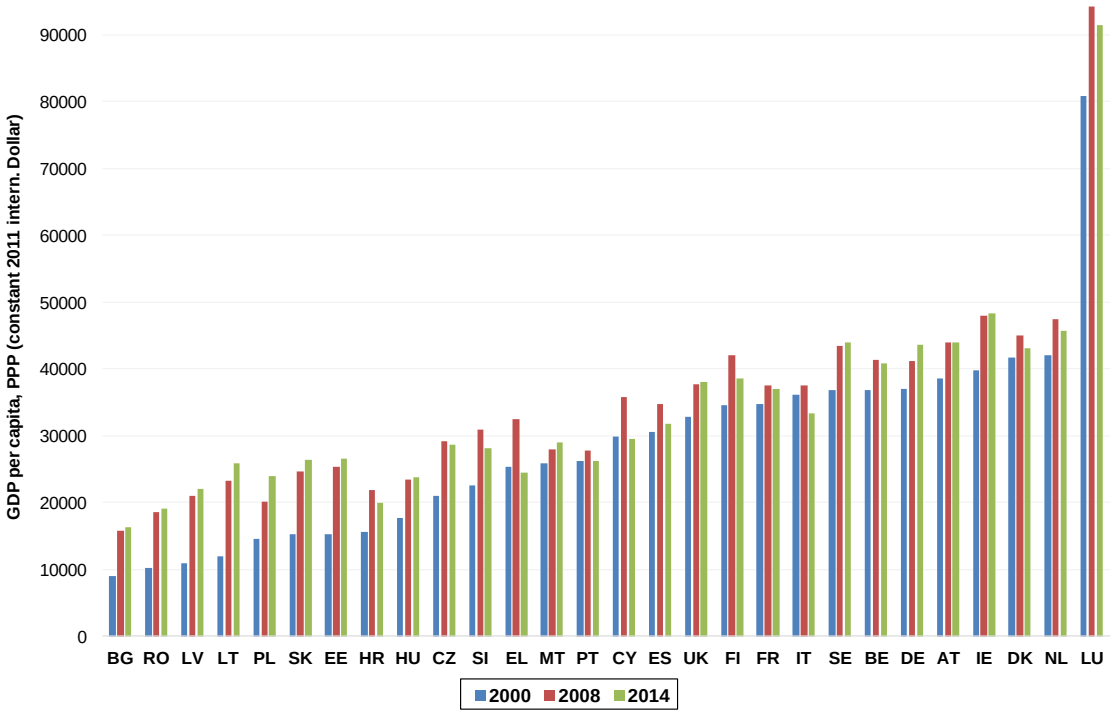
capita declined annually from 2008 till 2013, the cumulative real decline in the mentioned period reached 25.9%, when the GDP per capita dropped from 32,669.2 in 2007 to 24,197.6 in 2013. Hopefully the recovery of the Greece economy that brought an increase of the GDP per capita by 1.3% in 2014 will continue in the nearest future. But not only Greece was affected by the recession by a strong and long lasted decline of the real GDP per capita. In Cyprus for example the real decline started in 2009 and followed till 2014. The cumulative decline was as high as 17.7%. Comparing the GDP per capita figures between 2000 and 2014 the strongest relative real growth was reached in the "new" EU Member States, what is a positive sign of the convergence process of the Member States. The most impressive growth was achieved in Lithuania (114.5%), Latvia (100.5%), Romania (86.7%), Bulgaria (82.9%), Estonia (73.8%) and Slovakia (73.7%). The strong increase of the per capita GDP in the "new" Member States was the ground of the reduction in the Sigma convergence of the GDP per capita. While the coefficient of variation of the GDP per capita started at a value of 52.2% in 2000 it declined to 42.5% in 2014. The downturn of the variability in the GDP figures among the EU countries is a positive sign of Sigma convergence process of the EU Member States.

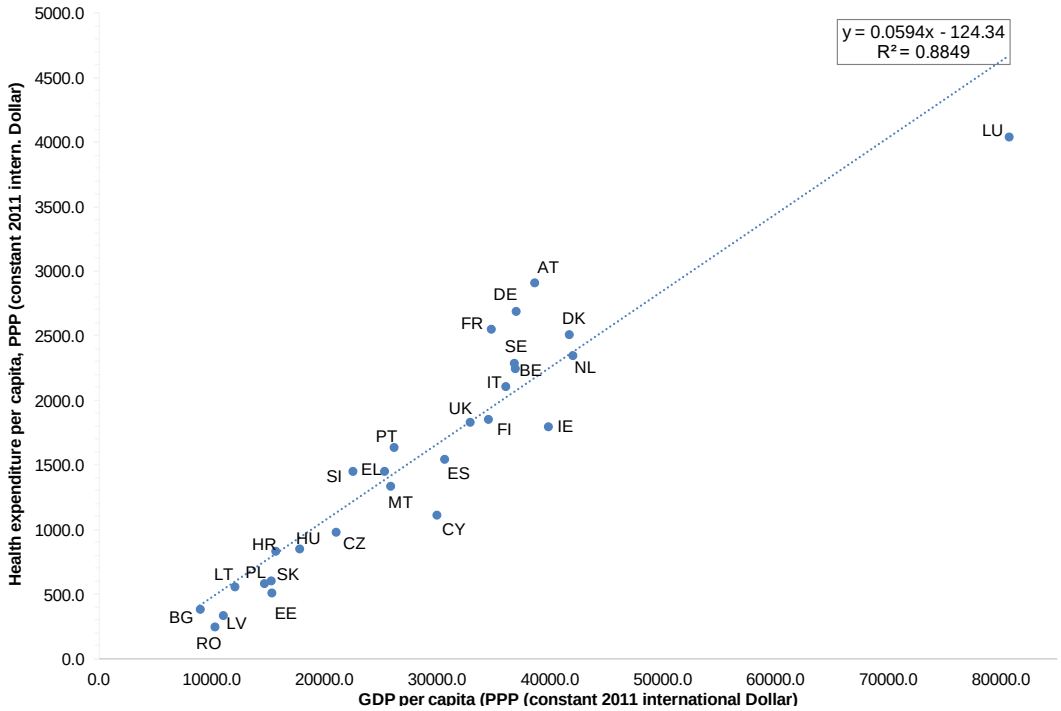
According to our expectations the health care expenditure per capita is very strongly a positively associated with the GDP per capita levels. The coefficient of correlation (r_{xy}) between the health care expenditure and GDP per capita in 2000 was statistically significant and very close to 1 (r_{xy} = 0.94). The simple linear regression line (in Figure 2) between the health care expenditures per capita and GDP per capita in the same year is in terms of the coefficient of determination R^2 a good model that fits well the original data of selected indicators (R^2 = 0.8849). EU Member States with a low value of GDP per capita has also a lower level of health care expenditure per capita and via versa. In 2000 an increase of the GDP per capita (PPP, constant 2011 international $) by 1000 Dollars led to an enhancement of the health care expenditure per capita (PPP, constant 2011 international $) in average by 59.4 $. In all of the analysed years (2000 – 2014) the coefficient of correlation between the health care expenditure and GDP per capita was statistically significant and positive.



Source: World Bank, own processing

Country codes: BE-Belgium, BG-Bulgaria, CZ-Czech Republic, DK-Denmark, DE-Germany, EE-Estonia, IE-Ireland, EL-Greece, ES-Spain, FR-France, HR-Croatia, IT-Italy, CY-Cyprus, LV-Latvia, LT-Lithuania, LU-Luxembourg, HU-Hungary, MT-Malta, NL-the Netherlands, AT-Austria, PL-Poland, PT-Portugal, RO-Romania, SI-Slovenia, SK-Slovakia, FI-Finland, SE-Sweden, UK-the United Kingdom

Figure 1 – GDP per capita in the EU Member States, PPP (constant 2011 international $)

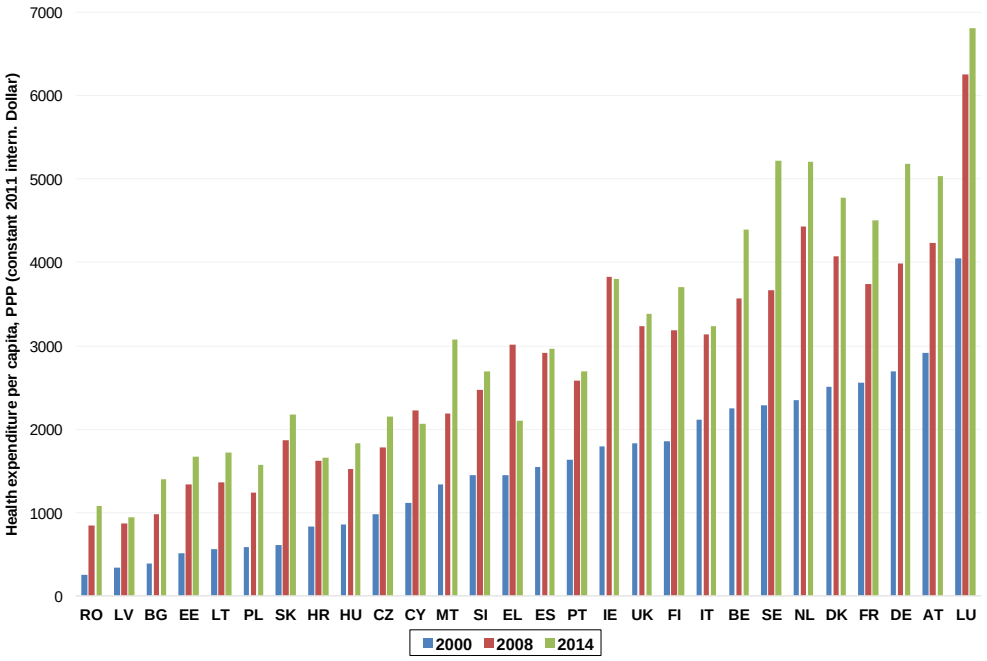


Source: World Bank, own processing

Figure 2 – Association between GDP and health expenditures per capita in the EU Member States in 2000

The health care expenditure per capita (PPP, constant 2011 international $) ranged between 247.7 and 4044.1 in 2000. The lowest health care expenditures were achieved at the beginning of analysed period of time in the "new" Member States (Figure 3), namely Romania (247.7), Latvia (335.8), Bulgaria (384.2), Estonia (511.0), Lithuania (558.2). On the other hand, the highest health care expenditures were attained in Luxembourg (4044.1), Austria (2914.1), Germany (2692.8), France (2554.8), and Denmark (2512.6). While the real GDP per capita declined in 2009 compared with the previous year in 27 EU Member States, the real health expenditure per capita declined in the same period only in two EU countries: Latvia (-7.4%), Greece (-1.4%). The response of the decline of expenditures to the health care sections needed about 1 year lag compared to the reaction of the real decline of GDP.

In most of the EU Member States in 2010 a moderate increase of the real GDP appeared, but in most of the countries in the same year a real drop of the real health care expenditure per capita was obvious. Altogether in 10 EU countries the health care per capita declined in 2010, with the highest fall in Greece (-11%), Estonia (-6.0%), Czech Republic and Ireland (-5.2%). But also in this year in some countries a strong relative increase of the health expenses per capita were achieved: Romania (10.0%), Bulgaria (8.3%), Hungary (7.4%), Poland and Germany (5.4%). The bad situation of the Greece economy had a negative consequence also in a strong reduction of the real health care expenditures. In years 2009 – 2012 and also 2014 real downturns of these expenditures per capita ware in Greece a reality. The highest increases in health expenditures were achieved in Slovakia by 33.5% in 2004, in Sweden by 29.9% in 2011, in Romania by 27.8% in 2003, in Bulgaria by 27.7% in 2001. The cumulative real increase of the per capita health care expenditure between 2000 and 2014 was in 13 EU Member States higher than 100%. The highest growth was achieved in the "new" Member States, for example in Romania the real per capita health care expenditure increased by 335.7% from 2000 to 2014. In the same time span, very high growth was achieved also in Bulgaria (264.1%), Slovakia (260.5%), Estonia (226.5%), and Lithuania (207.8%). The Sigma convergence between the EU Member States was reached not only for the GDP per capita indicator, but also for the health expenditure. In 2000 the coefficient of variation of the per capita health expenditure was as high as 60 % and it declined to 49.6% in 2014. The downturn of the variability in health expenditure per capita among the EU countries is a positive sign of convergence process of the EU countries in area of health expenditures.



Source: World Bank, own processing

Figure 3 – Health expenditures per capita in the EU Member States, PPP (constant 2011 international $)

Table 1 – GDP and health expenditures per capita, PPP (constant 2011 international $)

EU Member States	2000			2014			Index, % (2014/2000)	
	GDP/capita	Health exp. /per capita	Ratio	GDP/capita	Health exp. /per capita	Ratio	GDP/capita	Health exp. /per capita
Belgium	36901.2	2249.2	6.1	40777.8	4391.6	10.8	10.5	95.3
Bulgaria	8945.4	384.2	4.3	16363.0	1398.9	8.5	82.9	264.1
Czech Rep.	21003.2	981.5	4.7	28674.8	2146.3	7.5	36.5	118.7
Denmark	41692.7	2512.6	6.0	43156.8	4782.1	11.1	3.5	90.3
Germany	36979.3	2692.8	7.3	43552.3	5182.1	11.9	17.8	92.4
Estonia	15298.2	511.0	3.3	26593.5	1668.3	6.3	73.8	226.5
Ireland	39837.0	1798.8	4.5	48383.7	3801.1	7.9	21.5	111.3
Greece	25300.0	1453.5	5.7	24518.6	2098.1	8.6	-3.1	44.3
Spain	30629.8	1546.6	5.0	31749.7	2965.8	9.3	3.7	91.8
France	34773.4	2554.8	7.3	37052.7	4508.1	12.2	6.6	76.5
Croatia	15644.1	834.1	5.3	20033.1	1652.1	8.2	28.1	98.1
Italy	36056.7	2110.3	5.9	33341.0	3238.9	9.7	-7.5	53.5
Cyprus	29945.0	1114.0	3.7	29452.9	2062.4	7.0	-1.6	85.1
Latvia	10990.8	335.8	3.1	22038.5	940.3	4.3	100.5	180.0
Lithuania	12023.0	558.2	4.6	25786.3	1718.0	6.7	114.5	207.8
Luxembourg	80732.2	4044.1	5.0	91368.1	6812.1	7.5	13.2	68.4
Hungary	17766.0	852.3	4.8	23723.3	1826.7	7.7	33.5	114.3
Malta	25841.0	1337.8	5.2	29000.0	3071.6	10.6	12.2	129.6
Netherlands	42013.0	2350.3	5.6	45662.1	5201.7	11.4	8.7	121.3
Austria	38622.9	2914.1	7.5	43871.7	5038.9	11.5	13.6	72.9
Poland	14640.0	583.7	4.0	23953.7	1570.4	6.6	63.6	169.1
Portugal	26147.2	1638.4	6.3	26174.9	2689.9	10.3	0.1	64.2
Romania	10249.8	247.7	2.4	19133.9	1079.3	5.6	86.7	335.7
Slovenia	22493.6	1452.9	6.5	28156.3	2697.7	9.6	25.2	85.7
Slovakia	15241.7	604.5	4.0	26469.9	2179.1	8.2	73.7	260.5
Finland	34516.6	1855.9	5.4	38577.2	3701.1	9.6	11.8	99.4
Sweden	36816.3	2290.4	6.2	43976.3	5218.9	11.9	19.4	127.9
United Kingdom	32898.3	1833.5	5.6	38084.9	3376.9	8.9	15.8	84.2

Source: World Bank, own processing and calculation. (Ratio = GDP per capita / Health expenditures per capita, in %; Index = (value in 2014/value in 2000)*100 – 100.

A positive increase of the real health care expenditure per capita was significantly higher than the real change of the GDP per capita in selected period of time (Figures 1 and 3). This resulted in an increase of the ratio of per capita health expenditure compared to the GDP per capita. In 2000 the minimum ration was only 2.4% while the maximum ratio achieved 7.5%. Not only the per capita health expenditures were low in the "new" Member States in 2000 but also the ratios to the GDP per capita in these countries were at very low levels. For example, in Romania it was only 2.4%, in Latvia 3.1%, Estonia 3.3% and in Cyprus 3.7% (Table 1). Austria leads with the highest proportion of 7.5%, France and Germany follows with 7.3%, Slovenia´s ratio was 6.5%, Portugal reached 6.3% and Sweden 6.2%.

Due to stronger increases in the real health expenditure compared with a more moderate increase of the GDP per capita the ratios of the per capita health expenditure jump to higher levels. For example, the lowest ration 2014 reached 4.3% and maximum jumped to 12.2%. Also, the range of the lowest and highest ration value grow from 5.1% to 7.9%. In 2014 low ratios were attained in Latvia (4.3%), Romania (5.6%), Estonia (6.3%). While in 2000 there was no country with a ratio higher than 8 % the situation till 2014 change rapidly and at the end of the analysed period of time 9 countries achieved the proportion higher than 10%: France (12.2%), Germany and Sweden (11.9%), Austria 11.5%), the Netherlands (11.4%), Denmark (11.1%), Belgium (10.8%), Malta (10.6%) and Portugal (10.3%). It is clear from this comparison that the most developed countries of the EU have a much higher ratio of the per capita health expenditure to the GDP per capita than the less developed "new" Member States.

3. Cluster analysis of selected variables

Whether the higher health expenditure is in some kind related with a better health outcome of the population in the richest EU countries is a question that should be answered. For trying to understand the positions of the countries according their levels of GDP per capita, health expenditure per capita and health outcome we decided to select some relevant data to point out the position of the EU Member States. For the multivariate analyses, we used the mortality rates. Because the crude mortality rates are influences also due to the aging of the population and are not very useful for international comparison we chose the standardised death rates (SDR). SDR indicates the number of death in ratio to the total population, having excluded the differences in the age distribution when comparing different populations. As most causes of death vary with people´s age and sex, the use of a standard population to calculate the SDR improves comparability over time and between countries (Eurostat, The standardized death rates). In our interest were the SDR of all causes of death (relevant ICD codes A00 – Y89, excluding S00 – T98) (World Health Organisation, 2016) and SDR of the chronic (non-communicable) diseases of the total population and especially of the population that dies prematurely. Premature death is characterized as death before the age of 65.

The most risk factors of the non-communicable diseases are obesity, poor diet, alcohol consumption, smoking, lifestyle with no or irregular physical activity. Chronic diseases comprise the following diseases (Eurostat, Causes of death): malignant neoplasms (ICD codes C00 – C97), diabetes mellitus (E10 – E14), ischaemic heart diseases (I20 – I25), cerebrovascular disease (I60 – I69), chronic lower respiratory diseases (J40 – J47) and chronic liver diseases (K70, K73, K74). SDR are calculated per 100000 inhabitants.

For the analytical purposes altogether 16 indicators were used: 1. GDP per capita, 2. Health expenditure per capita, 3. SDR of A00-Y89 (excl. S00-T98), 4. SDR of A00-Y89 (excl. S00-T98) for inhabitants aged less than 65 years (abbreviated as: 65-), 5. SDR of C00 – C97, 6. SDR of C00 – C97 for 65-, 7. SDR of E10 – E14, 8. SDR of E10 – E14 for 65-, 9. SDR of I20 – I25, 10. SDR of I20 – I25 for 65-, 11. SDR of I60 – I69, 12. SDR of I60 – I69 for 65-, 13. SDR of J40 – J47, 14. SDR of J40 – J47 for 65-,15. SDR of K70,K73,K74, 16. SDR of K70, K73, K74 for 65-.

These indicators were used to execute a cluster analysis that is suitable for multivariate analysis of our input data. Due to a strong correlation between some selected variables before the cluster analysis (CA) a principal component analysis (PCA) was undertaken. PCA was used to identify a smaller number of uncorrelated variables that explain the maximum amount of variance of original dataset with only a few uncorrelated principal components. The CA was performed for 3 years, namely for 2000, 2008 and 2013. We end the analysis in 2013 because the SDR for the EU Member States were not available for 2014.

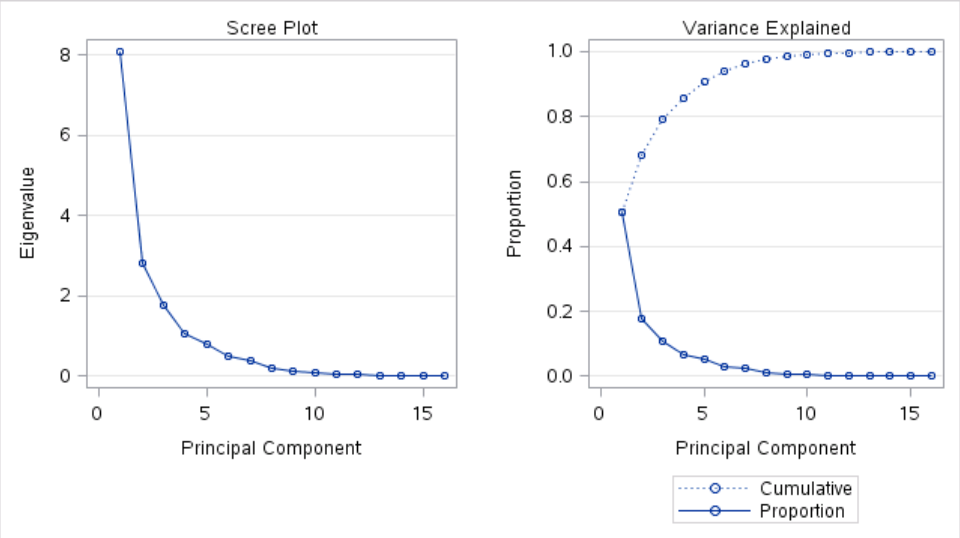
Using the outputs of the PCA (Table 2, Figure 4) for the datasets in 2000 only the first 4 components were selected for the cluster analysis. The first 4 components have the eigenvalues higher then 1, they explain about 86 % of the variance of original dataset and the components are not correlated. For demonstration, selected outputs of PCA for 2000 are presented, for the years 2008 and 2013 only the cumulative proportion of explained

variance is mentioned. Not only in 2000 were the first 4 components of the PCA selected for the CA, but also in 2008 and 2013. In 2008 the first 4 components explained as much as 86.5% of the total variance, and in 2013 the 4 components explained 85.9% of the total variance of original datasets.

Table 2 – Principal component analysis in 2000, Eigenvalues

Eigenvalues of the Correlation Matrix				
	Eigenvalue	Difference	Proportion	Cumulative
1	8.08619666	5.26395587	0.5054	0.5054
2	2.82224079	1.06417077	0.1764	0.6818
3	1.75807002	0.68647897	0.1099	0.7917
4	1.07159105	0.26093587	0.0670	0.8586
5	0.81065518	0.31141589	0.0507	0.9093
6	0.49923929	0.10379613	0.0312	0.9405
7	0.39544316	0.20368341	0.0247	0.9652
8	0.19175975	0.06790023	0.0120	0.9772
9	0.12385953	0.03278999	0.0077	0.9849
10	0.09106954	0.03525725	0.0057	0.9906
11	0.05581228	0.01687377	0.0035	0.9941
12	0.03893851	0.01597291	0.0024	0.9966
13	0.02296561	0.00511165	0.0014	0.9980
14	0.01785395	0.00981761	0.0011	0.9991
15	0.00803635	0.00176801	0.0005	0.9996
16	0.00626834		0.0004	1.0000

Source: own processing and calculation, stat. software: SAS EG 6.1, datasets: Worldbank, Eurostat



Source: own processing and calculation, stat. software: SAS EG 6.1, datasets: Worldbank, Eurostat

Figure 4 – Principal component analysis, scree plot of eigenvalues, 2000

The cluster analysis allowed us to construct groups – clusters of EU Member States (objects, observations) according their similarity. The objects in the same cluster are more similar to each other than the objects in different clusters. The number of clusters was chosen by examination of the dendrogram and the

characteristics of the clusters. Results of the CA in 2000 are presented in Figure 5. The 28 analysed objects were in this year classified into 6 groups. Two of the clusters are actually separate clusters with only one object. One of the separate clusters represents Cyprus and the second one Hungary. These countries are according to the analysed variables not similar to any other of the EU Member States. According to the Cluster centroids (see Table 3) the following most important outcomes are typical for the clusters:

Cluster 1 (Belgium, the Netherlands, Malta, Ireland, the United Kingdom, Denmark)

The Member States from this cluster had a very high GDP per capita and also heath expenditure per capita. The most of the SDR are a bit higher than at the clusters 2 and 3. This group of countries had the highest SDR between all of the 6 clusters for the chronic lower respiratory diseases and the lowest for the chronic liver disease. Positively can be rated these countries for the very low premature SDR of diseases I60-69, J40-47, K70, 73-74.

Cluster 2 (Germany, Austria, Spain, Italy, France, Luxembourg, Greece, Finland, Sweden)

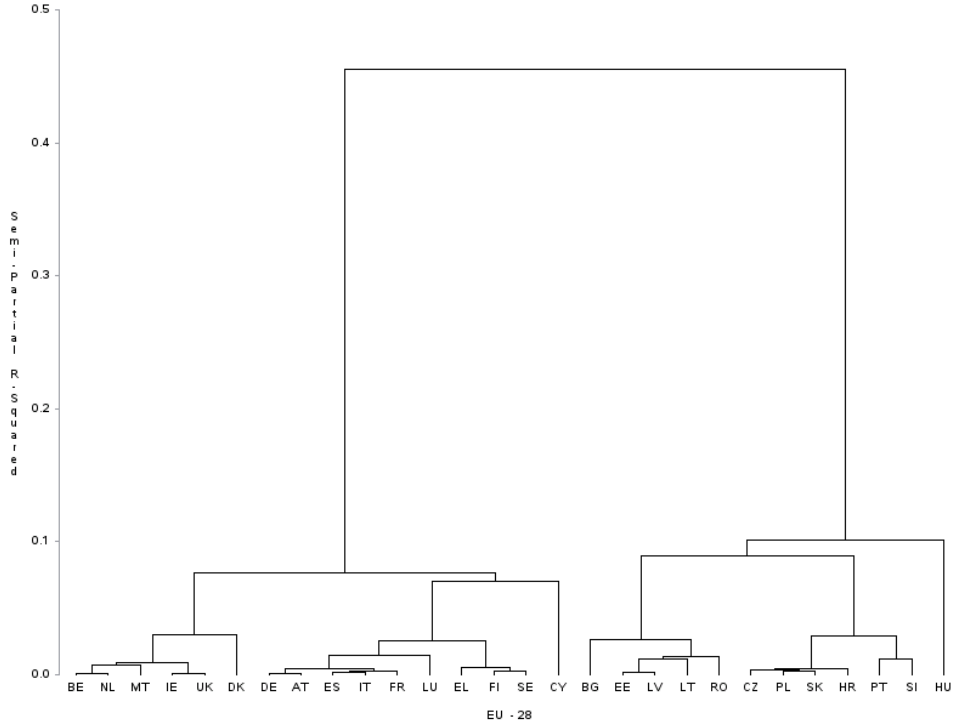
The countries in this cluster had the highest GDP per capita and also health expenditure per capita levels. On the other hand, they reached the lowest levels of the total SDR and the premature SDR of diabete mellitus and ischeamic heart diseases. Also, the other SDR are compared to other cluster centroids very low. Cluster 2 consists only "old" Member States, that usually have a higher living standard.

Cluster 3 (Cyprus)

This cluster is created by only one country. The separation from the other EU Member States was mainly due to very good results of Cyprus in terms of the lowest SDR and premature SDR in almost all of the analysed characteristics. Only exception is the SDR of diabetes mellitus. The GDP per capita and the health expenditure per capita according the cluster centroids are at the middle.

Cluster 4 (Bulgaria, Estonia, Latvia, Lithuania, Romania)

Five "new" Member States were grouped together in cluster 4. It is the cluster with the lowest GDP per capita and also lowest health expenditure per capita. These countries had the highest level of the total SDR and almost the highest premature SDR. From the chronic diseases, the worst situation in these countries was achieved for the ischeamic heart diseases and cerebrovascular diseases. For both set of diseases the highest SDR for the total population and also for the population aged less than 65 years were typical for the countries in cluster 4.



Source: own processing and calculation, stat. software: SAS EG 6.1, datasets: Worldbank, Eurostat

Figure 5 – Cluster analysis, Dendrogram (year 2000)

Cluster 5 (Czech Republic, Poland, Slovakia, Croatia, Portugal, Slovenia)

EU Member States in this cluster (except Portugal) are the "new" EU candidates. The cluster centroids of the GDP per capita and also health expenditure per capita are higher than in clusters 4 and 6, but lower than in clusters 1, 2 and 3. The group of these countries could be named from the point of view of the selected indicators as "middle cluster" with no extreme – neither minimum nor maximum value of the cluster centroids of any measured variable.

Table 3 – Cluster centroids in 2000

Year: 2000	*Cluster1*	*Cluster2*	*Cluster3*	*Cluster4*	*Cluster5*	*Cluster6*
GDP per cap	36530.5	39380.8	29945.0	11501.5	19195.0	17766.0
Health exp per cap	2013.7	2384.7	1114.0	407.4	1015.9	852.3
SDR-Total	1313.7	1178.8	1240.0	1848.0	1560.4	1794.6
C00-97	315.2	279.8	210.0	270.1	328.0	406.6
E10-14	25.6	22.7	83.0	15.1	29.1	29.7
I20-25	237.3	195.2	145.0	530.5	300.5	416.6
I60-69	125.2	139.6	96.0	348.9	231.1	267.2
J40-47	65.8	33.7	27.5	33.4	33.8	51.9
K70,73,74	9.5	16.8	9.5	26.8	27.2	69.9
SDR age group: 65-						
SDR-Total	244.5	235.3	224.0	523.1	355.3	525.9
C00-97	92.9	84.8	53.0	115.1	115.8	165.7
E10-14	3.9	3.0	6.5	4.8	4.6	6.5
I20-25	32.7	27.8	29.0	83.0	45.5	76.6
I60-69	10.2	10.7	9.5	47.2	23.0	40.1
J40-47	7.1	3.7	2.5	5.8	4.6	11.2
K70,73,74	7.0	10.7	3.7	19.9	20.2	63.3

Source: own processing and calculation

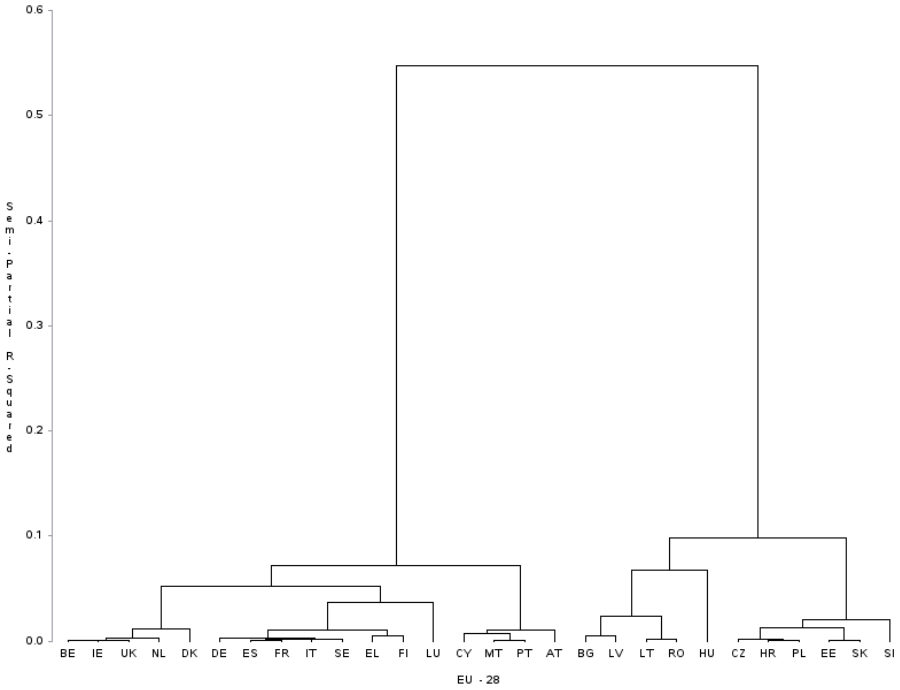
Cluster 6 (Hungary)

As it was mentioned earlier two of the EU countries created a separate cluster. While Cyprus had in 2000 the best (lowest) SDR of almost all of the selected chronic diseases, the case of Hungary is in a contrast to cluster 3. Hungary as most of the "new" Member States has a lower GDP per capita and also lower health expenditure per capita, these indicators are comparable with other "new" EU countries. So way Hungary modelled a separate cluster? The answer can be found again in the table 3. Hungary had the highest SDR for many of the chosen diseases: malignant neoplasms, chronic liver disease, premature total SDR, premature malignant neoplasms, premature diabetes mellitus, and premature chronic lower respiratory and also premature chronic liver disease. The highest SDR of almost all of the selected indicators caused the separation of Hungary from other EU Members. This cluster we can consider as the worst cluster from all 6 clusters according to the analysed data sets.

The cluster analyses output of the indicators in 2008 is presented in Figure 6. Also in this year the 28 EU countries were divided into 6 clusters. The cluster 5 is again a separate cluster, it consists only one country, namely Hungary. The Cluster centroids (see Table 4) give us a better understanding of the most common features of the 6 clusters in 2008:

Cluster 1 (Belgium, Ireland, the United Kingdom, the Netherlands, Denmark)

Five former EU Members created the first cluster. These countries had the highest health expenditure per capita and the second highest GDP per capita. The total SDR and also the total premature SDR are low; the lowest rates were achieved for the following diseases of the total population: I20-I25, I60-I69, and SDR for the premature death: I20-I25.



Source: own processing and calculation, stat. software: SAS EG 6.1, datasets: Worldbank, Eurostat

Figure 6 – Cluster analysis, Dendrogram (year 2008)

Cluster 2 (Germany, Spain, France, Italy, Sweden, Greece, Finland, Luxembourg)

Also, the cluster 2 contains only the "old" EU candidates. Typical for the group of these countries is a high living standard. GDP per capita for this cluster was the highest, the health expenditure the second highest. These countries performed very well according to the lowest total SDR and also lowest premature SDR. The premature SDR of the diabetes mellitus, cerebrovascular diseases and also chronic lower respiratory diseases was at the minimum levels in this group of countries. According to the cluster centroides we could say that it is the "best club" of countries through a high living standard combined with the lowest SDR in total and very low SDR for chronic diseases.

Cluster 3 (Cyprus, Malta, Portugal, Austria)

Cyprus established a separate cluster in 2000 but in 2008 created a cluster together with other three countries. Two of the countries are islands and belongs to the so called Mediterranean countries. Portugal is also a costal country. It means that most of the states in this cluster are well known as countries with coastal diet, Mediterranean diet (Buckland and Agudo 2015; Hoffman and Gerber 2012). The countries do not have the health expenditure per capita as high as the countries in clusters 1 or 2 but they have better results of some mortality data. For example, they reached the lowest SDR of malignant neoplasms desieases for the total population and also for the population aged less than 65 year, and the same is true for the SDR of chronic liver diseases. The only one negative mortality rate is related to the diabetes mellitus diseases.

Cluster 4 (Bulgaria, Latvia, Lithuania, Romania)

Again, the same "new" Member States like in 2000 grouped together in one cluster (except Estonia). Also the characteristics are like in 2000, it means that these countries had the lowest GDP and health expenditure per capita, but the highest SDR for altogether 6 followed diseases. The evaluation of this cluster is again negative in terms of lower living standard combined with a high level of mortality.

Cluster 5 (Hungary)

From 2000 till 2008 the situation in Hungary did not change radically. Some significant change in the analysed characteristics should shift Hungary to a cluster with another EU country, but again in 2008 Hungary generated a separate cluster. The bad situation in mortality continued and the highest levels of SDR were achieved in the following diseases in total: C00-C97, J40-47, K70, K73-74 and also at the premature SDR: C00-C97, E10-E14, J40-47, K70, K73-74.

Table 4 – Cluster centroids in 2008

Year: 2008	*Cluster1*	*Cluster2*	*Cluster3*	*Cluster4*	*Cluster5*	*Cluster6*
GDP per cap	43879.6	45382.2	33859.2	19635.8	23440.4	25328.3
Health exp per cap	3823.2	3737.7	2808.5	1014.0	1523.7	1721.1
SDR-Total	1096.5	1006.5	1078.1	1673.1	1557.0	1403.6
C00-97	300.9	254.6	245.6	274.7	361.0	318.8
E10-14	20.6	20.8	53.6	18.7	33.9	23.4
I20-25	138.6	138.9	162.9	419.0	414.6	331.1
I60-69	85.9	96.0	110.5	300.0	174.9	168.8
J40-47	57.2	29.6	30.3	28.4	58.5	28.1
K70,73,74	11.5	13.6	11.5	36.4	51.9	27.3
SDR age group: 65-						
SDR-Total	211.8	195.4	198.8	492.8	454.5	339.9
C00-97	83.0	73.8	72.2	117.4	155.9	107.2
E10-14	2.9	2.7	4.5	4.9	7.2	3.9
I20-25	19.1	20.1	23.7	74.0	64.7	41.5
I60-69	7.6	7.5	8.6	37.1	26.7	18.9
J40-47	5.6	2.7	2.7	5.8	14.4	3.9
K70,73,74	9.0	8.5	7.4	29.5	43.3	22.0

Source: own processing and calculation

Cluster 6 (Czech Republic, Croatia, Poland, Estonia, Slovakia, Slovenia)

These countries were together in one cluster in 2000. Only one country is missing now, namely Portugal. The cluster centroids almost of all of the analysed indicators are in the middle of the centroid rankings. However, they reached the minimum level of SDR of chronic lower respiratory diseases.

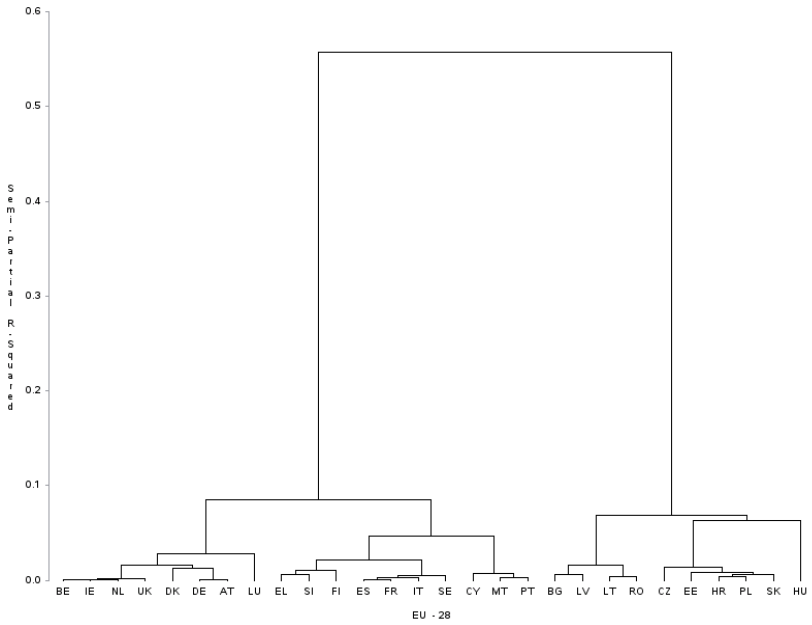
The last year when it was possible to carry out the CA of the SDR in total and also of the SDR divided into the subgroups of diseases was the year 2013. No more actual data on SDR according to causes of death were available on the Eurostat web site (Eurostat, Database) during the work on our paper. More actual data were available only on mortality in form of crude rates. Unfortunately, the crude rates are not very suitable for international comparison. The dendrogram of CA in 2013 is presented in Figure 7. The EU Members were classified into 6 clusters. Hungary again created a single cluster that shows no significant changes of the analysed indicators in this country from 2000 till 2013. Hungary is the only one Member State that in all three years builds up a separate cluster. According to the results in Table 5 we can discover the most related information of the countries that grouped together into one of the 6 clusters in 2013:

Cluster 1 (Belgium, Ireland, the Netherlands, the United Kingdom, Denmark, Germany, Austria, Luxembourg)

The cluster 1 is similar with the cluster 1 in 2008. It is now more numerous due to Germany, Austria or Luxembourg that were in 2008 in different clusters. The cluster is combined only from the “old” Member States. The countries reached the maximum levels of the GDP and health expenditure per capita and on the other hand the minimum rates of some SDR: I60-I69 (total and premature), I20-I25 (premature). The only negative sign of the countries in this cluster are the second worst SDR for chronic lower respiratory diseases.

Cluster 2 (Greece, Slovenia, Finland, Spain, France, Italy, Sweden)

Six countries of the cluster mentioned above were grouped together also in 2008. One “new” Member State, namely Slovenia, joined the club of the “old” candidates. Compared with cluster 1 these countries had a smaller level of GDP per capita and also of health expenditure per capita. Very good result achieved the countries joined in cluster 2 in low mortality rates of following diseases: SDR total, I20-I25, J40-J47, E10-E14 (premature), I20-I25 (premature).



Source: own processing and calculation, stat. software: SAS EG 6.1, datasets: Worldbank, Eurostat

Figure 7 – Cluster analysis, Dendrogram (year 2013)

Cluster 3 (Cyprus, Malta, Portugal)

The cluster 3 is almost the same as the cluster 3 in 2008. The Mediterranean Islands and Portugal joined together to create a cluster with GDP a health expenditure per capita at a middle value but with a very low SDR for a few chronic diseases. The lowest SDR were achieved for the following diseases in total population: C00-C97, K70, K73-74 and premature SDR: total, C00-C97, I60-I69, J40-J47, K70, K73-74. These countries compared to other clusters had the best results according to the SDR of chronic diseases, only the death rate of diabetes mellitus disease is still a problem for the three countries joined in cluster 3.

Cluster 4 (Bulgaria, Latvia, Lithuania, Romania)

No changes in 2013 compared with 2008 happened in composition of cluster 4. These four “new” Member States grouped together in all of the analysed period of time. And again, these countries reached the lowest levels of GDP and health expenditures per capita. Unfortunately, their SDR total and premature SDR are the highest ones. From the chronic diseases, the maximum SDR was achieved again in some of them: I60-I69 (total and premature), I20-I25 (premature).

Cluster 5 (Czech Republic, Estonia, Croatia, Poland, Slovakia)

Most of the countries in cluster 5 were grouped together also in 2000 or 2008. This club of countries did not achieve any extreme value of the characteristics in table 5. Most of the SDR are more comparible to the clusters 4 and 6 than to clusters 1, 2 or 3. Also in this case it is clear that the indicators of the “old” and “new” Member States have different levels.

Cluster 6 (Hungary)

Surprisingly Hungary again did not join with any other EU country. Despite of higher GDP and health expenditures per capita compared with cluster 4, in Hungary the maximum level of SDR were achieved even in more cases than in cluster 4, namely: C00-C97 (total and premature), O20-I25, J40-J47 (total and premature), K70, K73-74 (total and premature), E10-E14 (premature). Hungary can be according to the CA again rated very negatively due to the highest SDR of most of analysed diseases.

Table 5 – Cluster centroids in 2013

Year: 2013	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6
GDP per cap	48539.7	33747.4	28166.2	20169.6	24593.1	22821.4
Health exp per cap	4715.1	3480.5	2600.2	1225.9	1800.1	1766.8
SDR-Total	1016.1	941.5	984.0	1545.7	1335.4	1482.8
C00-97	270.1	251.3	225.2	272.2	306.8	352.1
E10-14	22.5	18.3	47.6	16.9	26.9	29.3
I20-25	120.1	112.1	128.0	393.7	311.8	396.6
I60-69	68.8	84.7	92.1	279.1	138.1	156.4
J40-47	49.7	24.7	26.0	24.6	30.8	63.0
K70,73,74	11.9	13.3	8.4	29.1	20.9	31.6
SDR age group: 65-						
SDR-Total	186.3	179.5	160.2	409.9	299.5	374.4
C00-97	72.8	71.6	63.9	107.7	98.2	143.0
E10-14	2.7	2.5	4.1	4.1	4.2	5.7
I20-25	16.0	16.7	17.6	57.7	35.5	53.9
I60-69	6.0	6.5	5.9	29.4	15.0	20.0
J40-47	5.4	2.1	1.8	4.6	4.4	14.4
K70,73,74	8.2	8.6	4.8	22.4	16.7	23.4

Source: own processing and calculation

The cluster analysis helped us to create group of countries that are similar to each other according to analysed indicators. The multivariate approach allowed having a more comprehensive look at the position of the EU countries not only from one point of view but from a multilevel reflection.

Conclusion

Gross domestic product per capita is positively and significantly correlated with the HE per capita of the EU Member States. The real increase of the HE was stronger than the growth of the GDP per capita which resulted in an increase of the ratios of HE per capita to the GDP per capita. According to the coefficient of variation the convergence process of both variables was positive. Using cluster analysis tools, it was discovered that the clusters were usually composed of either "old" or "new" Member States. Only exceptionally the "new" Member State joined a cluster with "old" Member States. The clusters with "old" Member States can be characterized as clusters with a high living standard, high HE per capita but also with lower SDR in total and lower SDR of some chronic diseases. For the clusters of "new" Member States are typical lower levels of GDP per capita, HE per capita and higher SDR of some analysed diseases. Hungary is the only country that in all analyzes periods created a separate cluster. Hungary achieved the worst results in terms of very high SDR compared to other clusters. Bad living standard can radically influence morbidity and mortality of the population. The Mediterranean diet is well known as a healthy kind of eating and this could be one of the reasons while the Mediterranean islands of Cyprus, Malta and also Portugal despite of lower GDP and HE per capita had the best outcome in terms of lowest standardised death rates of almost all diseases in our analysis.

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Intellectual Data Analysis of Production Profitability Influence on the Competitiveness of Construction Enterprises

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Abstract:

The article is devoted to the development of market relations in a construction sphere and development of competitive relations that are important factors for development of methods for competitive estimation of construction enterprises. The competitiveness of a construction enterprise characterizes competitive advantages and disadvantages that are crucial aspects for making effective management decisions and working out organization development strategies. Competitiveness development in the market of fixed assets construction is one of the main tasks of government policy. That's why competitive estimation of an enterprise is important either for a particular organization or for government in general. The questionnaire results among construction organizations directors of Chelyabinsk, Sverdlovsk and Moscow regions in 2015-2016 are represented in the article. The authors offered an economic and mathematical model based on intellectual analysis of product profitability in construction enterprises. They put forward and disproved theories of various factors influence on the competitiveness of construction enterprises. The authors analyzed research results and drew conclusions about an application of the offered technique and further approach of scientific research.

Keywords: intellectual analysis, profitability, competitiveness, construction, company, products, index.

JEL Classification: D40, D41, L74.

1. Introduction

The development of market relations in construction sphere and development of competitive relations prove the importance of estimation methods of construction organizations competitiveness (Kruglov 1998). The competitiveness of a construction enterprise characterizes competitive advantages and disadvantages that are crucial aspects for making effective management decisions and working out organization development strategies (Ugryumov and Shindina 2016). Development of competitiveness on the market of fixed assets construction is one of the main tasks of government policy. That's why the competitive estimation of an enterprise is important either for a particular organization or for government in general.

2. Research methodology

Scientists conducted a survey among construction organizations directors of Chelyabinsk, Sverdlovsk and Moscow regions in order to do research on processes related to the housing construction sphere and to define factors influencing construction product profitability and competitiveness of construction enterprises. 12 enterprises participated in the research: OOO "Arctika-Chelyabinsk", OOO "RSU-9", OOO "CHFSK", OOO "Electron-M", OOO "SMU-28", OOO "DorStroyServis", OOO SK "Megapolis", OOO "RSO Engineering", OOO "Stroykomplekt", OOO "Stroyotryad", OOO "GREENWILL", OOO "BrikMaster". The directors were offered to introduce data according to 14 indexes of organization activity in the questionnaire (Table 1): workforce productivity, sales profitability, products profitability, level of using fixed capital assets, capacity utilization coefficient, relative number of managing group of organization, technical level of construction machines and equipment, equipment capacity and effectiveness, turnover coefficient, regularity of the pace of production processes, discretization of using resources, equability of using resources, product prime cost and product quality (Table 2).

During research preparation, the following theories were put forward: all 10 indexes influence organization competitiveness equally; dependence between indexes is direct. The higher considered index is, the higher resulting index will be; product prime cost is a resulting index.

In order to approve or disapprove theories, it is necessary to apply economic-mathematical modeling methods (Alotaibi, Zien Yusoff and Islam 2013, Chen 2009, Drew, Skitmore, and Lo 2001, Ercan and Koksal 2015, Horta, Camanho, and Moreira da Costa 2012, Keung and Shen 2014, Kosinova, Tolstel and Chekalkina

[6] 454138, Chelyabinsk, Komsomolsky Prospekt, 33, 14.

2014) that help to define the influence level of one index on the others. The essence of economic-mathematical modeling is to find interconnections between indexes of organization activity and influencing factors (Lim and Peltner 2011, Matejun 2014, Tucker *et. al* 2015). The intellectual analysis of data is according to the initial data. The intellectual analysis presupposes mathematical model construction and definition of its statistical reliability (Makasi, Govender, and Rukweza 2014, Matejun 2014, Zainol, Yasin, Omar, Hashim, Osman 2015). Multiple lineal models of intellectual analysis are as follows:

$Y = b_0 + b_1 x_{i1} + \cdots + b_j x_{ij} + \cdots + b_k x_{ik} + e_i$ *where:* Y – value of function (target value); b - coefficients value; x - initial data; e - accidental observation errors.

Table 1 - Data for indicators calculation

№ p/p	Name of indicator	Calculation formula	Explanation of a formula
1	Workforce productivity	$WP = \frac{V}{N}$	V - work volume in a unit of time; N - number of workers.
2	Sales profitability	$P_r = \frac{Pr}{O} \cdot 100\%$	Pr - profit on sales; O - output in monetary terms.
3	Production profitability	$P_r = \frac{Pr}{PC} \cdot 100\%$	Pr - profit on sales; PC - absolute prime cost of products.
4	The level of the use of production fixed assets	$L_{pfa} = \frac{O}{\overline{PFA}}$	O - output in monetary terms; $\overline{PFA}$ -the average annual value of production fixed assets.
5	The load coefficient of production capacity	from 0 to 100%	For the production capacity load.
6	The relative number of enterprise managers	$RN_m = \frac{N_m}{N}$	N_m - number of managers at enterprise; N - total number of staff at enterprise.
7	Equipment supply (technical level of construction machinery and equipment)	$E = \frac{V_{mec}}{N}$	V_{mec} – work volume performed mechanically; N-total number of staff at enterprise.
8	Power supply (power and efficiency of equipment)	$P = \frac{\sum W}{N}$	$\sum W$- total power of all construction machinery and mechanisms; N - total number of staff at enterprise.
9	Turnover rate	$R_t = \frac{N_{red}}{N}$	N_{red} - umber of redundant employees due to the turnover; N-total number of employees in enterprise
10	Rhythm of production	$Rhythm_{pr} = 1 - \frac{\lvert T_{plni} - T_{acti} \rvert}{T_{plni}}$	T_{plni}, T_{acti} - planned and actual terms of production work at the i-object; days
11	Discretion in the use of resources	$D_{ur} = \frac{T_{dis}}{T}$	T_{dis} - time of discrete resource use at the object; T = total duration of resources use
12	Steady use of resources	$S_{ur} = \frac{V_{const}}{A}$	V_{const} - the volume of resources constantly used; A - total amount of work
13	Production prime cost	$PC_{pr} = \frac{O}{A} \cdot \frac{1}{P_{avr}}$	O - output in monetary terms; A - the total amount of works; P_{avr} -average sale price 1 sq. m of accommodation in the local market
14	Production quality	$Q_{pr} = 1 - \frac{CFG + WC}{O}$	CFG - cost of faulty goods; WC - defects liquidation costs, hidden faulty finished products, *i.e.* warranty costs

Source: Ma, Lei, and Cai (2015), Siskina, Ala, Juodis, Arvydas, and Apanaviciene (2009), Testa, Iraldo and Frey (2011).

3. The result of the experiment

Multiple regressions are designed to analyze the relationship between several independent variables and one dependent variable. Based on the survey the profitability of production was chosen as a dependent (resulting) variable. According to the majority of respondents, it is the key indicator of competitiveness and "survival" of the enterprise. Due to the fact that there is a need to determine the influence of several factors, there was developed a multi-factor model in Microsoft Office.

Table 2 - Observation data for regression model calculation

	LLC "Arctica-Chelyabinsk	LLC "DCS-9"	LLC "CFCC"	LLC "Electron-M"	LLC "BCD-28"	LLC "DorStroyServis"	LLC CC "Megapolis"	LLC "RSD Inginiring"	LLC "Stroykomplekt"	LLC "Stroyotryad"	LLC "GRINVILL"	LLC "BrikMaster"
Labour productivity	132.88	50.45	120	141.75	169.05	85	69	97	105.6	81	110.4	155
Sales profitability	0.063	0.013	0.12	0.2625	-0.039	0.1	0.068	-0.02	0.05	0.15	0.1088	0.04
Product profitability	0.073	0.013	0.133	1	-0.04	0.4	0.076	-0.024	0.06	0.608	0.1216	0.03
The level of basic production assets use	0.95	1.17	0.95	0.3	1	0.3	0.546	0.6	0.67	0.202	0.8736	0.95
The load factor of production capacity	0.95	0.6	0.2	0.2	0.27	0.1	0.138	0.15	0.2	0.142	0.2208	0.24
The relative number of enterprise managers	2.1	2.76	20	16.81	22	10.4	11.264	12.67	12	9.606	18.022	20
Equipment supply (technical level of construction machinery and equipment)	0.68	0.13	0.3185	0.35	0.28	0.2	0.182	0.162	0.17	0.2	0.2912	0.26
Power supply (power and efficiency of equipment)	1.579	0.58	3	3.15	3	1.8	1.736	1.796	1.7	1.802	2.7776	2.88
Turnover rate	0.09	0.054	0.02	0.01	0.02	0.01	0.014	0.01	0.01	0.01	0.0224	0.02
Rhythm of work production	1.33	0	0.1785	0.2	0.273	0.15	0.102	0.156	0.1	0.128	0.1632	0.25
Discreteness in the use of resources	0.23	0.867	0.29	0.3	0.25	0.2	0.166	0.142	0.15	0.17	0.2656	0.23
Steady use of resources	0.45	0.98	0.32	0.34	0.2835	0.2	0.184	0.162	0.174	0.19	0.2944	0.26
Production prime cost	17.6	0.35	0.27	0.336	0.22	0.1	0.154	0.126	0.138	0.192	0.2464	0.2
Production quality	0.993	0.984	0.014	0.028	0.02	0.01	0.008	0.01	0.012	0.016	0.0128	0.02

Then the correlation matrix was calculated to quantify the relationship between the production profitability and independent factors that are listed in the table. The correlation matrix is presented in Table 3.

The analysis of correlation coefficients showed that the correlation of production profitability (p. 3) demonstrates a strong connection with sales profitability (p. 2), a significant relationship with the level of the use of fixed assets (p. 4) and an extremely weak connection with a relative number of enterprise managers (p. 6); both positive and negative connections, i.e. with an increase (decrease) of each of the independent factors the profitability increases (decreases) depending on the factors. The correlation matrix shows possible as follows: reverse noticeable interconnection, close to a strong kind of connection between independent factors; moderate reverse connection; a noticeable interconnection. On the basis of the obtained results and on the basis of correlations the following indicators were consistently excluded from the matrix: the level of fixed assets use and the load factor of the capacity of a construction company. The result of the command “Regression” is presented in Figure 1.

Having analyzed the regression statistics, it is worth noting that the value of the determination coefficient $R^2 = 0.99645$ shows that the changes of a dependent factor by 99% can be explained due to variability in the total of considered independent factors. The remaining 1% includes other factors that are not considered in the model (*e.g.*, level of the use of fixed assets, the load factor of production capacity, etc.).

Results

Regression statistics	
Multiple R	0,998226944
R-squared	0,996457031
Standardized R-squared	0,990256836
Standard error	0,030923766

Variance analysis

	df	SS	MS	F	F value
Regression	7	1,075811079	0,153687297	160,7138164	9,82694E-05
Excess	4	0,003825117	0,000956279		
Total	11	1,079636197			

	Coefficients	Standard error	t-statistics	P-Value	Low 95%	High 95%	Low 95,0%	High 95,0%
Y-intersection	0,041059299	0,040680714	1,009306255	0,369924126	-0,07188847	0,154007069	-0,071888471	0,154007069
Relative number of enterprise	-0,113542507	0,008704831	-13,04361968	0,000199402	-0,13771099	-0,08937402	-0,137710993	-0,089374021
Equipment supply (technical le	13,77708736	1,251390407	11,00942382	0,000386879	10,30267059	17,25150413	10,30267059	17,25150413
Turnover rate	-7,675145645	4,634535341	-3,656076625	0,173047772	-20,5426786	5,192387316	-20,54267861	5,192387316
Rhythm of work production	2,194549059	0,366553043	5,986989067	0,003913546	1,176834658	3,21226346	1,176834658	3,21226346
Discreteness in the use of resc	-7,252848153	1,30379678	-5,562867054	0,00511379	-10,8727683	-3,63292797	-10,87276834	-3,632927965
Production prime cost	-0,864084498	0,100763956	-8,575333204	0,001015701	-1,14385009	-0,58431891	-1,143850091	-0,584318906
Production quality	5,589071712	0,894938527	6,245201811	0,003350829	3,104324019	8,073819406	3,104324019	8,073819406

Figure 1 - The result of Regression command

Table 3 - Correlation matrix

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14
P1	1.0000													
P2	0.0114	1.0000												
P3	0.0236	0.9008	1.0000											
P4	0.2286	-0.5911	-0.7446	1.0000										
P5	0.0715	-0.2075	-0.2649	0.5589	1.0000									
P6	0.6439	0.0759	0.0291	0.0461	-0.6156	1.0000								
P7	0.5232	0.2084	0.0774	0.2155	0.6956	-0.1484	1.0000							
P8	0.7917	0.3416	0.2613	-0.0343	-0.3998	0.9066	0.2270	1.0000						
P9	0.0246	-0.2124	-0.3052	0.5725	0.9883	-0.6156	0.7019	-0.4016	1.0000					
P10	0.3863	-0.0439	-0.1120	0.2320	0.7877	-0.3640	0.9346	-0.0431	0.7922	1.0000				
P11	-0.3552	-0.1142	-0.1020	0.5193	0.4360	-0.3620	-0.1579	-0.4208	0.4241	-0.1761	1.0000			
P12	-0.2893	-0.1320	-0.1387	0.5788	0.6461	-0.4852	0.0644	-0.4682	0.6326	0.0707	0.9680	1.0000		
P13	0.2056	-0.0464	-0.1277	0.2427	0.8589	-0.5342	0.8869	-0.2244	0.8650	0.9781	-0.0560	0.1940	1.0000	
P14	-0.2249	-0.2138	-0.2322	0.5104	0.9361	-0.7645	0.4430	-0.6218	0.9285	0.5611	0.6624	0.8222	0.6843	1.0000

A multiple correlation coefficient R = 0.99822 indicates that the correlation or connection between the size of the predicted (calculated by regression equation) value of a dependent factor, *i.e.* production profitability and a linear combination of all the independent factors is considered to be close. The value in the line "Standard error" describes the size of a typical deviation of the observed values from the regression line, *i.e.* the range of product profitability varies from the predicted (calculated) values by ± 0.03. When analyzing the multi collineation its possible existence was revealed, which proves the fact that there is some interconnection between independent factors. The same conclusion was made when analyzing the correlation matrix. The coefficients of revealed correlations are smaller than the value of the multiple correlation coefficient R = 0.99822, the multi collineation phenomenon will be considered to be non-important and none of the independent factors will be removed from the model. The regression equation is as follows (standard errors are listed in brackets):

$$Y = 0.041 + (-0.113 \times X_1) + (13.77 \times X_2) + (-7.675 \times X_3) + (2.194 \times X_4) + (-7.252 \times X_5) + +(-0.864 \times X_6) + (5.589 \times X_7) \quad (1)$$

The analysis of regression coefficients values and their standard errors (t-statistics) allows drawing a conclusion about the importance of all the variables in the coefficients equation, as they have bigger values than their standard errors. Regression coefficients show the dependence of the value of the dependence indicator on the increase of the factor indicator per unit. Thus, with the production profitability increase per unit, a relative number of managers of the enterprise decreases by 0.113 units, the equipment supply (technical level of construction machinery and equipment) increases by 13.77 units, turnover rate decreases by 7.675 units, rhythm of production increases by 2.194 units, discreteness of resource utilization reduces by 7.252 units, production prime cost decreases by 0.864 units, production quality decreases by 5.589 units. The free member value 0.041 shows the total influence of other factors.

Thus, the regression analysis calculations contradict basic hypotheses that were formulated at the preparation stage:

Hypothesis 1: All 10 indicators affect the competitiveness of the enterprise differently. Connections are both positive and negative, *i.e.* with an increase (decrease) in the value of each of the independent factors production profitability increases (decreases) depending on the factors.

Hypothesis 2: Correlation matrix revealed possible: reverse noticeable interconnection close to a strong kind of connection between independent factors; moderate reverse connection; a noticeable interconnection.

Hypothesis 3: Based on the survey the production profitability was chosen as a dependent (resulting) variable. According to the majority of respondents, it is a key indicator of competitiveness and "survival" of the enterprise.

Conclusion

In the resulting regression equation, there are indicators with negative coefficients which prove a reverse connection between the independent variable and the resulting one. Indicators with the highest negative values are the turnover rate (-7.675) and discretion in the use of resources (-7.252). This means that it is necessary for a construction company in its activity to pay special attention to these indicators because they are very sensitive to changes and can seriously reduce the outcome (result) indicator of the competitiveness that is the production profitability. According to the regression equation, the equipment supply with 13.77 coefficient influences the production profitability most. It is the improvement of the technical level of construction machinery and equipment that can significantly increase the production profitability.

Summarizing the study, it should be noted that the calculated regression equation allows us to objectively evaluate the competitive position and the competitiveness of the construction enterprise in general, as well as to identify its strengths and weaknesses. An adequate assessment of the competitive position and competitiveness shows the real condition of an object under the research, which eventually helps to choose the right strategy for further development.

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Offshoring Intensities and Skill Upgrading of Employment in the Slovak Republic

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Abstract:

Offshoring representing one of the main characteristics of the current stage of globalization contributed to reduction of the demand for relative unskilled workers resulting in falling wages of unskilled labor in developed countries. The shift away from low-skilled workers is driven by offshoring to Central and Eastern Europe (CEE) countries However, the Slovak Republic, like other European countries experienced considerable skill upgrading of employment over past decade. The study of intertemporal sectorial development of employment and growth rate of person engaged clearly indicates a change in the structure of employment. Therefore, it is interesting to examine how offshoring and domestic outsourcing influences these trends. In order to estimate the impact of offshoring on skill structure of labor demand in the Slovak Republic the system of cost share equations will be derived from translog cost function. The equations for different cost shares are estimated using seemingly unrelated regression (SUR). Our results indicate that offshoring contribution to the change of employment share in case of low and medium skill-levels was negative while positive for high-skilled labor demand.

Keywords: offshoring, outsourcing, employment, translog cost function, skill level.

JEL Classification: J31, F14, F16.

1. Introduction

International fragmentation of production, as a new phenomenon of last few decades, emerged together with intensified distribution of value added within production chains across countries. While the territorial proximity or common trade areas are still considered as crucial determinants of this process, their importance is generally decreasing during the period of the last 15-20 years (Ederer and Reschenhofer 2014). Narrow trade linkages among the Euro Union member countries represent one of the key implications of deeper economic integration in Europe. Intention to examine substantial characteristics of mutual flows of production among individual countries significantly increased since the establishment of the Euro Area due to growing current account imbalances between North and South of the Euro Area (Belke and Dreger 2011). As a result, mutual linkages among national productions can be also examined according to their contribution to external imbalances (Ederer, Reschenhofer 2014). Some authors analyses flow of goods and intermediate goods within the global supply chains, volumes of cross-country flows of production employed in domestic production that is subsequently exported abroad. Relationship between participation of a country in these flows and the overall advancement of the country can be also examined considering the role of regionalism in these production chains with clearly identified regional centers and regional structure (Baldwin and Lopez-Gonzalez 2013). Increasing interdependence associated with international fragmentation of production also affects business cycle synchronization among countries (Ng 2010, Takeuchi 2011, Amighini 2012).

Declining coordination and transport costs caused that production processes increasingly fragment across borders. This fundamentally alters the nature of international trade, away from trade in goods towards trade in tasks and activities, with profound implications for the geographical location of production, the patterns of gains from trade and the functioning of labor markets (Feenstr and Hong 2007).

In this paper, we examine impact of offshoring on skill structure of labor demand in the Slovak Republic, one of the CEE countries. The industry level data indicate considerable skill upgrading of employment over past 14 years. The share of workers with low education has fallen between 1995 and 2009 from 9.5 to 3.8%. There is also evidence of increased offshoring and decreased domestic outsourcing for the Slovak Republic. We estimate the system of cost share equations derived from translog cost function. The equations for different cost shares are estimated using seemingly unrelated regression (SUR). The data covers period 1995-2009 and come from World Input–Output Database (WIOD) database.

The paper is divided into six sections. Following the introduction, the relevant empirical literature is reviewed in Section 2. In Section 3 we provide a description of facts regarding skill upgrading in the Slovak

Republic. In Section 4 we provide a brief overview of model that we employ to examine the impact of offshoring on labor demand. In Section 5 we discuss main results. Finally, concluding remarks are made in Section 6.

2. Empirical literature

The transfer of activities abroad is referred to as offshoring. Offshoring represents one of the main characteristics of the current stage of globalization. It is often felt that whilst offshoring leads to important gains to producers and consumers, the costs appear to fall disproportionately on workers, especially those with low levels of skills. OECD suggests that trade openness is not systematically related to aggregate employment and that increased offshoring may not only represent a shock to which labor markets need to adjust, but may also have an impact on the way labor markets work. Labor demand has become increasingly elastic across a number of countries and the growing practice of offshoring may have contributed to this trend Hijzen and Swaim (2007). The current situation in advanced countries give an impression that firms shifts low-skilled intensive stage of production to low-skilled abundant countries and that offshoring is a cause of rising demand for skilled workers. This could tent to conclusion that offshoring will contribute to reduction of the demand for relative unskilled workers resulting in falling wages of unskilled labor in developed countries Foster- McGregor, Stehrer and de Vries (2013). The studies on the impact of offshoring for individual old EU member states (*e.g.* Belgium, Sweden) confirm that the shift away from low-skilled workers is driven by offshoring to Central and Eastern Europe countries Ekholm and Hakkala (2005) and Hertveld and Michel (2012). Therefore, the conclusion resulting for CEE countries assumed rising demand for low-skilled labor. However, the position of CEE countries as low-skilled and cheap abundant countries has dynamically changed over time.

The WIOD that provides annual time-series of world input-output tables from 1995 onwards and contributes to the revision of the effects of offshoring on labor demand as well. The WIOD provides data on the factor inputs used in production, low, medium and high-skilled workers and capital. Timmer *et al*. 2015 studied the German automotive industry and the effects of offshoring on labor demand. Their findings showed that the decline in domestic value added appears to reflect declining contributions from less-skilled domestic labor, in particularly medium-skilled workers. The value added by domestic capital and high-skilled workers in contrast held up well as their shares did not, or only slightly, decline. The change in the factorial distribution of foreign value added did not mirror these domestic changes. Value added by less-skilled foreign workers increased somewhat but by much less than the decrease in Germany. Obviously, this is due to lower foreign wages, which is an important driver for international production fragmentation. In addition, it might also indicate that activities carried out by these workers are increasingly automated as they are typically routine-based. This hypothesis is buttressed by the finding that the income shares of capital abroad rapidly increased, by more than seven percentage points. Hijzen and Swaim (2007) examined at the implications of offshoring for industry employment. The effects of offshoring on employment are analyzed using industry-level data for 17 high income OECD countries. Their findings indicate that offshoring has no effect or a slight positive effect on sectorial employment. Offshoring within the same industry ("intra-industry offshoring") reduces the labor-intensity of production, but does not affect overall industry employment. Inter-industry offshoring does not affect labor-intensity, but may have a positive effect on the overall employment of industries. These findings (Timmer *et. al* 2015) suggest that the productivity gains from offshoring are sufficiently large that the jobs created by higher sales completely offset the jobs lost by relocating certain production stages to foreign production sites. Similarly, the offshoring effects were examined by Foster- McGregor, Stehrer and de Vries (2013). They studied the link between offshoring and the skill structure of labor demand for 40 countries and 35 industries over period 1995-2009 using data from WIOD. Their results indicate that offshoring has impacted negatively all skill-levels, the largest impact was observed for medium-skilled workers. An evidence of offshoring impact on the skill structure across industries of one country was examined by Hertveld and Michel (2012). They focused mainly on the contribution of offshoring on the fall of the low-skilled workers. The amount of this fall ranged approximately between 24% and 32% during the period 1999-2004. Their estimations show that it is mostly offshoring to Central and Eastern European countries that entails a fall in the low-skilled employment share. Ekholm and Hakkala (2005) searching the evidence for Sweden found that overall offshoring as well as offshoring to low-wage economies tend to shift demand away for workers with upper secondary education. This effect is robust to controlling for offshoring of final goods production. It contrasts with the estimated effect of R&D investments, which tend to shift demand away from workers with lower secondary education and towards workers with tertiary education. On the other hand, they do not found any statistically significant effect of offshoring to high-income countries. They interpret this as evidence of offshoring to high-income countries constituting the main part of measured offshoring from Sweden and being related to a

more general fragmentation of production, rather than as a tendency for labor intensive activities to be re-located in response to labor cost differentials. A decomposition of offshoring to different geographical regions yields results suggesting that the negative effect on workers with upper secondary education is mainly driven by offshoring to Central and Eastern Europe. Los, Timmer and de Vries (2015) analyzed the impact of foreign demand on Chinese employment creation by extending the global input–output methodology. They found that between 1995 and 2001, fast growth in foreign demand was offset by strong increases in labor productivity and the net effect on employment was nil. Between 2001 and 2006, booming foreign demand added about 70 million jobs. These jobs were overriding for workers with only primary education. Since 2006 growth in domestic demand for non-tradable has become more important for job creation than foreign demand, signaling a rebalancing of the Chinese economy.

Lábaj using WIOD investigate the effects of domestic demand on final output and employment in national economies. The small and open countries such as Ireland, Estonia, Malta, the Czech Republic and the Slovak Republic indicated the lowest importance of domestic demand for their output creation. The collapse in international trade due to the economic recession in 2009 led to a substantial increase in domestic demand, particularly in India, Canada, Russia, China, Brazil and the rest of the world. Among the smaller economies, the Slovak Republic was affected significantly, as decline in demand for domestic products in foreign markets led to an increase of output generated by domestic demand for more than 2% (Lábaj, 2013, 2014). Slušná, Balog *et al.* (2015) based on the WIOD analyses states that the absolute number of jobs reduced in the majority of developed countries as well as the share of labor in value added creation decrease. However, the significant changes appeared in the internal structure of the workers. For example, in Germany and France during the period of 1995-2009 the share of high skilled labor in value added creation increased and opposite the share of low-skilled labor decreased. Thus, the loss of jobs occurred mainly in case of low-skilled work positions. In the Slovak Republic, the share of capital and labor in value added creation has unusual unbalanced ratio (capital has unusual high share and labor low share). High share of capital is typical for the electronics industry. This development is related to the massive inflow of foreign capital. In Germany and France, the share of capital in the value added creation declined in favor of work. The high share of high skilled labor on the value added creation is due to the high contribution of the service sector in production of vehicles in France and Germany and conversely, with low share of input from services in the Slovak Republic and other CEE countries. The share of high skilled labor in value added creation in the industry of vehicles production in the Slovak Republic was one of the lowest in the EU. Therefore, the Slovak Republic competed mainly with large stock of (foreign) capital and average high proportion of medium skilled labor. Further development of the automotive industry in the Slovak Republic will have significant effects for the whole economy only if its participation in global value chains will increase.

Habrman (2013) study showed that export of the Slovak Republic in the examined period 1995-2009 generates directly and indirectly approximately 40% of value added and employment in the Slovak Republic. Despite the very high openness of the Slovak economy and regular high growth of exports, GDP and employment is not growing as the economists, politicians and the public would expect. The reason is that the Slovak exports create low value added, which is a serious problem of the Slovak economy. Despite the rising importance of export in the Slovak Republic, most of jobs are created by domestic demand. Employment generated per unit of value added in sectors producing for export corresponds with the sectors producing for the domestic demand. The extremely small proportion of manufacturers of modules and systems compared to the production of finished automobiles is the reason why the share of export on value added is low. The greater part of the value added is generally generated by manufacturers of modules and systems, including the development of those parts. Luptáčik *et al.* (2013) analyzed the Slovak automotive industry and states that one job in car manufacturing bring six additional jobs in the rest of the Slovak economy. In 2012, 9% of total employment in the Slovak economy, direct and indirect depends on the automotive industry. The share of value added generated by the automotive industry in total national value added is over 11%. The value added generated directly by automotive industry is 4%.

The main results of the study suggest that the automobile industry generates directly and indirectly 17% of the Slovak economy gross production and create more than 200,000 jobs (9% of total employment). For comparison, the economic growth sources of Ireland are generated by sectors such as biotechnology, pharmaceuticals, financial services and IT with high and inelastic wages. Even during the crisis, the salaries and labor costs grew (the decline occurred in the public sector). Ireland saved previous economic structural changes - traditional industries such as the manufacture of computers has been moved to cheaper countries. However, the loss of these jobs was offset by growth in the service sector (Brejčák 2016).

3. Skill upgrading - industry level data

The characteristic feature of the Slovak industry is its main orientation on one sector. The share of manufacturing in gross output creation is more than 30% (39% in 1995 and 34% in 2011). The share of this industrial sector in value added creation is around 20%, although comparing years 1995 and 2011, the share decreased by 7% (26% in 1995 and 19% in 2011). The highest shares in value added creation within these sectors was generated by the following divisions: basic and fabricated metal, electrical and optical equipment, transport equipment and food, beverages and tobacco. The second largest share in value added and total output creation generated constructions sector. The share of this sector in value added creation generally increases (5% in 1995 and 9% in 2011).

Table 1 - The share (%) of labor and capital in value added creation for whole industries in the Slovak Republic (1995-2011)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
LAB/VA	37	38	41	41	40	40	38	38	38
CAP/VA	63	62	59	59	60	60	62	62	62
	2004	2005	2006	2007	2008	2009	2010	2011	
LAB/VA	38	39	38	38	38	40	39	39	
CAP/VA	62	61	62	62	62	60	61	61	

Source: WIOD, own calculations

Note: LAB/VA - share of labor in value added creation, CAP/VA - share of capital in value added creation

The vast inflow of foreign direct investments during early 2000s contributed to the overall success of the transition process of the Slovak Republic, while the creation of new jobs was considered as one of the most beneficial side effect. However, these positives effects were associated with increasing demand for medium and low skilled labor and high share of capital in value added creation (Slušná, Balog *et al.* 2015, Habrman 2013). The labor and capital share in value added creation for all sectors in the Slovak Republic during the period of 1995-2011 shown in Table 1, confirm this assumption. However, it is important to note, that this share did not significantly change during monitored 17 years.

Comprehensive industry based investigation reveals interesting changes in the relative importance of labor. The analysis is made for main sectors of industrial classification according to ISIC available in WIOD. The sectorial data covers 35 industries (the WIOD database provides data for 11 sections and 32 divisions see Appendix 1). The development in individual sectors differs from main industry values. Table 2 present cumulated data for 16 basic industrial sectors.

The worst balance for labor share can be observed for construction sector where during 17 years the decline in the labor share is more than 20%. The similar conclusions can be made for the agriculture, hunting, forestry and fishing sector and electrical, optical and transport equipment as well. The capital and labor ratios changed significantly - more than 12% in favor of capital. However, the data for manufacturing as whole sector brings positive information and corresponds to the general industrial trend in the Slovak Republic. The decline of the labor share in value added creation can be seen also in sectors such as Education (-18%) and Renting of m&eq and other business activities (-13%). Contrariwise, the positive development of the labor share can be noticed for retail and wholesale trade and financial intermediation. However, changes in the labor shares in individual sectors also induced changes in the internal labor structure.

The participation in global value chains raises the question whether the employment and created jobs are sustainable. The declining importance of manufacturing in developed OECD countries is often associated with a transfer of low-skilled jobs to CEE countries. The data of employment share for individual industries in Table 4 confirm the dominant position of manufacturing for job creation in the Slovak Republic. However, the intertemporal comparison reveals the decreasing share in total industries employment, though this is not true for division of transport equipment (the key sector of FDI inflow in the Slovak Republic). The growth rates between 1995 and 2011 show that the most jobs are created in sectors: Renting of m&eq and other business activities (such as computer and relative activities, software publishing consultancy and supply, research and development and other business activities) and retail trade. This information is very positive because these sectors create considerable demand for high skilled labor.

Table 2 - The share (%) of labor and capital in value added creation for individual sectors in Slovakia in 1995 and 2011

		1995	2011			1995	2011
Agriculture, hunting, forestry and fishing	LAB/VA	44	28	Retail trade	LAB/VA	38	48
	CAP/VA	56	72		CAP/VA	62	52
Basic metals and fabricated metal	LAB/VA	42	41	Other inland transport	LAB/VA	34	46
	CAP/VA	58	59		CAP/VA	66	54
Manufacturing (total)	LAB/VA	37	41	Financial intermediation	LAB/VA	16	31
	CAP/VA	63	59		CAP/VA	84	69
Electrical and optical equipment	LAB/VA	59	34	Real estate activities	LAB/VA	4	6
	CAP/VA	41	66		CAP/VA	96	94
Transport equipment	LAB/VA	42	30	Renting of m & eq, other business activities	LAB/VA	61	48
	CAP/VA	58	70		CAP/VA	39	52
Electricity, gas and water supply	LAB/VA	20	18	Public admin and defence	LAB/VA	50	52
	CAP/VA	80	82		CAP/VA	50	48
Construction	LAB/VA	55	33	Education	LAB/VA	83	65
	CAP/VA	45	67		CAP/VA	17	35
Wholesale trade and commission trade	LAB/VA	34	41	Health and social work	LAB/VA	57	62
	CAP/VA	66	59		CAP/VA	43	38

Source: WIOD, authors' calculations
Note: LAB/VA - share of labor in value added creation, CAP/VA - share of capital in value added creation

Although the leading employment sector - manufacturing lost the potential of the new job creation, the share of labor in value added formation increased. There has been also significant transformation of internal structure of labor force. For example, the share of high-skilled labor in total labor has increased in manufacturing (1.8%) as well as in all industries (5.4%, see Table 3 - the data are available only until 2009). The highest expansion of high-skilled labor experienced sectors such as Education (14.5%), Public administration (14.9%), Renting of m&eq and other business activities (10.7%) and Real Estate activities (10.7%). Generally, the share of high-skilled labor in manufacturing is only 8.3% compared to Renting of m&eq and other business activities with 42.2%. It can indicate the low share of services in manufacturing. Slušná, Balog *et al*. (2015) state that the share of high-skilled labor in value added creation in manufacturing sector was one of the lowest in the EU. Thus, the Slovak manufacturing sector competitive advantage was represented by the high share of (foreign) capital and average share of medium-skilled labor.

Table 3 - The share (%) of hours worked by high, medium and low skilled labor in individual industries in the Slovak Republic in 1995 and 2009 (share in total hours)

		1995	2009	Δ			1995	2009	Δ
All industries	H_HS	13.4%	18.8%	5.4%	Retail trade	H_HS	7.9%	10.5%	2.6%
	H_MS	77.1%	77.3%	0.2%		H_MS	87.6%	87.5%	-0.1%
	H_LS	9.5%	3.8%	-5.6%		H_LS	4.5%	2.0%	-2.5%
Agriculture, hunting, forestry, fishing	H_HS	8.4%	9.5%	1.1%	Other inland transport	H_HS	5.1%	10.3%	5.2%
	H_MS	70.4%	77.5%	7.1%		H_MS	84.3%	87.5%	3.2%
	H_LS	21.3%	13.0%	-8.2%		H_LS	10.6%	2.2%	-8.4%
Basic metals and fabricated metal	H_HS	6.4%	8.3%	1.9%	Financial intermediation	H_HS	32.9%	37.1%	4.2%
	H_MS	83.5%	87.9%	4.4%		H_MS	66.6%	62.1%	-4.5%
	H_LS	10.1%	3.8%	-6.3%		H_LS	0.5%	0.8%	0.3%
Manufacturing (total)	H_HS	6.6%	8.3%	1.8%	Real Estate Activities	H_HS	31.5%	42.2%	10.7%
	H_MS	83.0%	87.9%	4.8%		H_MS	65.7%	56.3%	-9.4%

		1995	2009	Δ			1995	2009	Δ
	H_LS	10.4%	3.8%	-6.6%		H_LS	2.8%	1.4%	-1.4%
Electrical and optical equipment	H_HS	5.2%	8.3%	3.1%	Renting of m&eq, other business activities	H_HS	31.5%	42.2%	10.7%
	H_MS	84.5%	87.9%	3.4%		H_MS	65.7%	56.3%	-9.4%
	H_LS	10.3%	3.8%	-6.5%		H_LS	2.8%	1.4%	-1.4%
Transport equipment	H_HS	5.2%	8.3%	3.1%	Public admin, defense	H_HS	20.3%	35.2%	14.9%
	H_MS	84.5%	87.9%	3.4%		H_MS	72.8%	60.7%	-12.1%
	H_LS	10.3%	3.8%	-6.5%		H_LS	6.8%	4.1%	-2.7%
Electricity, gas, water supply	H_HS	10.8%	17.3%	6.4%	Education	H_HS	39.1%	53.6%	14.5%
	H_MS	83.4%	80.7%	-2.7%		H_MS	52.5%	42.7%	-9.8%
	H_LS	5.7%	2.0%	-3.8%		H_LS	8.4%	3.7%	-4.7%
Construction	H_HS	5.2%	6.4%	1.2%	Health and social work	H_HS	17.5%	24.0%	6.5%
	H_MS	85.1%	89.3%	4.2%		H_MS	75.2%	70.6%	-4.5%
	H_LS	9.7%	4.3%	-5.4%		H_LS	7.3%	5.4%	-1.9%
Wholesale trade and commission trade	H_HS	7.9%	10.5%	2.6%					
	H_MS	87.6%	87.5%	-0.1%					
	H_LS	4.5%	2.0%	-2.5%					

Source: WIOD

Note: H_HS - share of hours worked by high-skilled labor, H_MS - share of hours worked by medium-skilled labor, H_LS - share of hours worked by low-skilled labor. The data are available only for period 1995-2009.

The qualification structure of selected sectors reported in Table 3 revealed the reduction of hours worked by low skilled workers (-5.6% change for all sectors). The largest decline of this indicator can be seen in the agriculture sector (-8.2%). Agriculture sector experienced negative trend considering the overall labor demand, however, the internal structure of labor shows that the ratio for high and medium skilled labor demand tends to rise. As a result, we suggest that the loss of jobs occurred mainly in low-skilled professions.

Table 4 - The share (%) of persons engaged in total number for individual industries in the Slovak Republic in 1995 and 2011

	1995	2011	Growth rate
All industries	100	100	6,83
Agriculture, hunting, forestry, fishing	9	4	-57
Basic metals and fabricated metal	4	3	-7
Manufacturing (total)	27	20	-21
Electrical and optical equipment	3	3	4
Transport equipment	1	1	24
Electricity, gas and water supply	2	2	-15
Construction	7	9	34
Wholesale trade and commission trade	5	7	61
Retail trade	5	11	112
Other inland transport	5	4	-15
Financial intermediation	1	2	46
Real estate activities	1	1	15
Renting of m&eq and other business activities	5	9	107
Public admin and defence	6	6	8
Education	9	7	-16
Health and social work	6	6	4

Source: WIOD, authors' calculations

The Slovak Republic, like other European countries, experienced considerable skill upgrading of employment over past decade. Examination of intertemporal sectorial development of employment and growth rate of person engaged clearly indicates a change in the structure of employment in the Slovak Republic. The

growth of jobs requiring the medium and high skilled workers increased the demand for high skilled labor and thus it is in contrast with the image of CEE country as a cheap low-skilled production factory. Therefore, it is interesting to examine how offshoring and domestic outsourcing influenced these trends.

4. Model specification

To analyses the effect of offshoring on the skill structure of labor demand we follow the approach that considers the relative demand for labor. Model will be based on translog cost function (see Berndt, Wood 1975) that is frequently used in empirical studies. Instead of estimating the translog cost function directly, we estimate a system of cost share equations derived from it. The translog cost function, so-called flexible functional forms, allows substitution elasticities to be unrestricted and they should not even be constant. Cost minimizing relative input demands may depend on the level of output.

Denoting C as total variable costs, w_i represents wages for different skill types and prices of material that are optimally selected for $i = 1,...,M$, x_k represents fixed inputs and outputs (fixed input capital K and gross output Y), z represents proxies for technological change, O represents offshoring and DO represents domestic outsourcing (quasi-fixed). The general formulation of the translog cost function is as follows (Foster-McGregor *et. al* 2013):

$$\ln C = \alpha_0 + \frac{1}{2}\sum_{i=1}^{M}\alpha_i \ln w_i + \sum_{k=1}^{K}\beta_i \ln x_k + \sum_{y=1}^{Y} y_y z_y + \frac{1}{2}\sum_{i=1}^{M}\sum_{j=1}^{M}\gamma_{ij}\ln w_i \ln w_j + \frac{1}{2}\sum_{k=1}^{K}\sum_{l=1}^{K}\delta_{kl}\ln x_k \ln x_l + \frac{1}{2}\sum_{y=1}^{Y}\sum_{p=1}^{R} y_{yp} z_y z_p + \frac{1}{2}\sum_{i=1}^{M}\sum_{k=1}^{K}\theta_{ik}\ln w_i \ln x_k + \frac{1}{2}\sum_{i=1}^{M}\sum_{y=1}^{Y}\delta_{iy}\ln w_i z_y + \frac{1}{2}\sum_{k=1}^{K}\sum_{y=1}^{Y}\delta_{iy}\ln x_k z_y \quad (1)$$

Taking first derivatives of the cost function with respect to wages and material we obtain $\frac{\delta \ln C}{\delta \ln w_i} = \left(\frac{\delta C}{\delta w_i}\right)\left(\frac{w_i}{C}\right)$ where $\left(\frac{\delta C}{\delta w_i}\right)$ represents the demand for input i. Differentiating the translog cost function (1) with respect to input prices we obtain a set of N cost share equations of the form:

$$s_i = \alpha_i + \frac{1}{2}\sum_{j=1}^{M}\gamma_{ij}\ln w_j + \frac{1}{2}\sum_{k=1}^{K}\theta_{ik}\ln x_k + \frac{1}{2}\sum_{y=1}^{Y}\delta_{iy}\ln z_y, \quad i = 1,...,M \quad (2)$$

Taking differences between two periods the equations for wage shares of different labor skill and material in industries $n = 1,...,N$ become:

$$\Delta s_i = \alpha_0 + \sum_{j=1}^{M}\gamma_{ij}\ln w_j + \theta_K \Delta \ln K + \theta_Y \Delta \ln Y + \delta_O \Delta \ln O + \delta_{DO}\Delta \ln DO + \varepsilon_i \quad (3)$$

Instead of estimating the translog cost function directly, most authors estimate the system of cost share equations because the number of parameters to be estimated is lower (Hertveldt, Michel 2012). Specification of our model follows approach employed by Foster-McGregor *et. al* (2013) and Hertveldt, Michel (2012) that considers labor and material inputs to be flexible and other inputs to be quasi-fixed. Dependent variables in the model are represented by the shares of each labor type on total variable costs. Total variable costs are calculated as the sum of total labor compensation plus the value of intermediate input purchases.

The source of data is the WIOD database consisting of a complete dataset for 35 industries over the period of 1995-2009. When examining effects of offshoring and domestic outsourcing the WIOD data allows to measure the intermediate input purchases by each industry from each industry. Foster-McGregor *et. al* (2013) distinguish between narrow and broad offshoring considering imported intermediates in a given industry from the same industry and imported intermediates from all industries. In our analysis, we consider a broad measure of inter-industry offshoring O calculated as:

$$O_n = \frac{\sum IIM_n}{V_n} \quad (4)$$

where: IIM refers to imported intermediate purchases from industry; n is the industry index; V refers to value added.

Measures of domestic intermediate use DO are constructed in a same manner:

$$DO_n = \frac{\sum DIM_n}{V_n} \quad (5)$$

where: DIM stands for domestic intermediate purchases; n is the industry index; V refers to value added.

Domestic intermediate use or domestic outsourcing can capture efficiency gains due to a reallocation of production within industries in a country while international offshoring capture efficiency gains due to fragmentation and includes industry specialization across borders.

Data for labor is split into three different skill categories (low, medium and high skilled) according to ISCED classification. The average wages by education level are calculated as the ratio of labor compensation for each labor skill type to the total hours worked of each labor skill type (according to Foster-McGregor *et. al* 2013). The values for gross output and capital stock are available directly from the WIOD.

The cost functions are estimated as a system of demand equations for all variables. The complete system of equations is estimated using seemingly unrelated regression (SUR) method.

5. Results and discussion

Examination of offshoring is obviously focused on trade in intermediates in one way or another. The main drawback of focusing on trade in intermediates is that one necessarily excludes the offshoring of assembly activities. In line with many previous papers (*i.e.* Hijzen and Swaim 2007, Foster-McGregor *et al.* 2013) we will also focus on trade in intermediates. We measure offshoring by focusing on the foreign content of production using the ratio of imported intermediates (using the import-use matrix) to value-added.

Table 5 - Levels of offshoring, outsourcing and cost shares

	O	DO	S_{LS}	S_{MS}	S_{HS}	S_{II}
1995	0.38	1.57	1.27%	13.94%	3.91%	80.89%
1996	0.43	1.13	1.23%	13.89%	3.94%	80.95%
1997	0.42	1.14	1.27%	14.57%	4.10%	80.07%
1998	0.45	1.14	1.23%	14.33%	4.07%	80.37%
1999	0.42	1.10	1.04%	14.73%	4.18%	80.04%
2000	0.52	1.09	0.81%	14.12%	4.18%	80.89%
2001	0.56	1.03	0.75%	13.99%	4.06%	81.20%
2002	0.55	1.03	0.66%	14.15%	4.03%	81.17%
2003	0.57	1.00	1.02%	13.79%	4.01%	81.18%
2004	0.56	0.88	0.62%	14.30%	4.91%	80.17%
2005	0.57	0.86	0.55%	14.11%	5.50%	79.85%
2006	0.63	0.85	0.53%	13.38%	5.43%	80.66%
2007	0.62	0.49	0.53%	13.82%	5.09%	80.56%
2008	0.59	0.90	0.63%	13.52%	5.22%	80.63%
2009	0.46	0.90	0.64%	14.96%	6.16%	78.24%

Source: WIOD, authors' calculations

Note: O = offshoring (constant), DO = domestic outsourcing (constant), s = cost share (wage shares of different labor skill types and materials)

In order to investigate the impact of offshoring and domestic outsourcing on the skill structure of Slovak industries we will limit our analysis to aggregate data for all sectors. Table 5 reports initial and final levels (*i.e.* 1995 and 2009) of offshoring as well as cost shares. As expected, the value of domestic intermediate use is larger than imported intermediate use. The study of the evolution between 1995 and 2009 reveals increasing trend of offshoring and vice versa decreasing trend of domestic outsourcing on the value added creation. According to Foster-McGregor *et al.* (2013) the offshoring ratios tend to be larger in smaller and open economies.

This is confirmed for the Slovak republic with average offshoring rate of 0.52 (for example the offshoring ratio for all sectors in USA is around 0.05 and in Germany 0.09 (Foster-McGregor *et a.* 2013). The cost shares S_i reflect the payment to factor i relative to total costs representing wage share of different labor skill types and materials in total variable costs. The sum of shares is equal to 1 (100%).

The results in Table 5 reveal that the cost shares of low-skilled labor and materials have declined over the period with those of high and medium-skilled labor increasing. The high percentage of material costs (average 80%) confirms the largest portion of intermediates in total variable costs due to the dominance of capital in the value added creation (for example the share of material in total variable costs in 1995 was 62% in Germany, 66.4% in France, 64% in USA and 71% in Poland (Foster-McGregor *et al.* 2013)

In Table 6 we provide some summary statistics on average growth rates of all variables included in the analysis. The cost shares of low skilled labor have declined while for medium and high-skilled labor cost share we observe positive growth rates. The positive growth in the labor compensation per hour tends to be higher for all labor types than for materials. The similar results are found when we consider the quantity of fixed inputs that increased significantly. The average growth rate of offshoring and domestic outsourcing differ. The growth rate of domestic outsourcing has slowly declined while offshoring gradually increased.

Table 6 - Descriptive statistics - Average growth rates of variables 1995-2009

Sample: 1995 2009					
Cost shares	Mean	Maximum	Minimum	Std. Dev.	Observations
ΔS_{LS}	-0.026951	0.557217	-0.398055	0.215341	15
ΔS_{MS}	0.005837	0.106090	-0.051102	0.041599	15
ΔS_{HS}	0.035907	0.225563	-0.063174	0.082395	15
Flexible factor prices					
Δw_{LS}	0.130975	0.814406	-0.356065	0.243276	15
Δw_{MS}	0.093979	0.183176	-0.006014	0.044501	15
Δw_{HS}	0.096557	0.255284	-0.027900	0.074542	15
Δw_{II}	0.084959	0.170924	-0.139479	0.077586	15
Fixed input and output quantities					
ΔK	0.087211	0.151230	-0.089654	0.055472	15
ΔY	0.086857	0.153533	-0.107518	0.063571	15
Offshoring and domestic outsourcing					
ΔO	0.020114	0.213247	-0.221574	0.104198	15
ΔDO	-0.008605	0.858377	-0.431243	0.280492	15

Source: WIOD, authors' calculations

According to equation (3) the whole industry results will be discussed. In general, offshoring should have a negative effect on the labor-intensity in an industry (the technology effect), but a positive effect on the level of output, due to the productivity gains from offshoring (the scale effect), so that the overall effect is ambiguous (Hijzen and Swaim 2007). The respective estimation results using SUR technique for each of the labor cost shares are shown in next table.

The results in Table 7 give mixed set of coefficients. The own-wage coefficients are found to be positive and significant for low and medium-skilled labor but insignificant for high-skilled labor. The medium-skilled wage impacts negatively upon the cost shares of high-skilled labor. The other coefficients tend to be insignificant. The price of intermediates has a strong and negative impact on the cost share of high-skilled labor and negative but insignificant effect on low-skilled labor cost share, suggesting that materials are substitutes for this type of labor but has the negative impact on high-skilled labor. These results for high-skilled labor correspond to Foster-McGregor *et al.* (2013). Our results indicate the strongest effect of material price change upon the labor cost shares.

The cost share of all three types of labor is decreasing in capital. The impact of output growth is positive for the low and high-skilled labor and negative upon the medium-skilled labor. The coefficient of output effect reveals the most significant and strongest impact on the change of high-skilled labor cost share.

The results suggest that offshoring has reduced demand for low and medium-skilled labor contrary to high-skilled labor. Domestic outsourcing has also negative effect on low and medium-skilled labor demand and positive effect on high-skilled labor. Interestingly, the offshoring impact coefficient is largest in absolute value for high-skilled labor as well as domestic impact coefficient. We suggest that the high-skilled labor have been the most significantly affected by international offshoring and domestic outsourcing. The coefficients for low-skilled labor in both offshoring and domestic outsourcing were found as insignificant.

Table 7 - SUR results – the full sample of industries

	ΔS_{LS}	ΔS_{MS}	ΔS_{HS}
Δw_{LS}	0.716760***	-0.014639	-0.045926
	(0.228946)	(0.033121)	(0.074639)
Δw_{MS}	-1.199389	0.429321***	-1.127491***
	(0.977984)	(0.141480)	(0.318835)
Δw_{HS}	-0.768684	0.038945	0.216149
	(0.688674)	(0.099627)	(0.224516)
Δw_{II}	-6.144889	0.136174	-14.08250***
	(5.740619)	(0.830467)	(1.871515)
ΔK	-3.673386*	-0.154096	-3.453205***
	(1.893873)	(0.273977)	(0.617427)
ΔGO	10.35747	-0.393331	18.51767***
	(7.913642)	(1.144827)	(2.579948)
ΔO	-0.117688	-0.255077***	0.676072***
	(0.533673)	(0.077204)	(0.173984)
ΔDO	-0.059728	-0.047849**	0.122468***
	(0.133451)	(0.019306)	(0.043507)
Constant	8.718654	5.810370	0.801124
R-squared	0.969625	0.918925	0.983749

Source: authors' calculations

Note: The set of equations are estimated by SUR, standard errors are reported in parentheses. ***, **, * - results are significant at 1, 5 and 10 percent respectively.

Overall findings indicate that the low-skilled labor share was mostly influenced by changes in material prices and capital (negatively) and gross output (positively). The medium-skilled labor share was mostly affected by the changes in own wages (positively) and offshoring (negatively). Finally, the main influence on high skilled labor share was observed in case of output (positive) and material prices (negative) change. Interestingly, all significant coefficients for high and low-skilled labor shares in absolute value are largest than for medium-skilled labor. We also suggest that the differences between the output determine the low and high-skilled labor share. It indicates that the output growth had the higher effect on high-skilled labor demand.

Generally, our results indicate high importance of offshoring on labor demand with stronger impact than domestic outsourcing. It is interesting to note that the impact of offshoring differs as it seems to be positive for the high-skilled labor demand and negative for the medium-skilled labor. In the section 3 we have suggested that the share of high as well as medium skilled labor in total labor force has increased over time. However, the change of high-skilled labor share was more significant (5.4%) than the medium-skilled labor change of share (0.2%). Offshoring could have play important role on this process. The positive influence of offshoring on high-skilled labor demand corresponds to the findings of Foster-McGregor *et al*. (2013). Their results confirmed negative effect of offshoring as well as domestic outsourcing on all types of labor demand. However, more detailed

examination of this issue would require longer time dataset. When consider the regression coefficients the results showed that the medium-skilled labor was affected the most by offshoring. Such result is consistent with Foster-McGregor *et al.* (2013).

Conclusion

Offshoring is frequently used for explanation of employment upgrading and a reason for reduction of the demand for relative unskilled workers. The main objective of this paper was to examine how offshoring and domestic outsourcing affects the trends in labor demand over the period 1995-2009. The offshoring intensities was computed as the share of imported intermediate in value added creation and domestic outsourcing as the share of domestic intermediate use in value added. A system of cost share equations derived from translog cost function was estimated using SUR technique.

The Slovak Republic, like other European countries, experienced considerable skill upgrading of employment over past decade. The study of intertemporal sectorial development of employment and growth rate of person engaged clearly indicates a change in the structure of employment in the Slovak Republic. The growth of jobs requiring the medium and high skilled workers increases the demand for high skilled labor.

According to the results of the estimations for all sectors, the contribution of offshoring to the change of employment share in case of low and medium skill-levels was negative while it seems to be positive for high-skilled labor demand. When consider the regression coefficients the results showed that the medium-skilled labor was hit hardest by offshoring. The coefficient for low-skilled labor for both offshoring and domestic outsourcing we found insignificant.

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APPENDIX 1

Table 8 - Industry classification in WIOT

Industry Name	ISIC Code
TOTAL INDUSTRIES	TOT
AGRICULTURE, HUNTING, FORESTRY AND FISHING	AtB
MINING AND QUARRYING	C
FOOD, BEVERAGES AND TOBACCO	15t16
Textiles and textile	17t18
Leather, leather and footwear	19
WOOD AND OF WOOD AND CORK	20
PULP, PAPER, PAPER, PRINTING AND PUBLISHING	21t22
Coke, refined petroleum and nuclear fuel	23
Chemicals and chemical	24
Rubber and plastics	25
OTHER NON-METALLIC MINERAL	26
BASIC METALS AND FABRICATED METAL	27t28
MACHINERY, NEC	29
ELECTRICAL AND OPTICAL EQUIPMENT	30t33
TRANSPORT EQUIPMENT	34t35
MANUFACTURING NEC; RECYCLING	36t37
ELECTRICITY, GAS AND WATER SUPPLY	E
CONSTRUCTION	F
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	50
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51
Retail trade, except of motor vehicles and motorcycles; repair of household goods	52
HOTELS AND RESTAURANTS	H
Other Inland transport	60
Other Water transport	61
Other Air transport	62
Other Supporting and auxiliary transport activities; activities of travel agencies	63
POST AND TELECOMMUNICATIONS	64
FINANCIAL INTERMEDIATION	J
Real estate activities	70
Renting of m&eq and other business activities	71t74
PUBLIC ADMIN AND DEFENCE; COMPULSORY SOCIAL SECURITY	L
EDUCATION	M
HEALTH AND SOCIAL WORK	N
OTHER COMMUNITY, SOCIAL AND PERSONAL SERVICES	O
PRIVATE HOUSEHOLDS WITH EMPLOYED PERSONS	P

Economic Practicability Substantiation of Financial Instrument Choice

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Abstract:

When forming investment portfolio of a sovereign fund it is very important to choose the goals which allow taking into account any risks, preferences and restrictions, principles and financial instruments which consider the requirements to the portfolio managers. While substantiation of regulation about the risk level reduction by investment fund portfolio diversification there is developed a hypothesis.

The portfolio modern theory defines the practicability of operations with financial assets by two interrelated characteristics "profitability – risk". To decrease the characteristics of risk there are implemented investment decisions which consider portfolio diversification taking into account redistribution of invested sum between different kinds of assets. But for all that it is possible to consider the following statement to be wrong: if every portfolio asset is determined by dispersion of profitability, then the profitability of the portfolio has dispersion which depends on its composition. On this hypothes is there is developed an assumption: while portfolio forming, an investor can choose any combination of investment decisions, whereby expected return and standard derivation (risk) of the portfolio are the best. To proof it there were carried out researches of used financial instruments diversification (three groups): assets of the biggest world companies which are in the rating FT Global 500, precious metals which have London Gold Market Fixing Ltd. quotations and property in Germany, Russia, Spain, Switzerland and the USA. Structured common portfolio of investment fund on financial assets of three groups corresponds to profitability rate 4,18% from the biggest world companies shares, 0,13% from gold and 0,82% from property in Germany. Criteria of accepted risk vary from 0,093535962 to 0,006718239 and fulfill conditions of efficient equity frontier parameter adherence.

The most important factor while estimation of sovereign funds management is the principle of maximum actions transparence. At the same time, it has to be implemented to all kinds of world sovereign funds. In the world economy, the majority of investment transactions are imposed by revenue-based levy (capital gain), thereby it increases operational expenses, besides levy can influence expected profitability level of investors. The differences in assets levy in different countries stimulate investors to choose the portfolios with grace variant of levy.

Keywords: investment assets of sovereign fund, revenue-based levy, profitability of financial instruments, global economics, investment policy.

JEL Classification: O47, P45, P47.

1. Introduction.

Specific conglomerates represented by banks, trade and manufacturing corporations, insurance companies are principal members of international financial markets. The most popular are represented as hedgefunds which are like private investment funds. The peculiarity of their functioning is the absence of statutory regulation or subjection to weaker regulation from the government, inaccessibility for general public. As a rule, such funds service very prosperous clients who manage the money of qualified investors, their bankruptcy doesn't cause serious negative social consequences. That's why these organizations are free from the majority of financial regulation standards and use almost unlimited financial instruments and risky investment, arbitral and speculative strategies in their policy.

Sovereign funds (funds of national welfare) are a specific group of international financial market participants. Such funds are created in countries with stable trade balance surplus which is connected with export of hydrocarbon (Norway, Russia, Saudi Arabia, the United Arab Emirates) or non-raw material export (Chinese People's Republic, Singapore, Australia) for further investment including foreign assets. Such funds are created for the following aim: to make a financial "safety bag" for the government while the decrease of world prices on export goods or the demand on them and also to prevent economically unjustified strengthening of national currency which can lead to the imbalance of economy in the country.

According to their policy sovereign funds adhere to different strategies in order to fulfill investment portfolio diversification. Some funds adhere to conservative policy of money investment by way of investment in reliable bonds and less by way of investment in the biggest companies' assets. Other sovereign funds use more aggressive investment policy and invest in different financial instruments of not so big companies, property and hedgefunds.

It's necessary to note that the theory of portfolio investment was worked out for the first time in the 50^{s} of the 20th century. Using mathematical algorithm Markowits Harry M. defined the most profitable ways to register the assets portfolio structure and to minimize its cost in accordance with expected risk value or to minimize the risk with prescribed value of expected return (with risk tolerance) which is comfortable for an investor.

Grounding on the hypothesis of effective market building Sharpe William F., an American economist, formed an assumption that market factors have an influence on financial instruments profitability. In this connection being the adherent of passive investment he defined the following regularity. It isn't possible to get excess profit on effective market thus it makes any investment portfolio management not useful and effective by investment first of all in share investment funds. A worked out, capital asset pricing model (CAPM) is a theoretical base for future profitability of fund asset portfolio forecasting. However, the use of such model has a number of restrictions. Particularly the influence of financial non-transparency of market is not taken into account. Thus Richard Roll, an economist, was sure that it isn't possible to examineCAPM model as nobody can really observe expected return but only its average value. It isn't possible to get to know if the proportion in the model is really right. At the same time, there are zero transaction costs and zero levy rates in CAPM model. Also, every transaction is followed by expenses, in particular by transaction costs. Using CAMP model, it is meant that an investment isn't imposed by levy and the levy doesn't influence investment.

However, in the world economy the majority of investment transactions are imposed by levy (capital increase) thereby it increases operational expenses. More than that the levy can influence expected level of return for an investor. The differences in assets levy in different countries stimulate investors to choose portfolios with grace variant of levy.

In the theory of random processes investment economists John C. Cox, Jonathan E. Ingersoll Jr., Stephen A. Ross concluded analytical forms of rational investor behavior characteristics taking into consideration the factor of random interest rate or project costs on the assumption that other parameters are constant. The sense of this model is that an investor at a starting moment t invests 1 dollar in order to get 1 dollar in real terms at moment $t + T$. Thus, financing of one project doesn't influence other investment projects or potential investor's possibilities.

All mentioned models are the most important developing stages of the theory about the high possibility to model and foresee investment portfolio structure of sovereign fund. At the same time the majority of investment decisions are based on the following basic assumptions:

- investments are often fully or partially irrevocable if an investor in any period of time after the beginning of the investment process wants to return invested money;
- the value of expected reward in invested money isn't specified. In this case an investor can get probabilistic characteristics which can influence investment attractiveness of an investment portfolio;
- investors have certain freedom of time in relation to decision-making time in the exercise of investment process, or they can put it aside till the moment they get additional information which will be available in the future.

2. Concept headings

While forming investment portfolio of sovereign fund a very important thing is the procedure of declaration making which is a conceptual issue of the goals correspondence, it takes into account the majority of important risks, preferences and restrictions, principles and financial instruments taking into consideration necessary requirements to profile managers. It's necessary to note that usually the provision of investment declaration are the following policy elements which are directed to:

- clear understanding while forming of investment declaration strategy; it allows an investor to understand the goals and frameworks in which he/she acts due to accepted restrictions;
- continuity of sovereign fund investment portfolio management and prevention of frequent plan reconsideration by investors, and consequently of the main goal in spite of external and internal circumstances;
- defining of productivity measures in investment strategy, establishment of "standard" profitability of benchmark depending on which profitability of the managers is altering;
- reliability, *i.e.* prevention of inappropriate investment fulfillment or the managers' non-ethical behavior.

It's necessary to distinguish the following principles of investment declaration forming.

Firstly, a declaration helps an investor to establish a realistic, achievable goal while researching and examination of financial market and investment risks in practice.

Secondly a declaration is a start which gives an opportunity to estimate management efficiency by investor's money from the manager's side.

Thus, the main investor's goals should be expressed in risk concept as well as in concept of profitability, because the value of profitability which is expected by an investor is proportional to the risk value while decision-making. If a manager doesn't take into account risk in consideration of profitability he/she can form unacceptable enclosures. Particularly if an investor is trying to avoid risky investments but at the same time establishes for a manager a goal to reach maximum value of profitability then the possibility that the investor will take losses is very high. So, the investor has to work out the problem of risk value and readiness value for it and to establish objective profitability for the manager.

One of the significant parameters which are taken into account in investment declaration is a factor of investor's fund management. Portfolio manager can manage the investor's fund actively or passively.

Active portfolio fund management means that a specialist thanks to his/her experience and skills, is trying to surpass an established target return rate of investment instruments. At the same time this management form means more expenses from the investor's side, as active management requires more commission services, provision with information and expanded horizon of the global situation vision on financial market.

In its turn, passive management is focused on a specialist's observation position because an investment is aimed to get certain profitability. Particularly if target profitability is the index of a particular stock market then specialist byes shares in companies (in his/her portfolio) in the proportion in which they are contained in the index. Using passive management an investor gets market profitability taking into account commission costs and levy. In this case, there is practically no additional risk which is different to current market risk.

For a quantitative description of how the profitability from fund assets management differs from its target rate of return (benchmarks) there is used an index which is called "tracking error" and is a standard derivation of factual profitability from the market profitability for a specified period of time. By assessment of the factor which testifies that free market is developing better and that additional profitability is added to the base value there is used information ratio which shows what additional profitability portfolio management brings taking into account

additional risk which amounts to 1% from the derivation from the level of target portfolio profitability. Information ratio calculates by the following formula:

$$IR = \frac{R_f - R_b}{TE} \quad (1)$$

where: TE – tracking error; R_f – fund profitability; R_b – profitability of benchmark.

It's necessary to note that using IR ratio is a very convenient criterion by active manager choosing, as it shows how efficient can the manager act on the market reflecting additional profitability which he/she gets by risk increasing or his/her actual profitability will differ from the target (1%).

Thus, while the criterion fulfillment of maximum profitability of sovereign fund investment portfolio with an adequate risk level there can be implemented the following rates: investment profitability, investment risk, Sharpe Ratio, Sortino Ratio, Treynor Ratio, «tracking error», «information ratio». Therefore, using these rates, it is possible to estimate the efficiency of a certain sovereign fund investment portfolio.

In order to carry out investment policy which will improve national economy development, decrease the economy dependence from raw material price, increase its diversification there are formed sovereign funds of development. Money from these funds is invested in more priority (from the economic development point of view) sectors.

In this case, it is really reasonable for such sovereign funds to use social-economical efficiency criterion of investment projects, which are implemented by means of sovereign funds of development. In praxis of investment projects efficiency estimation there are used the rates which characterize commerce and social efficiency. On basis of these rates there is estimated the practicability of this investment project implementation.

The following rates characterize commerce efficiency of a project: PP (Payback Period), NPV (Net Present Value), IRR (Internal Rate of Return), P (Profitability) and PI (Profitability Index). The estimation of these rates is based on discounting of expected cash flow from the project. As a rule, the discount rate is the profitability of alternative non-risky investments.

Similar approach to the policy of more extended diversification of investment portfolio and liquidity risk management is noted in Australian Sovereign Future Fund (WAFF) which was created in 2006. The WAFF fund was under guidance of Western Australia Treasury Corporation which had the functions of government corporate treasury service executor while interacting with people who represent public sector and manages debt and risk, investment of government surplus, contributes while risk management in foreign currency and provides financial advisory. Except WATC there is Treasury Department of Australian Government which also manages the fund. It considers not so risky assets investment and receiving of maximum profitability in investment sphere.

The most important goal of WAFF is money accumulation for people by achieving certain age. The Australian government in the period of 2006-2008 brought 51,3 billion dollars in the assets of the fund. Then by government share selling in company Telstra Corporation Limited the fund was increased up to 89,8 billion dollars. According to the fund forming rules till the 1st of June 2020 no payment should be done except fixed rate of management flow, by following of the conditions:

- the amount of fund shouldn't surpass its assets volume in a certain period, till 2020 the amount of fund should be increased up to 180,4 billion dollars;
- achievement of optimal profitability from invested money is kept by the following rule: average level of the annual consumer price index (CPI) + 4,5% (till 5,5% of annual index during a long period of investment returning);
- meeting of requirements to prevent risk losses from potential influence of volatility alteration on internal Australian financial markets and their reputation on international sector.

Choosing WAFF fund with appropriate structure of investment portfolio it's necessary to note high selectiveness which takes into account dynamic approach to risk elimination. The main characteristic of this fund is building in time aspect of short-term investment horizon, as its assets are invested in a combined order by short-term and medium-term debt financial instruments. Common investment policy of Australian Future Fund is based on interaction of some programs of the following directions: future investment strategy, current state of economy, choice of appropriate assets, carrying out of constant monitoring, common fund policy by risk management, fiscal policy of risk management, policy of liquidity risk management, also right of ownership and

the policy in the social risk management sphere. As on the 30th of June 2015 investment portfolio of WAFF fund is characterized by the following geographical coverage: Australian share is 20%, the UAS – 29%, the EU-countries – 14%, Great Britain – 5%, Japan – 9%, other countries – 4% and the countries with emerging markets – 20%. It's necessary to pick out wide diversification of the portfolio investment in economic sectors of WAFF fund. In energetic sector the share is 6%, the share for constructing is 9%, in manufacturing – 12%, final consumption – 13%, consumer goods – 10%, health care sphere – 23%, informational technologies – 12%, telecommunication – 4% and sector of services – 1%.

3. Statistical methodology & hypothesis

Modern portfolio theory defines practicability of operations with financial assets with the help of two interconnected characteristics "profitability – risk". I order to decrease risk characteristics there are used investment decisions which take into account portfolio diversification with regard to redistribution of invested sum of money between different kinds of assets. At the same time, it is possible to consider the following statement to be right: if every portfolio asset is defined by profitability dispersion, then portfolio profitability can have dispersion which depends on its structure. The following statement is no less important: an investor while portfolio forming can choose every combination of investment decision by which an expected profitability and standard derivation (risk) of portfolio are the best.

To proof this statement, we can distinguish a variant of sovereign fund portfolio forming for the period since 01.01.2010 till 31.12.2015 for the following financial instruments:

- Shares of eight biggest companies which are in the rating FT Global 500 in 2015: Apple (technological sector, the USA) - 724,773 billion dollars, Exxon Mobil (oil and gas sector, the USA) - 356,548 billion dollars, Berkshire Hathaway (investment sector, the USA) - 356,510 billion dollars, Google (sector of computer engineering and software, the USA) - 345,849 billion dollars, Microsoft (sector of computer engineering and software, the USA) - 333,524 billion dollars, Petro Chinal (oil and gas sector, China) - 329,715 billion dollars, Wells Fargo (bank sector, the USA) - 279,919 billion dollars, Johnson & Johnson (sector of pharmaceutics and biotechnology, the USA) - 279,723 billion dollars. The information about security quotation amount is gathered on the basis of the information recourse Investfunds (Cbonds.ru).
- Precious metals, gold, silver and platinum have appropriate quotations in London Gold Market Fixing Ltd.
- The price of property in countries: Germany, the Russian Federation, Spain, Sweden, the USA. The information is gathered on the base of House Prices Worldwide.

Received data of profitability value due to investment portfolio instruments are grouped in Table 3.

To calculate the average level of obtained profitability for the relevant period of time on the investment assets (excluding dividends) in Table 3 the following formula is used:

$$r_i = \frac{1}{n}\sum_{t=1}^{n}\frac{P_t - P_{t-1}}{P_{t-1}} \quad (2)$$

where: P_t is a share price for the current period; P_{t-1} is a share price in the previous period; n is the number of periods for which the average profitability is calculated.

At the same time the risk of investing in appropriate investment asset determines the index of dispersion, assessing the possible deviation values of the average measures by the following formula:

$$\sigma_i^2 = \frac{1}{n-1}\sum_{t=1}^{n}(r_{it} - r_i)^2 \quad (3)$$

where r_{it} – the one of the possible measures of return on asset *i* for the period *t*.

Table 3 – The calculation of the actual level of obtained profitability on financial instrument of the portofolio

Period/ quarter	The level of obtained financial instrument profitability															
	Stocks of the largest companies in the world								Precious metals			Property				
	Apple, stock	Exxon Mobil	Berkshire Hathaway	Stocks of Alphabet (Google)	Microsoft, stock	Petro China	Wells Fargo	Johnson@ Johnson	Gold	Silver	Platinum	Germany	Russia	Spain	Switzerland	USA
31.12.2015	-0,04569	0,04842	0,01257669	0,189655	0,253502	-0,05037	0,058617	0,100375	-0,048474	-0,056655	-0,044053	0,0256	0,02	0,0075	0,0098	0,0132
30.09.2015	-0,12063	-0,10637	-0,04195136	0,182079	0,002492	-0,37891	-0,08695	-0,04217	-0,048676	-0,066879	-0,157699	0,0143	-0,0185	-0,0023	0,0024	0,0127
30.06.2015	0,008037	-0,02118	-0,05688747	-0,02643	0,085834	0,007001	0,033824	-0,03121	-0,013479	-0,054217	-0,045173	0,0073	-0,0068	-0,0067	0,0022	0,0123
31.03.2015	0,127288	-0,08058	-0,03882784	0,045302	-0,12465	-0,00117	-0,00766	-0,03796	-0,015755	0,051298	-0,063847	0,0138	0,0107	-0,0036	0,0075	0,0145
31.12.2014	0,095583	-0,01701	0,08694078	-0,09815	0,001941	-0,13769	0,056873	-0,01895	-0,008631	-0,077148	-0,072308	0,0074	0,0169	0,005	0,0097	0,0147
30.09.2014	0,095347	-0,07074	0,08498272	0,004644	0,097278	0,017382	-0,01313	0,01883	-0,074905	-0,180163	-0,121622	0,015	0,0086	-0,0024	-0,0032	0,0113
30.06.2014	0,199531	0,036138	0,01880451	0,051017	0,030739	0,157396	0,056695	0,065051	0,017999	0,045068	0,043724	0,0127	0,0126	-0,0001	0,0066	0,0106
31.03.2014	-0,04329	-0,03478	0,05406545	-0,00553	0,095696	-0,00471	0,095595	0,072497	0,072437	0,016285	0,044952	0,0076	-0,0098	-0,0051	0,0038	0,0131
31.12.2013	0,176773	0,176197	0,04448947	0,279478	0,124099	-0,0185	0,098742	0,056523	-0,091971	-0,093635	-0,038271	-0,0042	0,0041	-0,019	0,0075	0,0118
30.09.2013	0,202295	-0,0477	0,01420658	-0,0055	-0,03648	0,048485	0,001212	0,009667	0,112836	0,149523	0,071374	0,0085	0,0044	-0,005	0,0058	0,0185
30.06.2013	-0,10421	0,002663	0,07408829	0,10899	0,20727	-0,19118	0,115707	0,053109	-0,254184	-0,341480	-0,164340	0,0134	0,0104	-0,009	0,0102	0,0222
31.03.2013	-0,16811	0,041132	0,16164994	0,122735	0,071134	-0,06764	0,082212	0,163053	-0,035747	-0,050083	0,032089	0,0081	-0,0168	-0,0097	0,0075	0,0213
31.12.2012	-0,20231	-0,05358	0,0170068	-0,06245	-0,10249	0,074656	-0,01014	0,017269	-0,066723	-0,129870	-0,084532	0,0088	0,0277	-0,022	0,0107	0,0164
30.09.2012	0,142275	0,068716	0,05844234	0,300683	-0,02713	0,039837	0,032596	0,019982	0,111042	0,279542	0,168067	0,0035	0,0279	-0,0254	0,0037	0,0115
30.06.2012	-0,02592	-0,01337	0,02686383	-0,09538	-0,05177	-0,10512	-0,0205	0,024257	-0,038496	-0,164971	-0,129268	0,0134	0,0279	-0,026	-0,0013	0,0179
31.03.2012	0,480297	0,023242	0,06356488	-0,00721	0,242681	0,128999	0,238752	0,005794	0,085892	0,239679	0,211226	0,0081	0,076	-0,0308	0,0074	0,0062
31.12.2011	0,062236	0,167011	0,07404279	0,254077	0,042989	0,004145	0,14262	0,029675	-0,054938	-0,140887	-0,103905	0,0019	0,0236	-0,0159	0,0173	0,0019
30.09.2011	0,135975	-0,10752	-0,08205194	0,017102	-0,04269	-0,15053	-0,14041	-0,04254	0,076054	-0,130497	-0,122532	0,0109	0,01	-0,013	0,0137	0,0049
30.06.2011	-0,03696	-0,03269	-0,07461437	-0,13699	0,024025	-0,04054	-0,11511	0,1227	0,046213	-0,075257	-0,028765	0,0036	0,011	-0,0143	0,0063	-0,0073
31.03.2011	0,080512	0,150574	0,04393958	-0,01212	-0,09029	0,16996	0,023233	-0,04204	0,023835	0,233550	0,010256	0,0064	-0,2307	-0,0262	0,006	-0,0219
31.12.2010	0,136655	0,183363	-0,0310837	0,129631	0,139649	0,120709	0,233678	-0,00178	0,075363	0,391029	0,055957	0,0056	0,0093	-0,0035	0,0107	-0,01
30.09.2010	0,128305	0,082705	0,03752039	0,181679	0,06432	0,032	-0,01875	0,049103	0,050643	0,177695	0,084856	0,0075	0,0041	-0,0091	0,0027	-0,0167
30.06.2010	0,070301	-0,14795	-0,01944137	-0,2154	-0,21441	-0,03634	-0,17738	-0,09417	0,115195	0,070857	-0,068693	0,0113	0,0034	-0,009	-0,0032	-0,0045
31.03.2010	0,098135	-0,03138	-0,97545455	-0,09516	-0,05363	-0,0226	0,139092	0,00804	-0,005350	0,019220	0,096667	-0,0094	0,1155	-0,0141	0,001	-0,0102
01.01.2010	-0,04569	0,04842	0,01257669	0,189655	0,253502	-0,05037	0,058617	0,100375	-0,048474	-0,056655	-0,044053	0,0043	-0,0138	-0,0024	0,0123	-0,003

Table 4 – The calculation of the statistical indicators on financial instruments

Indicators	Stocks of the largest companies in the world								Precious metals			Property				
	Apple	ExxonMobil	Berkshire Hathaway	Alphabet (Google)	Microsoft	Petro China	Wells Fargo	Johnson@J ohnson	Gold	Silver	Platinum	Germany	Russia	Spain	Switzerland	USA
Average quarterly yield	0,062185	0,00897	-0,01863031	0,046115	0,030838	-0,01686	0,034143	0,021046	0,001257402	0,004666807	-0,017743304	0,008216	0,005108	-0,01048	0,006188	0,006456
Mean-square deviation	0,145027	0,092394	0,21188937	0,136841	0,115415	0,12027	0,103856	0,058501	0,083960654	0,17071558	0,10038553	0,006718	0,056656	0,010076	0,00518	0,012151

Further calculation of profitability indicators and the level of associated risk on financial instruments were carried out by the formulae 2, 3 (obtained meanings are shown in Table 4), it allowed formulating as follows:

- having regard to securities of the eight biggest world companies, which are in the rating of FT Global 500 ranking, stocks of Berkshire Hathaway and Petro China are excluded from the investment portfolio of the fund in view of the negative profitability rates. The average value of profitability is -0,01863031 for Berkshire Hathaway and -0,01686 for Petro Chin;
- for precious metals, such as gold, silver and platinum which have London Gold Market Fixing Ltd. quotations, only platinum has the negative profitability in the amount of -0,017743304. Consequently, this investment asset is not recommended to include in the portfolio;
- having regard to property in Germany, Russia, Spain, Switzerland and the USA, Spain has the negative profitability in the amount of -0,01048. It would be wiser not to include this indicator in the portfolio of investment fund.

It's necessary to shape a matrix of correlation and covariance coefficients in order to make the optimal portfolio depending on the correlation degree of profitability ratios of investment assets among themselves and to keep the efficient frontier of equality. It's necessary to use the following coefficients.

The covariance coefficient is calculated as follows:

$$cov_{ij} = \frac{1}{n-1}\left(\sum_{t=1}^{n}(r_{it} - r_i) * (r_{jt} - r_j)\right) \quad (4)$$

where: r_{it} is the measures of return on asset *i* for the period *t*; r_{jt} is the measures of return on asset *j* for the period *t*; r_i is average return on asset *I*; r_j is average return on asset *j*; *n* is the number of periods during which return on assets *i* and *j* were determined.

The correlation coefficient is calculated as follows:

$$cor_{ij} = \frac{cov_{ij}}{\sigma_i * \sigma_j} \quad (5)$$

In the construction of the matrix of correlation and covariance coefficients on financial assets using the formulae 4, 5 the following results are shown. Having regard to securities of the eight biggest world companies, which are in the rating of FT Global 500 ranking, correlation coefficients for the most part are not high, which indicates a weak linear dependence between the level of the profitability indicator of investment assets. However, ExxonMobil stocks correlate heavily with Alphabet, Microsoft, Petro China, Wells Fargo stocks (Table 5).

Table 5 - The values of the coefficient correlation for stocks of the biggest world companies

Indicators	Apple	Exxon Mobil	Berkshire Hathaway	Alphabet (Google)	Microsoft	Petro China	Wells Fargo	Johnson @ Johnson
Apple	1							
ExxonMobil	0,210493	1						
Berkshire Hathaway	-0,05874	0,186747	1					
Alphabet (Google)	0,037405	0,608783	0,282335	1				
Microsoft	0,129499	0,420892	0,229465	0,452831	1			
Petro China	0,491227	0,45913	0,045516	-0,06134	0,009532	1		
Wells Fargo	0,311288	0,64482	-0,07466	0,352173	0,629015	0,382092	1	
Johnson @ Johnson	-0,2936	0,3263	0,164096	0,298052	0,529076	0,059507	0,278596	1

Whereas the negative values of covariance coefficients show that the profitability level between the six biggest companies stocks will vary in the opposite directions. Consequently, these categories of securities are not recommended to include in the portfolio of investment fund (Table 6).

Table 6 - The values of the covariance coefficient for stocks of the biggest world companies

Indicators	Apple	Exxon Mobil	Berkshire Hathaway	Alphabet (Google)	Microsoft	Petro China	Wells Fargo	Johnson @ Johnson
Apple	0,020156							
ExxonMobil	0,002703	0,008181						
Berkshire Hathaway	-0,00173	0,003504	0,043026					
Alphabet (Google)	0,000711	0,007376	0,007845	0,017945				
Microsoft	0,002077	0,004301	0,005378	0,006854	0,012766			
Petro China	0,008211	0,004889	0,001112	-0,00097	0,000127	0,013862		
Wells Fargo	0,004493	0,00593	-0,00157	0,004796	0,007226	0,004574	0,010337	
Johnson @Johnson	-0,00239	0,00169	0,001949	0,002287	0,003423	0,000401	0,001622	0,00328

Having regard to precious metals such as gold, silver and platinum which have London Gold Market Fixing Ltd. quotations, the high correlation coefficient indicates a significant linear dependence between profitability of the appropriate instruments (Table 7).

Table 7 - The values of correlation coefficient of precious metals, which have London Gold Market Fixing Ltd. quotations

Indicators	Gold	Silver	Platinum
Gold	1		
Silver	0,755557	1	
Platinum	0,622883	0,792102	1

Having regard to investment of property in Germany, Russia, Spain, Switzerland and the USA the values of correlation coefficient show a strong dependence between real estate prices in Germany, Spain and the US (Table 8).

Table 8 - The values of correlation coefficient of property in selected countries

Indicators	Germany	Russia	Spain	Switzerland	USA
Germany	1				
Russia	-0,14413	1			
Spain	0,415023	0,067302	1		
Switzerland	-0,08196	-0,01543	0,042251	1	
USA	0,403031	0,310358	0,182475	0,035116	1

4. Discussion

The development of global stock markets, availability of a wide statistical basis, as well as improvement in the field of mathematical techniques led to appearance of a universal theory and practice of financial instruments portfolio management of investment funds. The current portfolio theory uses various statistical approaches to evaluate indicators: the expected level of risk and profitability, the comparison of the correlation between financial instruments and the market as a whole. However, when selecting some portfolio components, a key role is making mathematical-statistical diversification based on Modern Portfolio Theory developed by Markowits.

It should be noted that an undiversifiable risk or a systematic risk factor determined by the stability of state economy is not taken into account in Markowits' model. Therefore, the higher stability is, the lower the risk of systematic is. However, the impact of systemic risk factor in the general risk of the fund portfolio increased significantly and affects the final decision in the framework of the forecast development.

Despite the universal application of Markowits' theory we should emphasize some meaningful constraints, such as hidden and explicit assumptions of investors and markets. The following assumptions can be these main proposals: the investors are well-minded and risk-prone in their policy. Thus, a well-minded investor always chooses higher value and prefers lower risk; the markets are efficient and the rational investors can make the optimal portfolio to achieve some goals; the market consists of a finite set of assets, the profitability of which is a random value in a certain period; the correlation between the assets of securities portfolio is constant. An investor can shape any portfolio, the profitability of which is also a random value; the probability of success increases overtime due to the diversification of the portfolio.

Conclusion

On the basis of generated hypothesis about the investor choice in forming the portfolio of any combination of investment decisions, in which the expected profitability and standard deviation (risk) of portfolio is the best, the conducted research on the diversification of used financial instruments of three groups (assets of the biggest world companies which are in the rating of FT Global 500, precious metals which have London Gold Market Fixing Ltd. quotations and property in Germany, Russia, Spain, Switzerland and the USA) allowed to formulate the following conclusions.

1.Having regard to shares of the eight biggest world companies the final values of covariance dependencies allowed to include only the securities of three companies in the portfolio: Apple (risk indicator was 0,145026849, profitability indicator was 0,062184534), Wells Fargo (risk was 0,103856026, profitability was 0,034142577) and Johnson@Johnson (risk was 0,058501221 and profitability was 0,021045751)

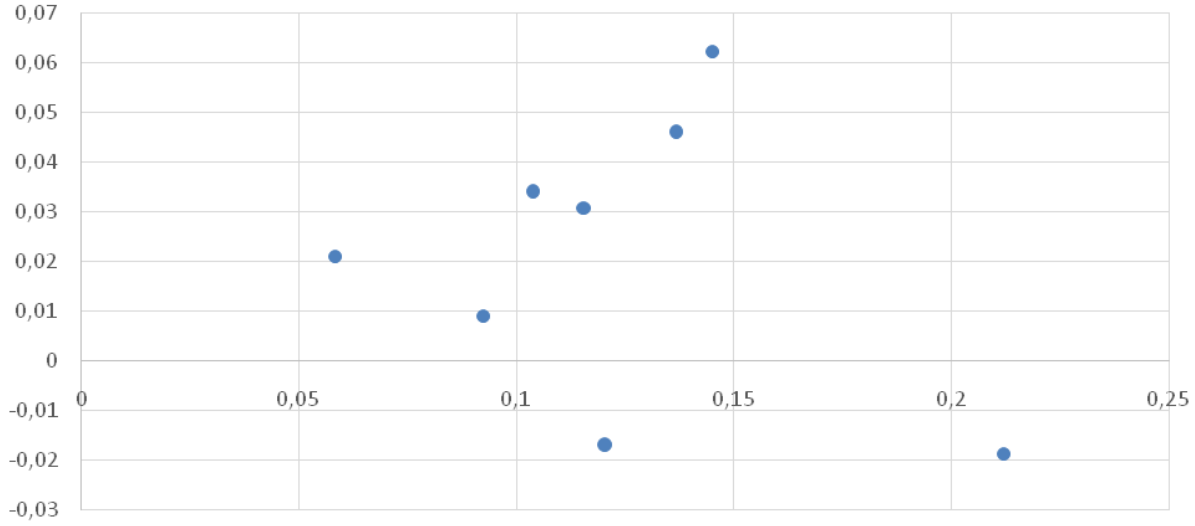

Figure 2 - Functional dependency of a pair of «risk - profitability» of Apple, Wells Fargo and Johnson@Johnson stocks

Thus, it's optimal to recognize Apple and Wells Fargo stocks while observing setting of effective boundaries of equality for the investment portfolio according to the minimal risk criteria for a given value of д profitability. In this case, the equation taking into account the covariance coefficients would be:

$$\sigma_p = \sqrt{0{,}020156 * \omega_1^2 + 0{,}008986 * \omega_1 * \omega_2 + 0{,}010337 * \omega_2^2} \quad (6)$$

The portfolio formed from stocks of the noted companies (Apple share is 0,27; Wells Fargo share is 0,73 for a minimal risk) shows the profitability of 4,18%.

Having regard to precious metals (according to Table 4) the average value of investment profitability in platinum is negative, and taking into account the calculated indicators, the values of covariance coefficient of the financial instrument «silver» 0,027929 is more than others, that indicates a greater risk of such investments (Table 9). Thus, «gold» is the most effective asset of investments.

Table 9 - The values of covariance coefficient of precious metals, which have London Gold Market Fixing Ltd. quotations

Indicators	Gold	Silver	Platinum
Gold	0,006756		
Silver	0,010378	0,027929	
Platinum	0,005031	0,013009	0,009657

Speaking about property in Germany, Russia, Spain, Switzerland, and USA the obtained negative covariance coefficients show the contrary profitability ratios change of investment in real property subject to the inclusion of these objects in a single asset of portfolio (Table 10).

Table 10 - The values of covariance coefficient of property in selected countries

Indicators	Germany	Russia	Spain	Switzerland	USA
Germany	0,000043				
Russia	-0,000053	0,003082			
Spain	0,000027	0,000037	0,000097		
Switzerland	-0,000003	-0,000004	0,000002	0,000026	
USA	0,000032	0,000205	0,000021	0,000002	0,000142

Thus, property in Spain is excluded from the most optimal investment in view of the negative average value of profitability (Table 4). The covariance dependence on property between Germany, Russia and Switzerland shows the highest degree of risk when placing in the same portfolio, and property in USA has the riskiest prospects (the biggest covariance coefficient except Russia). Consequently, the inclusion in the total portfolio of investments in German property is the most optimal for this type of financial assets. The profitability index was 0,82% with a minimal risk in the amount of 0,006718239.

Consequently, the total portfolio of the formed investment fund according to the structure of financial assets subject to the parameters of the effective equality border takes the following form (Table 11).

Table 11 - The structure of the investment fund, corresponding to the optimal criterion «risk - profitability»

Structure of portfolio	Profitability, %	Risk, share
Apple and Wells Fargo shares	4,18%	0,093535962
Precious metal - gold	0,13%	0,083960654
Property in Germany	0,82%	0,006718239

It should be noted that investments aimed at developing the economy, especially, investments in import-substituting technology, in infrastructure and other capital-intensive investments are characterized by low or even negative investment profitability and also by longness of a payback period. It's necessary to assess the effectiveness of public projects to evaluate the long-term and low-risk projects. At the same time the job gains in the territory, where the project is implemented, the average salary of employees in the implementation of this project and exceeding the average level of wages over wages in other sectors will characterize the public efficiency. When assessing investment funds, it's necessary to consider whether the chosen direction of investment corresponds to adopted long-term economic strategy of development of the country or plans of diversification.

The factor of ensuring the maximum transparency of their activity is the most important criterion for evaluation of sovereign funds management, which should be applied to all types of the world sovereign wealth funds. The growth of sovereign wealth funds and the amount of finance accumulated in them, attracts attention in view of the fact that the funds may have a significant impact not only on the stock markets, but also on the economy of the country. Foreign investments of sovereign funds may affect national security, because the purpose of the investment may be obtaining control over the strategically important industries and technologies. Consequently, the applicable principles should correspond to the fundamental positions: maintaining a transparent and stable organizational structure of fund management, involving the proper operational control and the nature of risk management; enforcement of legal rules for the disclosure of information in countries where sovereign wealth funds make investments; procedure of investment, taking into account the economic and financial risk and profitability factors; contribute to the stability of the global financial system and free flow of capital and investment.

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Time-Varying Beta of Russian Companies

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Abstract:

This paper examines the dynamic beta of Russian companies within the framework of the market model. The closing weekly prices of 29 Russian stocks, six Russian sector indices and the MICEX Index as a market index during the period from January 2009 to June 2015 are used to estimate time-varying beta using various econometric techniques. According to the results for the analyzed period, semiparametric regressions are confirmed to be the most effective model. As regards the forecast period, multivariate GARCH models surprisingly outperform all the other methods. An analysis of beta dynamics shows that most of time-varying betas are non-stationary.

Keywords: time-varying beta, russian stock market; DCC-GARCH model; Kalman filter; semiparametric regression.

JEL Classification: C14, C22, C58, G10, G12.

1. Introduction

In classic market and CAPM models (Markowitz 1952, Sharpe 1964, Lintner 1965) beta coefficient reflecting stock sensitivity to market portfolio is assumed to be constant over time. Within the framework of these models, beta is estimated by regression analysis, where asset returns is a dependent variable and market returns is a regressor. Thus, beta is the covariance between the market's returns and the asset's returns divided by the variance of the market returns. However, the OLS method of constant beta valuation has been criticised on numerous occasions. In particular, it was found that financial assets and market index volatility strongly varies over time (Bollerslev, Engle and Woolbridge 1992), thereby directly impacting beta values.

Beta represents one of the key financial indicators used for the valuation of companies and projects, target price estimation, risk assessment and evaluation of portfolio managers' performance. Analysts and investors use beta as a framework for fundamental analysis (DCF, DDM, LBO, etc), stock selection, hedging strategies and quantitative modeling. The study of beta and its features contributes to a better understanding of financial market mechanisms and can be useful in operations conducted by stock analysts, portfolio managers, investment bankers and hedgers.

Fabozzi and Francis (1978) and Bos and Newbold (1984) were the first who suggested that a beta can change over time within a CAPM model and proved that a beta representing systematic risk indicator is unstable. These results laid the groundwork for further research papers in the field. Therefore, Sunder (1980) confirmed beta non-stationarity for the US market, Bos and Fetherston (1992) for the Korean market, Kim (1993) for the Hongkongese market, Bos, Fetherston, Martikainen and Perttunen (1995) for the Finnish market, Kok (1992) for the Malaysian market, Wells (1994) for the Sweden market, Faff, Lee and Fry (1992) for the Australian market, as well as Shah and Moonis (2003) for the Indian market.

Subsequently, this field has experienced considerable development alongside the improvement in econometric and mathematical tools. Nowadays, there are several approaches to estimating dynamic beta based on certain econometric methods. These include Bayesian (Jostova and Philipov 2005), SV (Johansson 2009), Markov regime-switching (Mergner and Bulla 2008) and other less popular econometric models. Be that as it may, in this article we shall apply three modern techniques for time-varying beta estimation and forecast, which will be discussed later.

The employed models are rolling OLS, three types of multivariate GARCH models, semiparametric regressions and the Kalman filter. While the rolling OLS and Kalman filter methods are commonly used beta estimation techniques, multivariate GARCH models and semiparametric regressions are rarely applied in the literature, although in some cases they are capable of providing better estimates. Among GARCH models, DCC-GARCH, DCC-GJR-GARCH (including asymmetry in conditional volatility) and ADCC-GJR-GARCH (including asymmetry in conditional volatility and correlation) with both normal and Student's distribution assumptions, are employed. Among semiparametric regressions, those with normal, Epanechnikov and uniform kernel types are applied for beta estimation.

The sample includes data on 29 Russian companies, six sectoral indices and the MICEX index as a market portfolio. Based on the data, all of the models are compared for in-sample and out-sample performance.

Then estimated betas are investigated for stationarity by Augmented Dickey-Fuller, Philips-Perron and Kwiatkowski–Phillips–Schmidt–Shin tests. Four proposed hypotheses are tested in this paper.

Typical research has never been carried out for Russian companies before, and in general it is seldom found in the literature. Thus, testing Russian betas for stationarity is innovative for the research field. Another novelty of the paper is methodological and involves use of DCC-GJR-GARCH and ADCC-GJR-GARCH models, which have never been employed in analogous works earlier, while they are modern and powerful econometric tools for estimation and forecasting. Moreover, in typical papers, semiparametric models are also rarely compared with the Kalman filter and much less with GARCH models.

The paper is structured as follows: the following section will offer a brief review of the literature on beta estimations, while Section 3 will lay out hypotheses and Section 4 will describe the sample used. Section 5 will explore the models and criteria employed for their comparison. Section 6 will set out the results of the research, while Section 7 draws conclusions.

2. Literature review

The first method for dynamic beta estimation involves usage of the Kalman filter. Within the framework of the CAPM model, Fabozzi and Francis (1978) and Collins, Ledolter and Rayburn (1987) modeled beta as a random coefficient process – the simplest specification of the state-space model. Afterwards, researchers started to employ more complicated beta processes. Thus, the beta equation was presented as a random walk (Lie, Brooks and Fama 2000), mean-reverting (Groenewold and Fraser 1999, Brooks, Faff and McKenzie 1998) and combined (He and Kryzanowski 2008) processes.

The second method used is GARCH-type models. They have gained great popularity over the last ten years as they take into account heteroscedasticity, which is frequently observed on financial markets. The introduction of univariate GARCH models for time-varying beta estimation has provided great impetus for the volume of research conducted in the field (Bollersev, Engle and Wooldridge 1988, Bodurtha and Mark 1991, Engle and Rodrigues 1989). Moreover, Schwert and Seguin (1990) suggested their own method for beta calculation, where market returns variance is assumed to change over time. However, the first GARCH models have significant drawbacks. They have been criticised for their inability to identify financial market asymmetry effects (when negative and positive shocks differently affect volatility). Apart from that issue, univariate GARCH models imply that the volatility of only one variable (market or asset returns) is of dynamic nature, while variance of both market portfolio and security as well as even their covariance can significantly fluctuate over time.

Thus, modern multivariate GARCH models, which are capable of estimating the time-dependent variance-covariance matrix and asymmetry effects, were applied. In their works, Choudhry and Wu (2008) and Yun (2002) estimated and forecast beta using multivatiate GARCH models. In most papers, the GARCH technique for dynamic beta valuation has been confirmed to be superior to the traditional regression-based approach (Hillier F., D., and Hillier J. 2000, Brooks, Faff and McKenzie 2002).

The third, less popular, but more modern method, is semiparametric regressions. One type of these regressions is the varying-coefficient model introduced by Hastie and Tibshirani (1993). It perfectly fits the market, CAPM or three-factor model of Fama and French (1993). However, for beta computation it was first used a few years after its introduction. Within the market model, it was applied in the papers of Eisenbeiss, Kauermann and Semmler (2007) and Esteban and Orbe-Manadaluniz (2010), while within CAPM and the three-factor model it found application in the works of Li and Yang (2011) as well as Ang and Kristensen (2012). Thus, in analyzing the German stock market, Eisenbeiss *et al.* (2007) concluded that a varying-coefficient model exceeds the classic regression method. The great advantage of semiparametric models resides in the fact that it sets no requirement to know the exact function form of a beta, as opposed to GARCH models or the Kalman filter.

3. Hypotheses

Several papers set out to compare various dynamic beta estimation techniques, including the above-mentioned approaches. Model comparisons were carried out in the works of Choudhry and Wu (2008), Brooks *et al.* (1998) and Mergner and Bulla (2008). In all of them the Kalman filter showed the best performance for time-varying beta valuation in terms of both in-sample and out-sample predictions, with the exception of several securities. However, the difference between previous works and the methodology of this article does not enable us to draw any hasty conclusions. Moreover, dynamic beta estimation for Russian companies has never been carried out in the literature before, thereby making this research especially topical. Thus, on the basis of previous works, four hypotheses are proposed:

- H1: OLS method for beta estimation is ineffective.
- H2: Kalman filter is the superior technique for in-sample dynamic betas estimation.
- H3: Kalman filter is the superior technique for out-sample dynamic betas prediction.
- H4: Time-varying betas of Russian assets are proven to be statistically non-stationary.

The first, second and third hypotheses have been tested in the past literature before, however, the Kalman filter has never been compared to modern multivariate GARCH models, such as DCC-GJR-GARCH or ADCC-GJR-GARCH, which make it possible to capture asymmetry in conditional correlation and volatility. Semiparametric regressions are also rarely applied as a beta estimation technique, as a result of which the superiority of the Kalman filter over the latter technique is not so readily apparent.

As regards the fourth hypothesis, three stationarity tests (Augmented Dickey-Fuller, Philips-Perron and Kwiatkowski–Phillips–Schmidt–Shin tests) are employed to determine whether betas remained unchanged over the analyzed period. Using several tests makes it possible to avoid the defects and disadvantages inherent in a particular test (DeJong, Nankervis, Savin and Whiteman 1992).

4. Data and preliminary analysis

The available data includes the closing weekly prices of six Russian sectoral indices and 29 of the most liquid Russian stocks during the period from January 1, 2009 to June 30, 2015 and the MICEX index as the market portfolio. All observations are divided into analyzed periods (from January 2009 to December 2013, 260 observations) and forecast periods (from January 2014 to June 2015, 76 observations) for comparison of the models. The first five observations were used for Kalman filter calibration. The sample is not big, but it is usual for typical papers (*e.g.,* He and Kryzanowski (2008) used a sample of 204 observations). The company overviews are shown below in the table below.

Table 1 - Company overviews

Index/Company	Bloomberg ticker	Sector
MICEX Index	INDEXCF Index	-
MICEX Oil & Gas	MICEXO&G Index	-
MICEX Power	MICEXPWR Index	-
MICEX Telecommunications	MICEXTLC Index	-
MICEX Metals & Mining	MICEXM&M Index	-
MICEX Manufacturing	MICEXMNF Index	-
MICEX Financials	MICEXFNL Index	-
Sberbank	SBER RX Equity	Financials
VTB	VTBR RX Equity	Financials
Acron	AKRN RX Equity	Chemicals
Uralkali	URKA RX Equity	Chemicals
Dixy Group	DIXY RX Equity	Consumer goods & services
Magnit	MGNT RX Equity	Consumer goods & services
M.Video	MVID RX Equity	Consumer goods & services
Sistema	AFKS RX Equity	Telecommunications
MTS	MTSS RX Equity	Telecommunications
Rostelecom	RTKM RX Equity	Telecommunications
Gazprom	GAZP RX Equity	Oil & Gas
NOVATEK	NVTK RX Equity	Oil & Gas
Rosneft	ROSN RX Equity	Oil & Gas
Surgutneftegaz	SNGS RX Equity	Oil & Gas
Tatneft	TATN RX Equity	Oil & Gas
Lukoil	LKOH RX Equity	Oil & Gas
Gazprom Neft	SIBN RX Equity	Oil & Gas
E.ON Russia	EONR RX Equity	Utilities
Inter RAO	IRAO RX equity	Utilities
FGS	FEES RX equity	Utilities
Russian Grids	RSTI RX Equity	Utilities
RusHydro	HYDR RX Equity	Utilities

Index/Company	Bloomberg ticker	Sector
Severstal	CHMF RX Equity	Metals & Mining
Norilsk Nickel	GMKN RX Equity	Metals & Mining
MMK	MAGN RX Equity	Metals & Mining
NLMK	NLMK RX Equity	Metals & Mining
Raspadskaya	RASP RX Equity	Metals & Mining
Mechel	MTLR RX Equity	Metals & Mining
Aeroflot	AFLT RX Equity	Transport

The returns of each security and index are computed in the standard form as:

$$R_{i,t} = (\ln P_{i,t} - \ln P_{i,t-1}) \times 100\% \quad (1)$$

where: P_t is the price of security *i* at the moment *i*.

All data were obtained from the Bloomberg database. The augmented Dickey-Fuller (ADF) stationarity test, the ARCH heteroscedasticity test and the Ljung-Box serial correlation test confirm that the nature of this data is consistent with expectations (all results support the models used).

5. Methodology

Three advanced approaches are used in the paper in order to estimate and forecast time-varying betas of Russian companies: the Kalman filter, multivariate GARCH models and semiparametric regressions. The Kalman filter implies a market model in which both alpha and beta change over time. Among GARCH models DCC-GARCH, DCC-GJR-GARCH with the assumption of conditional variance asymmetry effects and ADCC-GJR-GARCH with both the assumption of conditional variance and correlation asymmetry effects, are used. All three GARCH models are computed for standard and Student's distribution assumptions. Semiparametric regressions also imply that both alpha and beta fluctuate over time. On the basis of the semiparametric model, three estimates of beta were obtained depending on the type of kernel distribution – Gaussian, Epanechnikov or uniform. Thus, for each security 11 series of dynamic beta (including the rolling OLS technique) are estimated. All models are compared to find the best options in terms of in-sample and out-sample performance. For out-sample period one-step ahead forecast is used for all the models.

5.1. Rolling OLS

The most commonly used approach to estimate a beta is to regress security returns on market returns. The author uses the market model, which implies the following equation:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t},\ \varepsilon_t \sim N(0, \sigma_t^2) \quad (2)$$

where: $R_{m,t}$ is returns of the market index at time t; $R_{i,t}$ is returns of asset i at time t. Residuals ε_t are assumed to have zero mean, constant variance and to be normally distributed (IID). β_i reflects security sensitivity to a market index α_i defines constant mean returns independent of market index fluctuations.

Coefficients α_i and β_i are parameters, which are to be estimated within the model. Coefficient β_i can be expressed as:

$$\beta_i = \frac{Cov(R_{i,t}, R_{m,t})}{Var(R_{m,t})} \quad (3)$$

Coefficient β_i (beta) reflects a systematic risk of an asset i. In terms of the corporate finance theory, estimated within a regression this coefficient stands for a levered beta. If a beta value exceeds one, it means that changes in market returns lead to greater changes in asset returns. This kind of assets relates to aggressive securities, while assets with a beta value lower than one are considered to be defensive (or protective).

Using rolling regression an out-sample beta time series is obtained for the forecast period. Rolling window size amounts to the length of analyzed period. As one-step ahead forecast is used, an out-sample beta at time t is equal to the beta obtained from the regression based on data available at (t-1). Regression is estimated by a simple OLS method.

5.2. Semiparametric regressions

Semiparameric models are a trade-off between completely non-parametric and parametric techniques (such as a simple regression) and they are often employed for data applicable to natural sciences. They are convenient for usage when functional dependence on regressors is unknown or when nonparametric models cannot be applied due to the curse of dimensionality. These types of models may also be useful if it is unknown how regressors in simple linear equations are affected by other factors. This problem relates to the market model as well, within the framework of which linear dependence on alpha and beta is assumed, but it is unclear what factors impact the latter ones.

There are many types of semiparametric models, although the semiparametric regression with smoothed coefficients introduced by Hastie and Tibshirani in 1993 is the most suitable for the purpose of this research. Within the market model, it takes the following form:

$$R_{i,t} = \alpha_{i,t} + \beta_{i,t} * R_{m,t} + \varepsilon_{i,t},\ \alpha_{i,t} = f_{1,i}(t/T),\ \beta_{i,t} = f_{2,i}(t/T),\ \varepsilon_{i,t} \sim N(0, \sigma^2_{\varepsilon_i}) \quad (4)$$

where T is the number of observations. The function forms of $f_{1,i}(t/T)$ and $f_{2,i}(t/T)$ are unknown and the great advantage of the model is that it is not required to indicate their actual forms. However, it is assumed that alpha and beta are somehow affected by time as a variable. As beta and alpha are unobservable variables, it is complicated to determine which factors actually affect their dynamics, but it is fair to consider the time variable related to these factors. In typical works (Eisenbeiss *et al.* 2007; Esteban and Orbe-Manadaluniz, 2010) the same assumption about time variable influence was made.

Values of alpha and beta coefficients are computed at the moment t by the following function minimization:

$$\min_{(\alpha_{i,t},\beta_{i,t})} \sum_{s=1}^{T} K_{t,s}^{h_i} (R_{i,s} - \alpha_{i,t} - \beta_{i,t} R_{m,s})^2,\ K_{t,s}^{h_i} = h_i^{-1} K\left(\frac{t-s}{Th_i}\right) \quad (5)$$

where: $K(\cdot)$ is the kernel function; h_i is the bandwidth.

The choice of kernel type and bandwidth appears to be the main problem when dealing with non- or semiparametric models. While a kernel function defines the smoothing grade of functions $f_{1,i}(t/T)$ and $f_{2,i}(t/T)$, a bandwidth is responsible for the accuracy of the estimated interdependence.

Three types of kernel functions are applied:

1) Gaussian: $$K\left(\frac{t-s}{Th_i}\right) = \frac{1}{\sqrt{2\pi}} \exp\left(\frac{1}{2}\left(\frac{t-s}{Th_i}\right)^2\right) \quad (6)$$

2) Epanechnikov: $$K\left(\frac{t-s}{Th_i}\right) = \begin{cases} \frac{3}{4}\left(1 - \left(\frac{t-s}{Th_i}\right)^2\right), & -1 \le \left(\frac{t-s}{Th_i}\right) \le 1 \\ 0, \quad otherwise \end{cases} \quad (7)$$

3) Uniform: $$K\left(\frac{t-s}{Th_i}\right) = \begin{cases} \frac{1}{2}, & -1 \le \left(\frac{t-s}{Th_i}\right) \le 1 \\ 0, \quad otherwise \end{cases} \quad (8)$$

A chosen bandwidth is based on the least-squares cross-validation method, which is described in detail in the paper of Li and Racine (2010). This method is completely determined by input data.

Thus, beta and alpha estimates are calculated as:

$$\begin{pmatrix} \hat{\alpha}_{i,t} \\ \hat{\beta}_{i,t} \end{pmatrix} = \left(\sum_{s=1}^{T} K_{t,s}^{h_i} X_s X_s^T \right)^{-1} \sum_{s=1}^{T} K_{t,s}^{h_i} X_s R_{i,s} \quad (9)$$

where $X_s = (1 \quad R_{m,t})$; $R_{i,s}$ represents the returns on asset i at the moments.

Note that while $h_i \to \infty$ coefficients are less volatile during the time and their estimates approach those of simple OLS with constant parameters. On the contrary, the smaller a bandwidth, the more volatile the values of dynamic betas and alphas.

Typically to OLS method, rolling semiparametric regressions are used in order to make out-sample beta forecasts. Therefore, on the basis of semiparametric regressions three estimates of time-varying betas and alphas are computed depending on the type of kernel function.

5.3. Multivariate GARCH models

All GARCH models are based on DCC-GARCH (Dynamic Conditional Correlation – Generalized Autoregressive Conditional Heteroskedasticity) and ADCC-GARCH (Asymmetric Dynamic Conditional Correlation – Generalized Autoregressive Conditional Heteroskedasticity) models introduced by Engle in 2002 and Capiello, Engle and Sheppard in 2006, respectively. In the paper, DCC-GARCH and its two modifications (DCC-GJR-GARCH and ADCC-GJR-GARCH), which are able to detect asymmetry in conditional variance and correlation, are employed.

All three models, namely DCC-GARCH, DCC-GJR-GARCH (including conditional variance asymmetry) and ADCC-GJR-GARCH (including conditional variance and correlation asymmetry), are employed for beta estimation and forecast. The ADCC-GJR-GARCH model should provide better performance due to its structure, but introduction of additional variables in conditional variance and correlation equations decreases forecast accuracy, which is a significant disadvantage.

The multivariate GARCH models were chosen based on data exigencies and the underlying hypotheses: mainly, that the volatility of financial assets changes over time due to various corporate and global events. Econometrically, the GARCH models capture this idea by allowing correlations to vary over time, making these models very tractable in assessing volatility interrelationships between financial securities. The equation of a market index and securities returns are defined as:

$$R_{i,t} = \mu_i + \varepsilon_{i,t}, \; R_{m,t} = \mu_m + \varepsilon_{m,t}, \; \varepsilon_t | \Omega_{t-1} \sim N(0, H_t) \quad (10)$$

where: μ_m is the mean returns of a market index; μ_i is the mean returns of asset i; ε_{it} is errors in the equation of returns at time t; H_t is the variance-covariance matrix; R_t is the time-varying correlation matrix; Ω_{t-1} is the conditional previous information set.

The variance-covariance matrix H_t in DCC and ADCC models take the following form:

$$H_t = D_t R_t D_t \quad (11)$$

Or

$$\begin{pmatrix} h_{m,t} & h_{mi,t} \\ h_{mi,t} & h_{i,t} \end{pmatrix} = \begin{pmatrix} \sqrt{h_{m,t}} & 0 \\ 0 & \sqrt{h_{i,t}} \end{pmatrix} * \begin{pmatrix} 1 & p_{mi,t} \\ p_{mi,t} & 1 \end{pmatrix} * \begin{pmatrix} \sqrt{h_{m,t}} & 0 \\ 0 & \sqrt{h_{i,t}} \end{pmatrix} \quad (12)$$

where: $h_{m,t}$ and $h_{i,t}$ are conditional variances; $h_{mi,t}$ is a conditional covariance; D_t is the diagonal matrix of conditional variances.

The correlation matrix R_t changes over time and is estimated as:

$$R_t = (diag(Q_t))^{-\frac{1}{2}} Q_t (diag(Q_t))^{-\frac{1}{2}} \tag{13}$$

where Q_t is the variance-covariance matrix of standardized residuals ($z_t = \varepsilon_t / \sigma_t$), which takes the following form in the DCC model:

$$\begin{aligned} Q_t &= (1-\omega_1-\omega_2)\overline{Q} + \omega_1 z_{t-1} z_{t-1}^{'} + \omega_2 Q_{t-1}, \\ \overline{Q} &= \frac{1}{T}\sum_{t=1}^{T} z_t z_t^{'},\ \omega_1+\omega_2<1,\ \omega_1,\omega_2>0 \end{aligned} \tag{14}$$

where $\overline{Q}$ is the unconditional variance-covariance matrix of standardized residuals.

Conditions imposed on ω_1 and ω_2 are mandatory: firstly, they provide a positive definite variance-covariance matrix; secondly, they keep such a structure of a correlation matrix which ensures that one-directional market index and asset fluctuations increase the conditional correlation.

In an ADCC model, a parameter reflecting asymmetry effect is included in the variance-covariance matrix of standardized residuals Q_t :

$$\begin{aligned} Q_t &= (1-\omega_1-\omega_2)\overline{Q} - \omega_3\overline{N} + \omega_1 z_{t-1} z_{t-1}^{'} + \omega_2 Q_{t-1} + \omega_3 \eta_{t-1}\eta_{t-1}^{'}, \\ \overline{N} &= \frac{1}{T}\sum_{t=1}^{T} \eta_t \eta_t^{'},\ \omega_1+\omega_2+\nu\omega_3<1,\ \omega_1,\omega_2,\omega_3>0 \end{aligned} \tag{15}$$

where: $\eta_t = I[z_t<0] \circ z_t$, I is a function which is equal to 1 if $z_t<0$ and equal to 0 or otherwise, $\circ$ stands for the Hadamard product; $\overline{N}$ is the unconditional variance-covariance matrix of η_t ; ν is the largest eigenvalue of matrix $\overline{Q}^{-\frac{1}{2}}\overline{N}\overline{Q}^{-\frac{1}{2}}$.

The significance of parameter ω_3 means asymmetry in conditional correlation. Restrictions on ω_1, ω_2 and ω_3 provide a positively determined variance-covariance matrix of Q_t in an ADCC model. Two specifications are proposed in order to model conditional volatilities. The first one is the simple GARCH model introduced by Bollerslev (1986):

$$\begin{cases} h_{m,t} = c_1 + a_1\varepsilon_{m,t-1}^2 + g_1 h_{m,t-1} \\ h_{i,t} = c_2 + a_2\varepsilon_{i,t-1}^2 + g_2 h_{i,t-1} \end{cases} \tag{16}$$

Apart from the simple GARCH model, the GJR-GARCH model (Glosten, Jaganathan and Runkle 1993) is employed:

$$\begin{cases} h_{m,t} = c_1 + a_1\varepsilon_{m,t-1}^2 + \lambda_1\varepsilon_{m,t-1}^2 I[\varepsilon_{m,t-1}<0] + g_1 h_{m,t-1} \\ h_{i,t} = c_2 + a_2\varepsilon_{i,t-1}^2 + \lambda_2\varepsilon_{i,t-1}^2 I[\varepsilon_{i,t-1}<0] + g_2 h_{i,t-1} \end{cases} \tag{17}$$

$$\lambda_1 \geq 0,\ \lambda_2 \geq 0$$

where: λ_1 and λ_2 are the parameters which determine asymmetric volatility shocks; I is a function which is equal to 1 if $\varepsilon_{t-1}<0$ and is equal to 0 otherwise. If λ_1 and λ_2 are statistically significant, it means that the asymmetry effect is observed in conditional volatility.

Conditional covariance between a market index and an asset *i* $h_{mi,t}$ is calculated on the basis of a correlation matrix R_t and matrix D_t estimates and then is used to compute a security beta:

$$h_{mi,t} = p_{mi,t}\sqrt{h_{m,t}h_{i,t}} \tag{18}$$

$$\beta_{it}^{*} \mid \Omega_{t-1} = \frac{\operatorname{cov}(r_{m,t}, r_{i,t} \mid \Omega_{t-1})}{\operatorname{var}(r_{m,t} \mid \Omega_{t-1})} = \frac{h_{mi,t}}{h_{m,t}} \tag{19}$$

The log-likelihood function used to estimate all the coefficients is given by:

$$L(\theta) = -\frac{1}{2}\sum_{t=1}^{T}(n\ln(2\pi) + \ln\left|D_t R_t D_t\right| + \varepsilon_t'\left(D_t R_t D_t\right)^{-1}\varepsilon_t) \tag{20}$$

where. T is the number of observations; n is the number of variables; θ is the vector of unknown parameters.

In order to satisfy stationary conditions, optimization was carried out with an adaptive barrier algorithm.

In the typical way described above, GARCH models were estimated with the assumption of Student's distribution. Thus, on the basis of multivariate GARCH models, six time-varying beta estimates for each asset were obtained: three for normal distribution and three for Student's distribution.

5.4. Kalman filter

The Kalman filter was named after Rudolf Kalman (Kalman 1960) and was first used for guidance, navigation and control of various vehicles. The Kalman filter is an efficient recursive filter that estimates the internal state of a linear dynamic system from a series of noisy measurements. Thus, the Kalman filter can be used for a state space model representation of the market model. As opposed to GACH models where to assess beta, conditional volatility and correlation processes should be determined first, the state space model makes it possible to estimate the time-varying beta directly.

The state space model consists of an observation equation (a market model equation) and transition equations (alpha and beta processes). Specification of the Kalman filter, which assumes that dynamic processes of both alpha and beta are random walk processes, can be expressed as:

$$\begin{gathered} R_{i,t} = \alpha_{i,t} + \beta_{i,t} * R_{m,t} + \varepsilon_{i,t},\ \beta_{i,t} = \beta_{i,t-1} + \eta_{i,t},\ \alpha_{i,t} = \alpha_{i,t-1} + u_{i,t} \\ \varepsilon_{i,t} \sim N(0, \sigma_{\varepsilon_i}^2),\ \eta_{i,t} \sim N(0, \sigma_{\eta_i}^2),\ u_{i,t} \sim N(0, \sigma_{u_i}^2) \end{gathered} \tag{21}$$

Random errors ε_{it}, η_{it} and u_{it} are assumed to be uncorrelated at all lags and normally distributed. The parameters of a Kalman filter are estimated using the likelihood function. According to Faff *et al.* (2000) random walk or AR(1) process fits beta dynamics the most, and for this reason it is chosen as the transition equation.

In order to describe the model estimation process, let's turn to a traditional form of a Kalman filter:

$$\begin{cases} y_t = Z_t x_t + d_t + \omega_t \\ x_t = M_t x_{t-1} + c_t + S_t \upsilon_t \end{cases} \tag{22}$$

$$\omega_t \sim N(0, \sigma_{\omega}^2),\ \upsilon_t \sim N(0, Q_t)$$

It is easily seen that in our case (for any asset k):

$$y_t = R_{k,t},\ Z_t = \begin{pmatrix} 1 & R_{m,t} \end{pmatrix},\ x_t = \begin{pmatrix} \alpha_{k,t} \\ \beta_{k,t} \end{pmatrix},\ M_t = S_t = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},\ c_t = d_t = 0,\ \upsilon_t = \begin{pmatrix} \eta_{k,t} \\ u_{k,t} \end{pmatrix},$$

$$\omega_t = \varepsilon_{k,t}, \sigma_{\omega}^2 = \sigma_{\varepsilon_i}^2,\ Q_t = \begin{pmatrix} \sigma_{\eta_k}^2 & 0 \\ 0 & \sigma_{u_k}^2 \end{pmatrix}$$

Later introduce the following variables: $b_{t|t-1} = E_{t-1}(x_t)$, $b_t = E_t(x_t)$ and $P_t = E_t[(b_t - x_t)(b_t - x_t)^T]$. Thus, the Kalman filter is comprised of seven recursive equations presented below:

$$\begin{cases} b_{t|t-1} = M_t b_{t-1} + c_t \\ P_{t|t-1} = M_t P_{t-1} M_t^T + S_t Q_t S_t^T \\ y_{t|t-1} = Z_t b_{t|t-1} + d_t \\ v_t = y_t - y_{t|t-1} \\ F_t = Z_t P_{t|t-1} Z_t^T + H_t \\ b_t = b_{t|t-1} + P_{t|t-1} Z_t^T F_t^{-1} v_t \\ P_t = (I_m - P_{t|t-1} Z_t^T F_t^{-1} Z_t) P_{t|t-1} \end{cases} \quad (23)$$

Afterwards, unknown variables θ are estimated within a maximum log-likelihood function, which takes the following form:

$$\ell = \ln L(\theta) = -\frac{T}{2}\ln(2\pi) - \frac{1}{2}\sum_{t=1}^{T}\left(\ln F_t + \frac{v_t^2}{F_t}\right) \quad (24)$$

where: T is the number of observations and unknown variables are $\sigma_{\varepsilon_i}^2$, $\sigma_{\eta_i}^2$ and $\sigma_{u_i}^2$.

The Kalman filter recursively forecasts conditional alpha and beta values. Therefore, it estimates the entire series of both alpha and beta values for each stock. It is only required to set an initial value, which is assumed to be equal to 1 for beta and 0 for alpha. However, to eliminate potential bias (further observations put beta close to its fair value eliminating the effect of an incorrectly set initial value), the first five observations were used for Kalman filter calibration and were not used in the analysis on which the results are based.

5.5. Models comparison

All four approaches (OLS, GARCH models, the Kalman filter and semiparametric regressions) are compared to ascertain which model is the best in terms of explanatory power. The models are compared for both the analyzed and forecast periods. The latter is based on one-head beta predictions from January 2014 to June 2015. As in-sample and out-sample criteria, mean squared errors are used. The former was calculated as:

$$MSE_i = \frac{\sum_{t=1}^{S} e_{i,t}^2}{S} = \frac{\sum_{t=1}^{S} (R_{i,t}^{estimated} - R_{i,t})^2}{S} \quad (25)$$

where $e_{i,t}$ is the prediction error of asset i at time t. S is the number of observations during the analyzed period.

The out-sample MSE was computed in the same way:

$$MSE_i = \frac{\sum_{t=0}^{T-S-1} e_{i,t+1}^2}{T-S} = \frac{\sum_{t=0}^{T-S-1} (R_{i,t+1|t}^{predicted} - R_{i,t+1})^2}{T-S} \quad (26)$$

Therefore, the smaller the MSE value the more accurate a prediction is. Thus, the model with a minimum MSE value is considered to be the best one for a certain security.

6. Results

Table 2 illustrates the results of time-varying beta estimation for the analyzed period. They are based on in-sample MSE values.

As seen in Table 2, the semiparametric regressions are the best models for most of the assets under analysis (18 out of 35). However, the Kalman filter is still a good competitor, being the best in 15 out of 35 cases. It is worth mentioning that among semiparametric regressions the one with a uniform kernel type turned out to be the most efficient model (13 out of 35). GARCH as well as OLS models have shown the worst performance in terms of in-sample MSE.

Table 2. - The models comparison in terms of in-sample MSE.

Model	Number of best performance
DCC-GARCH (normal dist.)	1 / 35
DCC-GJR-GARCH (normal dist.)	1 / 35
ADCC-GJR-GARCH (normal dist.)	0 / 35
DCC-GARCH (Student's dist.)	0 / 35
DCC-GJR-GARCH (Student's dist.)	0 / 35
ADCC-GJR-GARCH (Student's dist.)	0 / 35
Kalman Filter	15 / 35
Semiparametric regression (Gaussian)	5 / 35
Semiparametric regression (Epanechnikov)	0 / 35
Semiparametric regression (Uniform)	13 / 35
OLS	0 / 35

In order to compare models on average for the whole sample, mean rank was calculated in-sample MSE. For each asset, all the models were ranged from 1 to 11 depending on its MSE value. The most accurate model was given rank of 1, while the worst one – rank of 11. This procedure was done for all the assets and then mean rank was calculated for every model. Mean ranks of the models for in-sample period is presented in Figure 1.

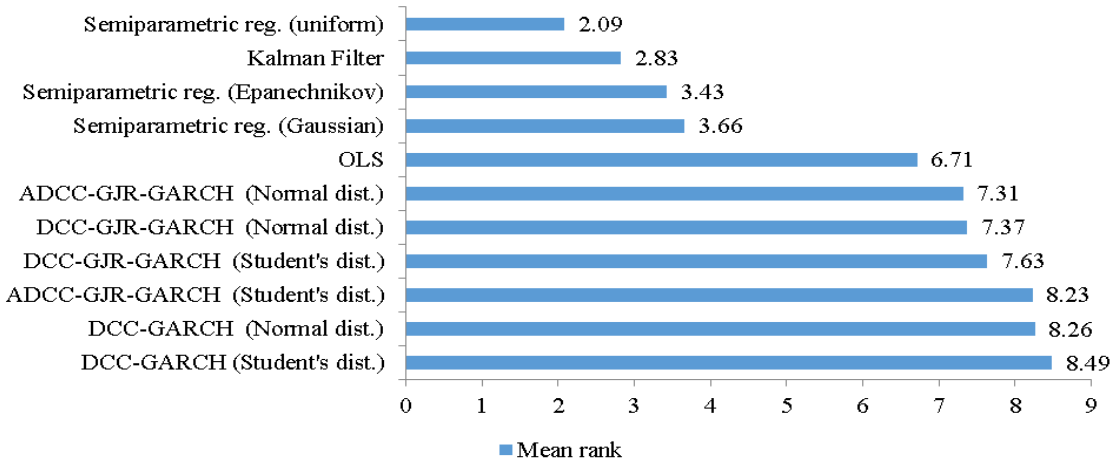

Figure 1 - Comparison of mean rank based on in-sample MSE.

As shown in the Figure 1, semiparametric regression with uniform kernel type is the most efficient model for the sample in whole, although it is not the best model in terms of the number of best performance. The Kalman filter followed by semiparametric regressions with Gaussian and Epanechnikov kernel types is the second best technique. GARCH models have shown the worst performance and turned out to be even less effective than OLS for in-sample estimation. These results prove that the H1 hypothesis, as an OLS method assuming beta constancy, is inferior to the Kalman filter and semiparametric regressions according to the in-sample MSE values. This conclusion supports the results of Choudhry and Wu, (2008), Brooks *et al.* (1998) and Mergner and Bulla (2008). Although the Kalman filter is still considered as one of the most efficient models for beta estimation, the results reject the undisputed superiority of the Kalman filter technique, which was mainly accepted in the previous works, indeed, employing an older methodology. Thus, the second H2 hypothesis is partially confirmed as semiparametric regressions demonstrate better estimates for most securities and the sample in whole. However, it is applicable only to the results for the analyzed period and cannot be applied as the basis for comparing the forecasting ability of the models used.

Table 3 highlights the results of models compared for the forecast period. They are based on out-sample MSE values. In contrast to the analyzed period, GARCH models turn out to be the most efficient for beta forecast (in 24 out of 35 cases). GARCH models with Student's distribution are the best for 11 assets, while with normal distribution - for 13. Semiparametric regressions are the best models for five securities, whereas the Kalman filter is best only for one. Surprisingly, but OLS method occurred to be the most accurate for 5 assets.

Table 3 - Comparison of models in terms of out-sample MSE.

Model	Number of best performance
DCC-GARCH (normal dist.)	3 / 35
DCC-GJR-GARCH (normal dist.)	4 / 35
ADCC-GJR-GARCH (normal dist.)	6 / 35
DCC-GARCH (Student's dist.)	3 / 35
DCC-GJR-GARCH (Student's dist.)	4 / 35
ADCC-GJR-GARCH (Student's dist.)	4 / 35
Kalman Filter	1 / 35
Semiparametric regression (Gaussian)	1 / 35
Semiparametric regression (Epanechnikov)	4 / 35
Semiparametric regression (Uniform)	0 / 35
OLS	5 / 35

GARCH models, including those with asymmetric volatility and correlation have been shown to be the best models for certain assets. The reason for this is the existence of strong heteroscedasticity, which is frequently observed for financial markets and is consistent with GARCH models, especially those capable of capturing asymmetry effects (negative shocks affect volatility in a way other than positive), whereas the Kalman filter approach is not always able to adapt to sharp volatility fluctuations. Thus, the difference in the results for the analyzed and forecast periods is attributable to poor Kalman filter prediction power compared to modern approaches, while its filtered estimates in the analyzed period are much better at capturing beta and alpha dynamics.

Analogously mean ranks were estimated for out-sample period. Results of calculations are presented in Figure 2. Mean ranks of the models are much closer to one another than for in-sample period. However, GARCH models superiority can be concluded. Note that GARCH models with Student's distribution tuned out be top-3 models. Overall, ADCC-GJR-GARCH model with Student's distribution (assuming both asymmetry in conditional volatility and conditional correlation) is the best model for the sample in terms of out-sample forecast. Interestingly, OLS method outperformed the Kalman Filter and 2 of 3 semiparametric regressions (with Epanechnikov and uniform kernel types).

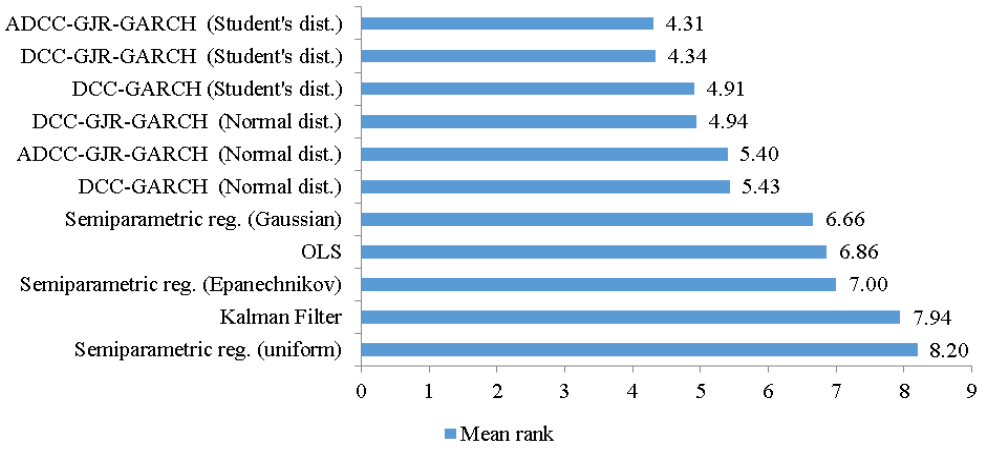

Figure 2 - Comparison of mean rank based on out-sample MSE

On the whole, no model can be considered as the most effective and a particular technique fits a certain asset the most. These results reject the third H3 hypothesis concerning the Kalman filter's superiority for dynamic beta prediction. On the basis of results for the analyzed period, beta values are taken from the most efficient model for each stock according to in-sample MSE. Thus, betas ranging from January 2009 to December 2013 are used for further analysis.

Table 4 - Descriptive statistics of optimal dynamic betas and OLS betas

	MICEX Oil & Gas	MICEX Power	MICEX Telecommunications	MICEX Metals & Mining	MICEX Manufacturing	MICEX Financials	Sberbank	VTB	Acron
OLS beta	*0.96*	*0.94*	*0.78*	*0.97*	*0.87*	*0.96*	*1.32*	*1.26*	*0.87*
Mean	0.96	0.88	0.69	0.97	0.84	0.96	1.21	1.30	0.91
Median	0.96	0.87	0.67	1.00	0.82	0.96	1.21	1.30	0.89
Max	1.00	1.13	0.98	1.12	1.27	1.21	1.67	1.51	1.65
Min	0.80	0.68	0.40	0.53	0.37	0.85	0.74	1.19	0.47
Std. deviation	0.02	0.08	0.11	0.12	0.13	0.05	0.18	0.07	0.28
Skewness	-3.15	-0.06	0.74	-1.78	0.48	0.45	-0.47	0.61	0.60
Kurtosis	26.29	-0.62	0.32	3.20	1.77	0.92	0.84	0.17	-0.39
Jarque-Bera test									
Stat.	7872.4	4.0	25.0	246.7	44.2	18.2	17.4	16.5	17.1
P-value	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Uralkali	*Dixy Group*	*Magnit*	*M.Video*	*Sistema*	*MTS*	*Rostelecom*	*Gazprom*	*NOVATEK*
OLS beta	*1.00*	*0.79*	*0.60*	*0.58*	*1.06*	*0.67*	*0.57*	*1.02*	*0.82*
Mean	0.86	0.83	0.71	0.46	0.94	0.62	0.50	1.02	0.80
Median	0.94	0.81	0.79	0.48	0.95	0.58	0.50	1.02	0.81
Max	1.37	1.16	1.00	0.58	1.30	0.89	0.64	1.16	1.09
Min	0.36	0.24	0.04	-0.02	0.51	0.50	0.23	0.81	0.45
Std. deviation	0.27	0.18	0.27	0.11	0.18	0.10	0.11	0.06	0.16
Skewness	-0.46	-0.32	-1.31	-1.93	-0.34	0.96	-0.54	-0.83	-0.16
Kurtosis	-1.15	-0.28	0.53	6.31	-0.29	-0.11	-1.10	1.74	-0.89
Jarque-Bera test									
Stat.	23.0	5.0	76.7	590.2	5.6	39.5	25.1	62.8	9.3
P-value	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0

	MICEX Oil & Gas	MICEX Power	MICEX Telecommunications	MICEX Metals & Mining	MICEX Manufacturing	MICEX Financials	Sberbank	VTB	Acron
	Rosneft	*Surgutneftegaz*	*Tatneft*	*Lukoil*	*Gazprom Neft*	*E.ON Russia*	*Inter RAO*	*FGS*	*Russian Grids*
OLS beta	*0.99*	*1.00*	*1.15*	*0.92*	*0.85*	*0.99*	*1.01*	*1.22*	*1.20*
Mean	0.99	1.04	1.10	0.93	0.85	0.98	1.15	1.30	1.47
Median	1.02	1.02	1.12	0.91	0.84	0.98	1.15	1.19	1.39
Max	1.30	2.12	1.21	1.13	1.07	1.13	1.77	2.66	2.80
Min	0.74	0.31	1.00	0.81	0.64	0.68	0.61	0.59	0.77
Std. deviation	0.15	0.31	0.06	0.08	0.13	0.05	0.32	0.43	0.45
Skewness	-0.05	0.60	-0.46	0.71	0.06	-2.88	0.34	1.17	0.80
Kurtosis	-1.16	0.64	-1.13	-0.45	-1.47	14.68	-0.75	0.83	0.27
Jarque-Bera test									
Stat.	13.9	20.0	22.3	23.7	22.6	2679.2	10.6	66.3	28.2
P-value	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RusHydro	*Severstal*	*Norilsk Nickel*	*MMK*	*NLMK*	*Raspadskaya*	*Mechel*	*Aeroflot*	
OLS beta	*1.02*	*1.21*	*1.27*	*0.98*	*1.04*	*1.12*	*1.54*	*0.75*	
Mean	1.14	1.28	1.02	1.14	1.17	1.24	1.53	0.76	
Median	1.10	1.27	0.91	1.20	1.24	1.17	1.47	0.80	
Max	1.96	1.63	1.79	1.59	1.34	2.07	2.18	1.11	
Min	0.57	0.98	0.76	0.65	0.82	0.55	1.02	0.20	
Std. deviation	0.36	0.16	0.26	0.29	0.17	0.33	0.29	0.24	
Skewness	0.50	0.27	1.16	-0.38	-0.73	0.51	0.53	-0.41	
Kurtosis	-0.52	-0.69	0.56	-1.30	-0.97	-0.46	-0.72	-0.85	
Jarque-Bera test									
Stat.	13.1	7.9	61.3	23.8	32.4	13.3	17.4	14.7	
P-value	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

In Table 4, beta descriptive statistics and their OLS estimates are introduced. The mean standard deviation of beta is equal to 0.21, while the mean beta of all the companies stands at 1.01. This means that the time-varying beta of certain assets fluctuates near 1, so their stocks could be aggressive or protective in different periods of time. Note that time-varying betas of MICEX Power and Dixy Group are normally distributed according to the Jarque-Bera test.

Figure 3 shows the mean betas of Russian sector indices and their standard deviations.

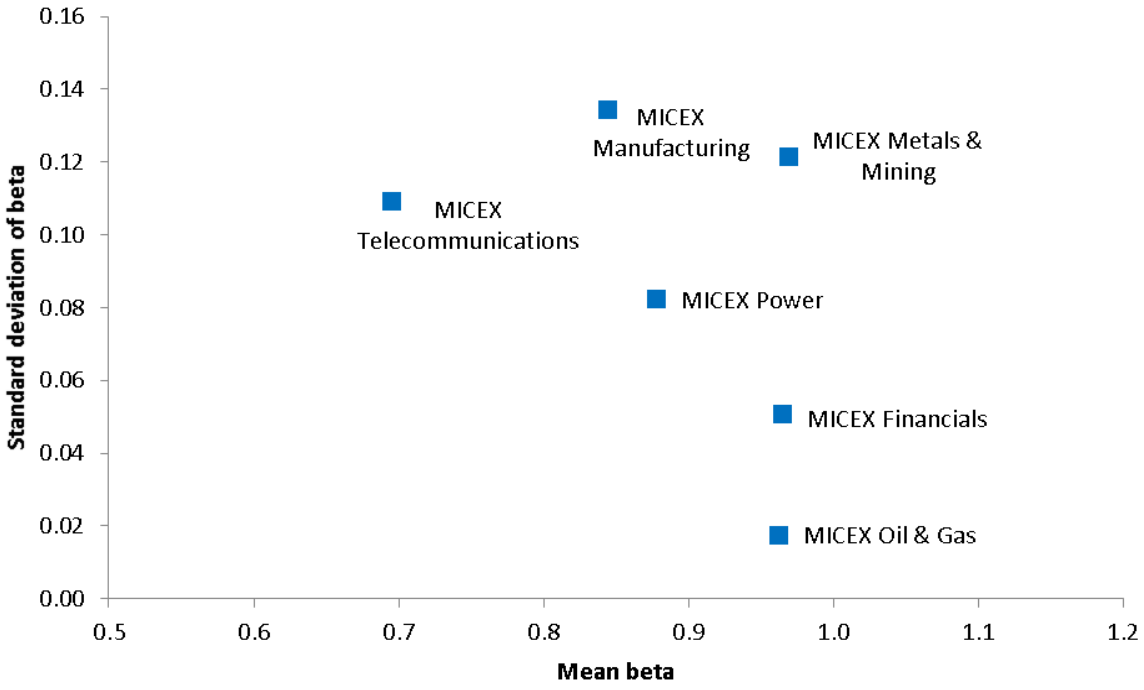

Figure 3 - Mean betas of Russian sector indices and their standard deviations.

Beta of the oil & gas industry is the least volatile (its standard deviation totals 0.02) and displays one of the greatest mean values (0.96) among sectors. This makes it the most protective sector in terms of beta fluctuations, although it does not eliminate the investment risk due to beta. The metals & mining sector should be considered as the riskiest among sector indices due to its mean beta (0.97). In contrast, the mean beta of the telecommunications sector is the smallest (0.69), and being one of the most volatile, its standard deviation stands at 0.11. The MICEX Manufacturing Index has a mean beta value of 0.84 but its standard deviation is the largest among all sectors (0.13).

Figure 4 depicts the mean betas of Russian companies and their standard deviations. M.Video stock is the most defensive security as it has the lowest mean beta value (0.67) with one of the lowest standard deviations (0.11). Thus, the security is the least sensitive to market fluctuations and the grade of this sensitivity has a low risk of change. On the contrary, such companies as Russian Grids, FGS and Mechel are to be considered as very risky due to their high mean beta values and their relatively high standard deviation.

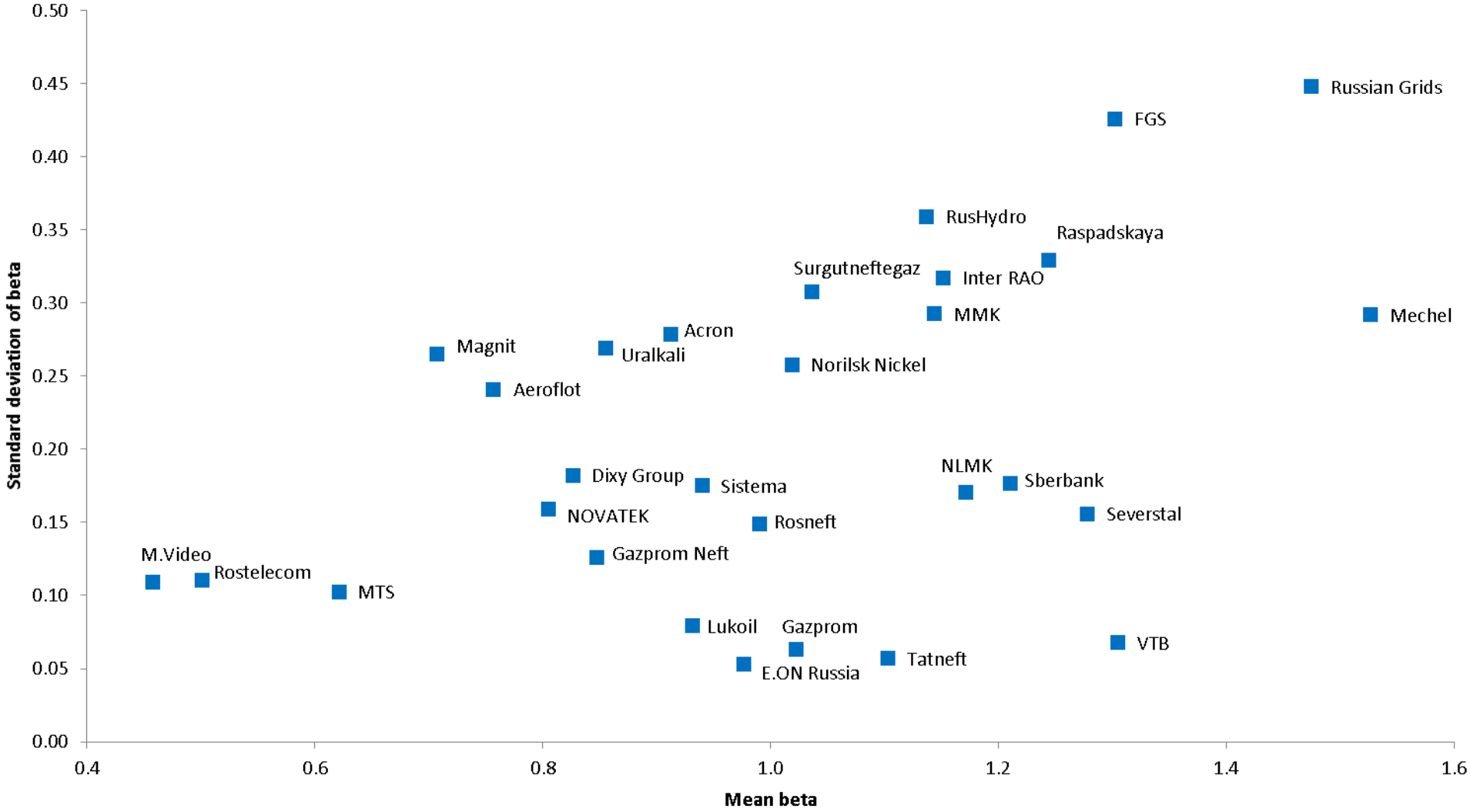

Figure 4 - Mean betas of Russian companies and their standard deviations.

Table 5 shows the results of the Augmented Dickey-Fuller, Philips-Perron and Kwiatkowski–Phillips–Schmidt–Shin tests for beta stationarity. The results are significant at the 5 per cent level.

Table 5 - Stationarity tests results

Number of non-stationary betas	ADF test	Philips-Perron test	KPSS test
ADF test	29 / 35		
Philips-Perron test	25 / 35	27 / 35	
KPSS test	29 / 35	27 / 35	34 / 35
All three tests prove stationarity	1 / 35	All three tests reject stationarity	25 / 35

Note: Results are significant at the 5 per cent level.

As shown in Table 5, an analysis of beta dynamics shows that for the 5 per cent significance level 29, 27 and 34 out of 35 time-varying betas processes are non-stationary according to the Augmented Dickey-Fuller, Philips-Perron and Kwiatkowski–Phillips–Schmidt–Shin tests, respectively. Betas of only one securities are confirmed to be stationary according to all of the tests (E.ON Russia). Although the results differ for each test, the author regards the KPSS test as the most reliable one. Therefore, most of the beta processes are inferred to be non-stationary. Note that all three tests prove beta non-stationarity for 25 securities.

As one beta processes are proven to be constant according to all three tests, H4 cannot be fully confirmed. Since beta non-stationarity for the majority of Russian stocks is proven, the use of constant betas is incorrect and dynamic approaches are to be preferred.

Conclusions

In this paper, 29 Russian stocks and six sector indices during the period from 2010 to 2013 were investigated for beta time-variation. Employing various econometric methods, it was concluded that the Kalman filter and semiparametric regressions showed the best performance for the analyzed period. However, for the forecast period multivariate GARCH models demonstrated greater efficiency (in 24 of 35 cases), which is a surprising result for typical research. According to the results, most of the beta dynamic processes are proven to be non-stationary under the Augmented Dickey-Fuller (29 out of 35), Philips-Perron (27 out of 35) and KPSS (34 out of 35) tests.

It is believed that the results of this study make a contribution to broadening scholarly understanding of Russian stock beta behavior. Beta estimates make it possible to correctly rank Russian stocks depending on the systematic risk and their possible change (expressed by a standard beta deviation).

The present research could be helpful when attempting to determine beta under popular DCF, LBO and other valuation models. Nowadays most equity research analysts working on emerging markets use Hamada formulae for company beta calculation rather than use regression to estimate beta directly. The reasons of such preference are the regression results inconsistent with corporate finance theory, poor market efficiency, high volatility and great exposure to external shocks. In these cases, dynamic models, which takes into account heteroscedasticity and allows to estimate time-varying alpha as well, are to be employed. Their usage lead to more accurate beta estimates than those available under the standard approach involving the use of regressive analytical models.

The proposed methodology could also be a valuable tool for risk managers, traders and portfolio managers. On the basis of out-sample beta and alpha forecasts beta-neutral portfolio can be constructed (portable alpha strategy), market sensitivity of which is close to zero, while alpha is maximized. For this kind of portfolio even small beta changes is significant for risk-return characteristics, therefore, dynamic models should be applied for its regular calibration and market-neutral position keeping. Employed in the study methods can possibly be used for active hedging strategies, as beta stands for optimal hedging ratio for portfolio comprised of an asset and market index. In case of beta non-stationarity importance of time-varying beta estimation techniques increases even greater, as OLS method assumes its constancy. According to the literature, beta non-stationarity is more frequently observed for emerging markets. Thus, emerging markets participants should consider it in their work.

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Infrastructure-Driven Development Policies: An Empirical Impact Analysis

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Abstract:

One of the paradigms of the Infrastructure-driven development concept is the idea that public policies shall direct consistent resources towards infrastructures to stimulate growth in economically lagging regions. Nonetheless, despite the general macro implications for growth demonstrated by several studies, the impact of infrastructure on local growth need further evidence and specific methodology for micro-level analysis. This paper focuses on the financing and development of the so-called social, economic and territory infrastructures. Financing and incentives for infrastructure development require specific policies; among such policies there is the negotiated planning. Based on an empirical analysis, the paper evaluates their effectiveness. Projects are analyzed in terms of structures taxonomy and how they are intended to meet identified problems. Factors associated with success in terms of economic development are discussed. Results suggests that the scope and purpose of projects as well as the level of agreement between stakeholders drive positive outcomes.

Key words: political economy, local policies, economic development, infrastructure financing.

JEL Classification: O10, O47, H54.

1. Introduction

Government at different levels try to address the persistent problems of depressed and weak areas by supporting locally-based policies along with infrastructure investments. Since the evaluation of policies is a key ingredient of today's public decision-making process, the identification of successful drivers is a thought-provoking topic. Yet, both the ex-ante appraisal and the ex-post evaluation is challenging because of the complexity related to the multiplicity entities called upon to interact in order to converge on agreed plan for socio-economic development. Though, there is wider recognition that successful projects should be sustainable with clearly defined long-term objectives so that the expectations of stakeholders persist constant (Agrawal 2001). Also, long-term success depends on adopting and then being able to manage different strategies simultaneously (Di Foggia 2016a) regardless the different objectives levels e.g. general, specific and operational. The negotiated programming for local development (NPLD) is a form of agreed regulation between public authorities at various levels and stakeholders – *e.g.* local authorities, employers, community, trade unions, co-operatives, development agencies – interested in the implementation of pre-defined projects. The backbone of NP is infrastructure development, specifically infrastructure assets, systems and networks that provide essential services for local development. In the past decade, much has been said about both their efficiency and effectiveness. One of the aspects for which the discussion has been pretty long is the lack of empirical evidence. It is inevitable that a different efficiency in the returns from projects may occur due to different geographical and resource endowments. Infrastructure has therefore become a ubiquitous theme in the policy debate (Zhang, Wu, Skitmore, and Jiang 2015).

This work contributes to the existing literature offering some considerations that come from an empirical analysis. Yet, it is important to note two aspects. The first is that in the majority of cases, we know little about the efficiency of these measures since as just mentioned the concerned empirical analysis are deficient. The second aspect is relative to the fact that, even if the objectives are many, the principle one is the reduction of differential territorial development (objective of cohesion). This paper support policy makers and decisions in the light of a sound analysis supported by reliable data. Specifically, the paper contributes to design better policies by facilitating better-informed decision making. Another objective is the improvement of the quality of policy proposals. The analysis of political acceptability is not considered even if the results provide sufficient evidence to respond to concerns that are likely to arise in the decision-making process. These ideas are developed presenting mainly the results of the quantitative analysis based on data and accompanied evaluation of those involved for various reasons in the projects. In the first part of the document we refer to the literature on this subject trying to evaluate the common aspects, after that the instruments, their origin, the legislative framework, and the objectives. In the next section, before a concise discussion we define the methodology of the research. After that the presentation of the results comes. Conclusions and policy implications follow.

2. Literature

A major policy lesson stemming from the budgetary troubles of many countries worldwide is the need to improve expenditure performance, *i.e*. the reinforced connection between funding decisions, policy priorities and outcomes (Di Foggia and Arrigo, 2016). No exception for infrastructures (Misbakhova, Shinkevich, Belozerova, and Stakhova 2016). In fact, poor infrastructure endowment is one of the most persistent challenges all over the world and one of the main challenges for infrastructure development have been limited sources of financing, but also policies and their implementation (Tortajada 2016). This is consistent with a recent study that indicates a significant causal positive link between infrastructure and economic growth especially when a critical mass of infrastructure is present (Koutroumpis 2009). Nonetheless, despite the implications for growth demonstrated by numerous econometric studies, significant under-investment in infrastructure continues to exist. A central reason for the under-investment is a poor regulatory mechanism (Amann, Baer, Trebat and Lora 2016) since unhealthy regulatory governance calls for high regulatory risk. Within the instruments for facilitating infrastructure development there is the NP *i.e.* agreements intended to promote local development, signed by trade unions, trade associations and public administrators of municipalities that must share a common requirement of geographical proximity. This is specifically important for the success of local infrastructure projects since the projects acceptance is hampered by political, legal, institutional and procedural frameworks (Friedl and Reichl 2016).

These findings suggest that integrate different attitudes, perspectives and positions of relevant stakeholders is crucial. Many studies hinting to development policies underestimate their impact (Di Foggia 2016b) this is risky since such infrastructures enable innovation and the healthy functioning of economic systems. Particular attention in stimulating innovative activities should be paid to the application of various tax instruments (Nechaev and Antipina 2016). The object of numerous studies is governance in light of the problematic of institutional issues characterized by widespread overlapping responsibilities between the central and local government. More generally, the difficulty of multilevel governance, also as regards decentralization and to which corresponds the poor coordination at the national level as well as the poor empowerment of the local authorities (Casadio and Paccagnella 2012).

However, the governance of financing mechanisms and management of the infrastructure is fundamental for the research of new and innovative finance mechanisms for the local infrastructure systems (O'Brien and Pike 2015). Another study considers all incentives granted in the form of soft loans (Accetturo and De Blasio 2009). As a consequence, a broad debate has taken hold on the effectiveness of this instrument with respect to other policies. In particular, it is possible to identify two different lenses of observation to look at these tools: on one side is a vision based on the analysis of their social potential, and on the other side a more marked attention to the achievable concrete results through the projects foreseen.

A recent study summarizes some of the indicators used; number of projects launched, the ability to bring in additional resources to territories that activate the pact, the mobilization capacity of local players, the number of investments, the impact on the labor market (Galetto 2009). Many of the more recent contributions show particular attention with regard to the players of the pacts. This work adds to the existing literature thanks to a quantitative analysis of available unpublished data provided by the Ministry for Economic Development.

3. Data

The database for empirical analysis was built in close cooperation with the Ministry of Economic Development. In addition, official data from the national statistics institute and AIDA Boureau van Dijck were used furthermore, this work takes into consideration the feedback of the so-called "qualified witness " or persons involved in various capacities in the activities – in order to assess the perceived effectiveness and identify the critical and most successful points – as well as outside observers, experts in legal and economic issues. These evaluations have been collected through the methodology of focus groups (Wilkinson 2004). All this has allowed the triangulation, which is the practice of analyzing data using multiple sources and approaches in order to increase the credibility and consistency of the study. The projects examined are 911.

Table 1 contains the total investment, the contribution granted and contribution paid. The projects targeting economic infrastructure show an average amount greater than the average, while projects with lower average amounts appear to be those with a lower overall funding per project.

Table 1 - Projects by infrastructure type

Focus area (I level)	Indicators	Investment
Economic infrastructures	Average amount	1.36
	Total amount	511.40
	No of projects	375
Social infrastructures	Average amount	1.10
	Total amount	281.60
	No of projects	265
Territorial infrastructures	Average amount	1.30
	Total amount	363.60
	No of projects	271
Total	Average amount	1.30
	Total amount	1,156.60
	No of projects	911

Source: own elaboration. Amounts expressed in millions of Euro.

4. Empirical evidence

Provided that relative infrastructure quality is difficult to estimate (Tortajada 2016) as indicated in a recent paper published by the Bank of Italy, the development potential provided by a good infrastructure is considerable. Also, good infrastructures contribute to the resilience for economic systems that is its structural robustness as the ability to maintain its functionality in response to shocks (Chopra and Khanna 2015). This paper tries to answer some questions, the first of which is whether the infrastructures examined have actually demonstrated to be effective.

In the affirmative case, it is of interest to understand which type among those classified as economic infrastructure, social infrastructure, and territorial infrastructures has had a greater impact on the social well-being and productivity of economic activities of the territories under examination. Economic infrastructures directly influence the economic activities, social infrastructures act indirectly, while the structures of the territory include services which, although subject to private investment and private activities, impact on the local attractiveness, on the quality of life and on the dynamics of development. As stated before the study took under consideration 911 projects; all the information comes from official sources. In order to neutralize the effect of the recent financial crisis we proceeded to normalize the economic data. Results suggests that, irrespective of the infrastructures classification, there is a positive relationship between the amount of funding in relative terms and the result in terms of the performance of economic activities.

For example, on increasing the amount of funding (per capita or as a percentage) there is a corresponding increase in the economic impact on the local economy. The latter is measured by an indicator that includes, among others, the economic and financial performance of companies and the employment rate of the territories involved. The table below contains some preliminary correlations about the quantitative nature of the projects and some territorial variables.

Table 2 - Correlations

	No units	Unemployment rate	Turnover	Density	Average income	Investment per capita
No of units	1					
Unemployment rate	0.04	1				
Turnover	0.87	-0.07	1			
Density	-0.29	-0.15	-0.28	1		
Average Income	0.14	-0.08	0.10	-0.14	1	
Investment per capita	-0.16	0.10	-0.14	0.27	-0.03	1

Source: own elaboration

The table introduces some peculiarities in the form of the positive correlation between the amount disbursed and territories with fewer companies, territories with elevated unemployment values, with morphological characteristics such as unfavorable or territories with lower average income. The paper also identifies the criteria used to allocate the resources. The data indicate that the funds were granted in areas with a lower concentration of economic activity, with higher rates of unemployment and with critical morphological

characteristics. In synthesis, a first analysis suggests a positive correlation between funding and critical economic and social development of territories. The literature tells us that the infrastructural make up (for example, networks or facilities related to energy, transport or communications technologies) tend to have a positive impact on the economic activities of enterprises and individuals, but also on the level well-being of local communities.

Starting from a basic situation, or absence of projects, the analysis indicates what changes occur, in correspondence to other conditions following the realization infrastructure. After having finalized the analysis and made a distinction of the three categories in question (level I, economic infrastructure, social and territory infrastructures) we see what type of infrastructure among those financed has had the greatest impact on the industry's turnover in the short-medium term in the territories. Specifically, there seems to be a greater effect generated by the structures of the territory, at least in the short term. At this point it is possible to introduce other contextual variables in order to verify the influence. With this model, we intend to verify the effectiveness of investments and evaluate the mediation of some variables or circumstances.

Table 3 shows the results the regression model in which INV represents the investments, GEO is a variable aimed at capturing the dispersion of a territory in terms of density and altimetry, CON is the level of concentration of the companies operating in such area. From the model, some information emerges, for example the amount of the investment has direct business implications as the geographic variable. From an industrial organization point of view an interesting figure that emerges is the negative, although small, negative impact of the concentration variable that resembles the market power.

Table 3 - Regression

Variables	Turnover		
INV	0.00169***	0.00169***	0.00170***
GEO	0.00531***	0.00529***	0.00531***
CON	-9.89e-06***	4.09e-06***	2.60e-06
SI	0.00858		
EI		-0.0206	
TI			0.0151
Observation	842	842	842
R-squared	0.741	0.741	0.741

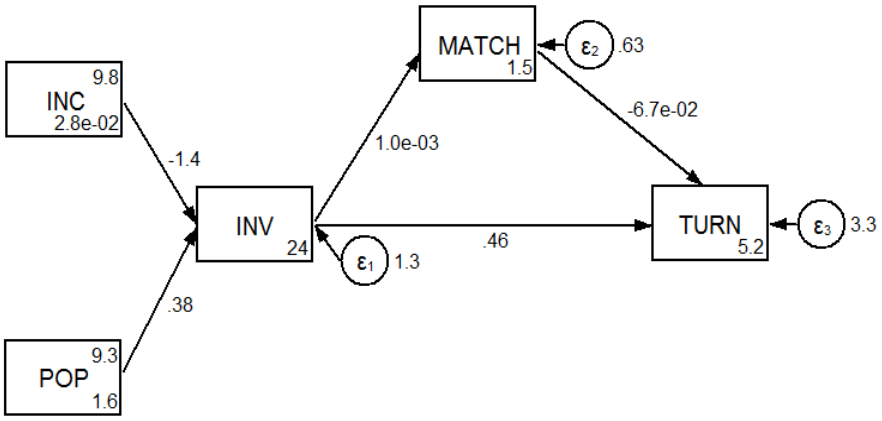
Note : * SI: social infrastructure, EI: Economic infrastructure, TI: territorial infrastructure.
Source : own elaboration

It is possible that the economic infrastructures produce effects in the medium long-term period, since in most cases these consist in networks (transport and energy to name some). The effects of territory structures, however, tend to occur in the short term as directly linked to productive activities, artisan and tertiary activity. The results reported in the table refer to what we call the multiplier, which is a numerical coefficient that indicates to what measure an increase in public spending generates an increase in income. In our case the multiplier is used to estimate how many euros a euro of funding is able to generate. If we consider the morphological variable which has the ultimate goal of quantifying the differences of the examined territories, it seems that, regardless of the differences between the infrastructure, the investment amount is higher in disadvantaged – in terms of altitude and density - territories.

To perform the analysis an element of mediation was introduced, which is a variable called concentration (a proxy of the structure or market concentration). Without considering the geographical variables, networks already require a productive structure which is more or less developed or developing. Other interesting facts that emerge from the analysis are those of the evolution of employment in the territories: it is a fact which should be taken with caution. The results regarding the desirability of the analyzed projects allows to extract some implications in order to support policy makers in the development of new policies for local development. A prominent topic is the quality of the decision-making process: no wonder that the healthier the phase of consultation, the better the performance of the projects if managed through clear multi-level governance without overlapping jurisdictions.

Figure 1 shows how the level of investment decreases with increasing wealth in terms of average income. Another element that emerges is the convergence of projects in struggling urban areas. Below we present two simple models. The variables involved are the following: INC is a measure of the average available income expressed in logarithms, POP corresponds to the concentration of the population and aims to define areas on the basis of the population; INV corresponds to the logarithm of the total investment for each project, the variable MATCH corresponds to the correspondence between the field of intervention and economic activities of

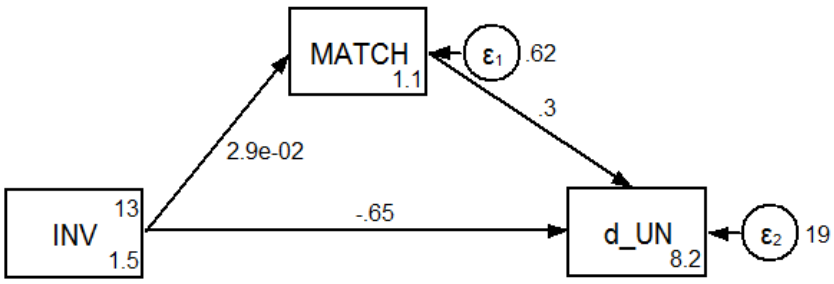
companies present in the area, TURN corresponds to the logarithm of the turnover of the businesses. The low income reflects the poor performance in terms of maintaining and generating high value added activities such as: poor infrastructure, weak human capital, characterized by low education and training levels. sectoral imbalance in terms of over-dependence on low value-added agriculture or in some cases a debilitated industrial sector, low entrepreneurial culture, insufficient enterprises with low innovation activities, weak institutions and social capital in terms of a lack of networks of firms, organizations and individuals and poor public sector capacity to implement local development solutions (OECD 2001)



Source: own elaboration

Figure 1 - Exogenous factors and financial effects

Although this data is to be read with caution as other factors influence the variables in consideration, because until now shown it confirms the positive relationship that exists between the loan granting entity and the socio - economic system of reference. In fact, it is of note how the investments confirm the hypothesized, that is, the positive influence on the performance results of companies and on the level of unemployment, in fact increased funding corresponds to a decrease in unemployment.



Source: own elaboration

Figure 2 - Investments and unemployment

Figure 2 shows the influence of the investments on the difference of the unemployment level before and after the project. So, the results seem to suggest that economic infrastructures have shown greater efficacy in territories not particularly disadvantaged from a morphological point of view while those of the territory and the social ones, on the contrary, seem to appear more efficient in disadvantaged areas where infrastructure are missing. Based on the empirical evidence gathered thus far, it is possible to conclude that the agreement is potentially a tool capable of changing the institutional context and favor the start of a cooperative game between local actors.

5. Discussion

In the past local development efforts, have sometimes failed to achieve the anticipated results because they sought simply to transplant an approach from one area to another without paying enough attention to differences in local context. A major challenge of such projects is the improvement of the area in which they are focused. Landscape – rural or industrial – redevelopment is often considered a positive approach towards sustainable development, nevertheless such projects face barriers regarding both regulation and liability issues, cleanup standards, and access to funding. Regarding the benefits, they range from environmental to social and

economic (Loures 2015). As stated before the purpose can't be purely economic (Silverthorne 2006) but must embed social and environmental aspects too (Blagojević and Tufegdžić 2016). In fact, the impact and more precisely the benefits to the stakeholders are frequently intangible and spread, with the implication that any other benefits are secondary and a possible positive side effect.

The economy-wide effects can be measured as changes in production, welfare or total employment, thus with remarkable differences from the current situation in terms on potential turnover, demography, high-tech enterprises, sectorial composition of the regional economy. A certain number of approaches for assessing the sustainability at the local scale have been developed. Widely speaking, methods based on an ex-post evaluation of the results, models which provides concepts that incorporate all of the parameters on a quantitative basis, targeted assessment tools, reference models which provide a list of indicators and principles to be followed and finally, decision-making tools, which highlight the strengths and weaknesses of a project as a whole (Riera Pérez and Rey 2013). From a micro point of view the first step corresponds with the identification and definition of a set of socio-economic indicators aimed at capturing the wellbeing on site, this methodology is pretty common to carry out impact assessment (Uhlmann, Rifkin, Everingham, Head and May 2014). However, the analysis of these various methods reveals that only a combination of the mentioned approaches and data from different reliable sources can guarantee the triangulation (Hastings 2010) and lead to a sound methodology to capture all of the aspects associated with the sustainable renewal or development. As reported in a recent study (Laprise, Lufkin and Rey 2015), it is generally recognized that the selected indicators shall be exhaustive: together represent the three dimensions inherent to the concept of sustainable development, relevant: synthetically reflect the performance of the project in relation to a given criterion, sensitive: respond to variations of the parameter that is evaluated for both quantitative and qualitative indicators, objective: eliminate ambiguity, accessible: depend on known values or known quantities and reflect the reality of the usual practice and finally readable: ensure simplicity of interpretation, as it is intended to contribute to decision-making and to communication of the results to multidisciplinary stakeholders. Provided what above mentioned we here comes a digest of indicators useful to assess the effectiveness of the projects. Such indicators can be divided into social, economic and environmental. From a social view the following indicators shall be considered: trust in local government, population growth and/or density, sense of belonging, proportion of population who participate in elections, social acceptance (revealed preferences), number of people living in the community, skills availability. From the economic side the following indicators: main sectors of businesses that exist, characteristics of the local economy, reliance on economic sector (one or more), new economic activities, revenues by source, economy diversification, profitability, property values, use of existing infrastructure, reduction of infrastructure cost, household income levels, investments, spending spinoff, tax revenues. From the environment view: urban sprawl, industrial heritage, greenfield consumption, reduce air and water pollution, value of cultural assets, human-environment connections. The analyzed instruments have the strength to be focused and avoid the risk of excluding the characteristics and specifics of the territory. This was also recalled in a recent work done by the Bank of Italy which confirms the development potential provided by a good infrastructure. The efficient implementation of projects is hampered by design flaws, regulations (as pertain to coordination between the different levels of government, the location of the projects, the selection of the private contractor) and monitoring. In this context one must remember that the Italian legal system has allowed the realization of some projects, albeit with great difficulty due to regulatory uncertainty. Despite the difficulties that have occurred, these policy tools have put in motion a remarkable amount of financial resources, which are transferred in the local economy. Thus, have created new jobs, new economic activities, and have helped to consolidate running economic activities. Nevertheless, data showed that there have been a significant number of withdrawals.

Concluding remarks

Policy makers face the persistent problems of depressed and weak areas supporting local policies and infrastructure investments. The Infrastructure-driven development approach suggests that public policies shall direct consistent resources towards infrastructures to stimulate growth in economically lagging regions. Since both quantity and quality of infrastructures positively impact on local growth, it Is difficult to identify which infrastructure subsector matters the most in different circumstance. Regardless the subsector, investments in infrastructures have often been financed with public funds. The public sector has been the main actor in this field, given the inherent public good nature of infrastructure and the positive externalities. Development policies seek to mitigate such problems support local economies. There is no one definition of success since it depends on the objectives and on definitions of success which may vary amongst the stakeholders of the same project.

This paper focused on a specific development policy aimed at equipping territories with infrastructures and bringing greater local participation in the decision-making. These instruments base on local social and economic infrastructures that in turn support the local economic development. No wonder that the evaluation of these policies is challenging. This is mainly due to the level of complexity related to the multiplicity of public and private entities called upon to interact in order to converge on an organic and structured plan of a territory socio-economic development. Besides being sustainable for the long-term, successful projects shall ensure the cooperation convergence of views of the local authorities and community as well as the potential stakeholders. In addition to the economic benefits these projects provide, the related investments also bring social welfare, such as improved connections and services provided the following fundamental characteristics. Social and productive forces must converge on a clearly defined territory development plan.

Also, the presence of entrepreneurship that makes feasible the plan agreed by intervening with its own financial resources is recommended. Equally important is the presence of multiple projects that reinforce each other allowing the integrated development of the territory. In fact, modern society is reliant on the stability and performance of infrastructure networks for almost every social and economic interaction. As per the scope and the amplitude of the projects, it is important that the projects could be executed in the short term and be proportional to the requirements. In addition, the local consultation is a key tool to converge uniformly on the development goals identified in the conciliation process. Indeed, the consultation phase characterizes this tool as a bottom-up approach. No wonder that good local infrastructure can implement the competitiveness and the attractiveness of territories, improve the standard of living strengthening local identities and support territories' networks with tangible and intangible assets related to accessibility and knowledge.

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Crowdinvesting as a Perspective Instrument of Financing Small and Middle-Sized Businesses in the Russian Federation

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Abstract:

The article substantiates the relevance of developing alternative funding ways for project activity of small and middle-sized businesses in the Russian Federation. Therefore, this research aims at working out proposals for forming a common outline and individual infrastructure elements of a crowdinvesting system to activate project and investment activity of such businesses in the Russian Federation. Desk and sociological research was applied to achieve the research objectives. Desk research was done, using the available statistical and analytical information, Russian laws and regulations, and secondary sources. Data regarding current state of the small and middle-sized business sector were collected, and lists of potential respondents were compiled, and latest contacts of such respondents were collected within the desk research. Sociological research included questionnaire surveying, using e-forms to submit data and sending requests via e-mail. Sample included 31 small and middle-sized Russian businesses. The article presents findings obtained within research and development done out of public funds according to the 2016 Governmental Assignment of the Financial University in Creating a system of public investment (crowdinvesting) to activate small and middle-sized businesses. Research materials present basic concept of mainstreaming project and investment activity of small and middle-sized Russian businesses.

Keywords: crowdinvesting, equity-based crowdfunding, blockchain, financial technologies, P2P lending, fundraising, innovations, venture investment.

JEL Classification: G11, G24, O31.

1. Introduction

A theory of crowdsourcing and crowdfunding appeared in mid 2000's to summarize the first results. The history of crowdsourcing concept is closely associated with Jeff Howe, who published his article *The Rise of Crowdsourcing* in June 2006 and used the idea of crowdsourcing for the first time in the world. He describes the phenomenon of people uniting to solve a certain problem with such union not including any award or including a small award, and the effects of such unions on companies that solve similar tasks professionally.

Further on, the theory of crowdsourcing and crowdfunding was picked up by followers of the managerial and economic approaches. Daren C. Brabham developed a technique of application of crowdsourcing as a tool to solve communication problems and he reasons application of crowdsourcing practices in developing and making managerial decisions in his publications (Howe 2012). Crowd-technologies are defined as a tool to solve managerial tasks, a mechanism to regulate life of an organization within this approach; however, application of crowdtechnologies is reduced in reality to a tool of discovering ideas for appropriate managerial decisions to rely on. A close relation of crowd-technologies, primarily of crowdsourcing and crowdfunding, to development of information technologies and social changes was recognized within our research, in particular to better understand the nature of crowd-technologies. One should mention studies done by the following authors to this context:

- the theory of symbolic interactionism (Mead G. H), as a model of crowd interaction and motivation (Blumer 1984);
- the theory of information society (Bell, D., Toffler, E., Castells, M.) (Melnik2005).

Globalization and accelerated rates of scientific and technological expansion lead to increased relevance of the ideology of joint project implementation, which was applied in practice in a great variety of forms with

crowdsourcing, crowdfunding and crowdinvesting being most popular. Despite differences between the said varieties of crowd-technologies, one can also point out common characteristics that determined their popularity:

- broad coverage. Access to results achieved by large groups of people is available online;
- a wide array of choices and alternatives. Crowdsourcing allows us to see the existing problems from different points of view thanks to involvement of large sections of the public possessing varying personal and professional knowledge;
- unprecedented speed. Usually, crowdsourcing projects are characterized by fixed deadlines, which allows for prompt solving the problems stated, when combined with decentralization of multiple participants;
- efficiency, arising as result of mass involvement of the public and use of cheap remote labor;
- user involvement.

Currently, crowdsourcing is applied effectively to fulfill a great number of tasks, including: solving R&D problems; testing software; recruiting; attracting funds; developing products, design etc.; troubleshooting for organizational problems of a business; forecasting; marketing research.

We believe Wikipedia, a successful developing project with its contents being created and moderated predominantly by volunteers and it also being funded by a great number of small donations, is the most popular and, obviously, successful project.

Crowdsourcing has rapidly gained popularity in Russia (Figure 1), which is associated with its relevance to the Russian realia and relatable to traditional values like communality and team spirit. Low efficiency of the bureaucracy against high level of governmental influence over economy and society and purely developed private sector, including small businesses, on the one hand, and public associations created a number of niches for crowdsourcing projects.

Along with clones of successful foreign projects, a lot of in-house projects arose in Russia that are highly competitive with the foreign examples in their innovation and performance. *RosYama* is a vivid example, when users monitor conditions of roads together and interact directly with the government. There are also interesting social projects available that target the disabled, *e.g. No barriers*, or *Subway for everyone*. In most cases, users of such resources do not even think about them being involved in crowdsourcing, they just share their knowledge, information and opinions with others.

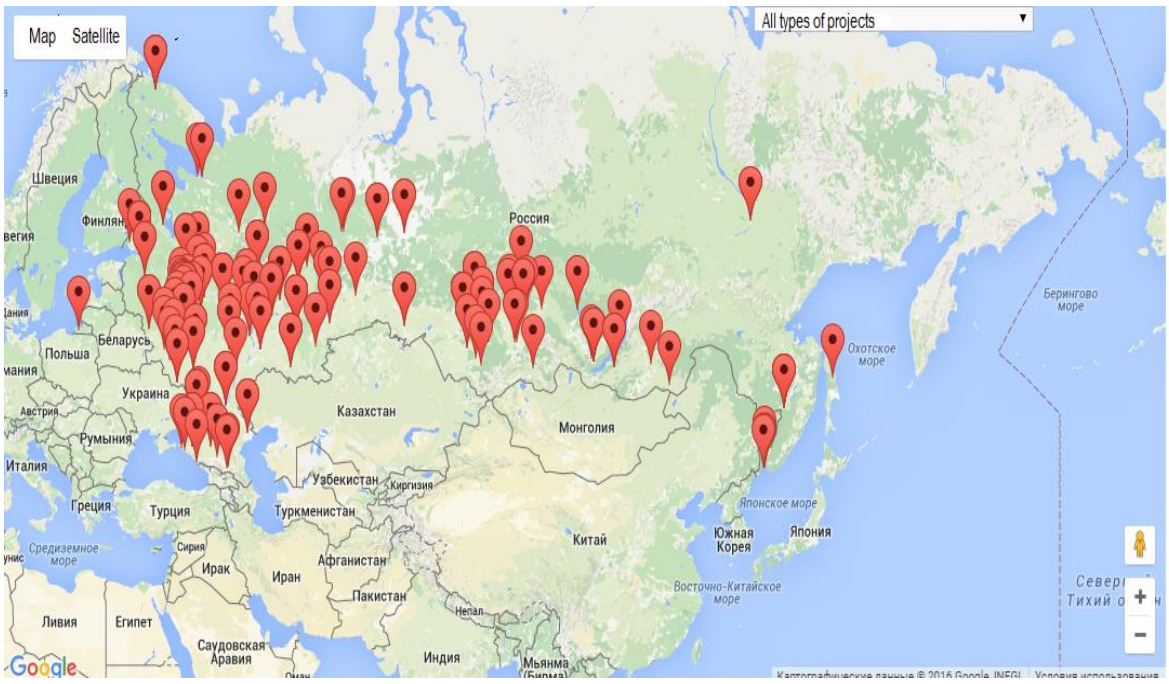

Figure 1 - A map of crowdsourcing projects in Russia

Asmolov G. is considered to be the founder of social crowdsourcing in Russia, as he has created such projects as: *An aid guide for fire victims, Virtual watch bell - an aid book*. This project aims at effective provision of assistance to victims. The system received information from messages, links, videos or photos sent by users. Data may also be collected from mass media, blogs, and web-sites. The *Aid guide* systematizes, checks (if

possible information and maps such information. The projects allow "building up effective bridges" between those in need of help and volunteers possible. With time, the web-site started receiving messages that were not related to fires. Thus, an idea of *Virtual Watch-bell* appeared where a person can notify about his/her misfortune, attract attention to problems or help, give advice to the victims.

Sberbank was one of crowdsourcing pioneers in the corporate sector and presented a 2012 report on corporate social responsibility in 2013 for public review. Registered users were able to express their comments and create a list of recommendations and write proposals to improve Sberbank's work. The most active and useful participants receive rewards and presents.

With time, crowdtechnologies have also been effectively applied by governmental structures. The Government of Moscow was one of pioneers in this line of activity, and *An active citizen* may be marked out as one of its most popular projects.

The concept of crowdfunding is also closely linked to the idea of crowd. This new way of attracting funds to projects became popular at the time of financial crisis in 2008-2009, which resulted from difficulties in attracting funds the usual way, primarily from loss of access to borrowed capital for small businesses. There are currently over 600 crowdfunding platforms in the world (Andreeva *et al.* 2014)

The concept of crowdfunding was used for the first time by Michael Sullivan in 2006; however, there still is not any universal approach to define such phenomenon, or even regulated spelling: crowd funding, crowd-funding or crowdfunding. We also came across the following variants in literature throughout our research: financial crowdsourcing, crowd financing, hyper funding (Howe 2012). The most conventional spelling *crowdfunding* is used for this research. Key definitions of crowdfunding are presented in Table 1.

Table 1 - Defining crowdfunding (Larionov 2014)

Author / source	Definition
Ahlers, G. K. C. *et al*.	A form of collecting funds by an individual or a group of individuals by means of voluntary donation, usually, of (extremely) small amounts to support a certain idea
Ordanini, A., Miceli, L., Pizzetti, M., Parasuraman, A.	A personal initiative taken to raise funds for a new project that was presented by a certain individual by means of small or medium investment of a group of interested parties
Schwienbacher, A., Larralde, B.	An open request via Internet (predominantly) to give funds in the form of voluntary donations in exchange for some form of award and/or right of voting.
Rubinton, B.	A process, where one party attracts funds to fund a project, while requesting and receiving small contributions from a great number of people in exchange for providing a certain value to such people.
Guseva D., Malykhin N.	A collective contribution of people using their resources to support projects that were initiated by other people or entities. In the modern world, this process takes place via Internet.
Tegin V., Usmanov B.	A collective cooperation based on the trust of those joining their financial or other resources via Internet to support projects that were commenced by nitiative of other people (entities).

For this project, we have considered a project funding practice by means of raising small amounts of funds of members, usually, via Internet.

Let us distinguish between three key groups of stakeholders in crowdfunding projects: a project author; a crowdfunding platform; investors (shareholders, contributors, charity providers). Crowdfunding platforms serve as financial and information mediators, primarily performing the following functions: search and interaction with new investors; search and selection of new projects; information support; document flow and settlement procedures with members.

Moreover, a number of financial portals like Planeta.ru, a Russian crowdfunding platform, also act as a full-service crowdfunding agency and take up the following tasks, along with the abovementioned: arranging the process of award provision and logistics; consulting issuers throughout the crowdfunding campaign; providing awards, in case there is not demand on the part of investors; providing online broadcasting etc.

Crowdfunding platforms are not subject to obligatory registrations and operate while having no special license in most countries. Usually, funds are transmitted to the issuing company, as soon as a certain target amount has been gained. If such amount was not gained, the funds are returned to the investors. Most portals use a commission fee model for their monetization.

Let us mark out key advantages of crowdfunding for funding of innovative start-up project: shrinking the role of financial mediators; independence from bank lending; marketing and promotion; testing an innovative idea; publicity and transparency of project investment; retaining control over implementation of the innovative product.

Crowdfunding won popularity recently in such segments as film or music industry and proved effective as a funding instrument for small and medium-sized businesses and projects referring to social business. One may distinguish between the following trends and factors that facilitate crowdfunding development: technological advances and development of social media; freedom from mediation; difficulties of small businesses in attracting their start-up capital.

The global crowding market underwent a stage of accelerated development in 2014 (Crowdconsulting, 2015) and achieved USD 16.2 bln, which is 167% vs. USD 6.1 bln that were attracted in 2013 (Gruzina *et al*. 2014). The industry is expected to double its figures up to USD 34.4 bln before 2017. The biggest growth was observed in the US and Europe in the structure of global crowdfunding market, despite the ever growing involvement and expansion of this instrument in other countries: american crowdfunding market grew by 105% up to USD 1.6 bln; european market volumes grew by 65% up to USD 945 mln; other markets grew by 125% on the average. Thus, the European and North-American markets take up 95% of the global crowdfunding market. A growth of crowdlending volumes is primarily associated with microloans and crediting of small and middle-sized businesses. A substantial growth, by 232%, is observed for classical crowdfunding (reward-based crowdfunding).

Table 2 - Crowdfunding classification

Funding model	Type of crowdfunding	Form of contribution	Form of return	Investor's motivation	International platforms	Russian platforms
Non-cash	Charity	Donations	Intangible benefits	Personal Social	GoFundMe	Помоги.org Тутеза.ру
	Classical (bonus)	Donations	Tangible and intangible benefits (awards)	Personal/social + strive for any form of rewarding	Kickstarter Indeigogo Rockethu	Boomstarter Planeta.ru
Cash	Shareholder - crowdinvesting	Investment	Return on investment	A combination of personal and financial motivation	Seedrs Crowdcube AngelList	StartTrack Jumpstartupper
Loan (debt, crowdlending, p2p crediting)	Loan (loan)	Re-payment of principal amount and interest	A combination of personal and financial motivation	Lending Club Prosper.com	Webmoney Вдолг.ру	

Source: compiled by the authors.

Applications of crowdfunding has constantly been expanding; however, according to figure 2 projects that are associated with creation of games, technologies and design take the lead in the amount of funds raised at the world's largest crowdfunding platform Kickstarter.

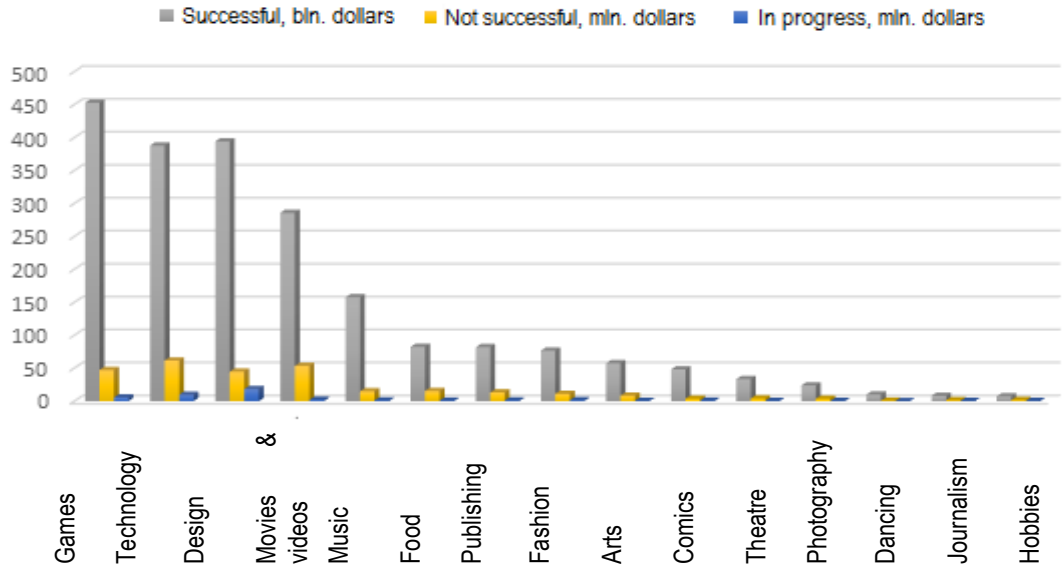

Figure 2 - Attracting funds via Kickstarter broken down by categories

With view to the above, it is interesting to know that the share of successful projects in Games category does not exceed 34% vs. 62% in Dance category (Figure 3).

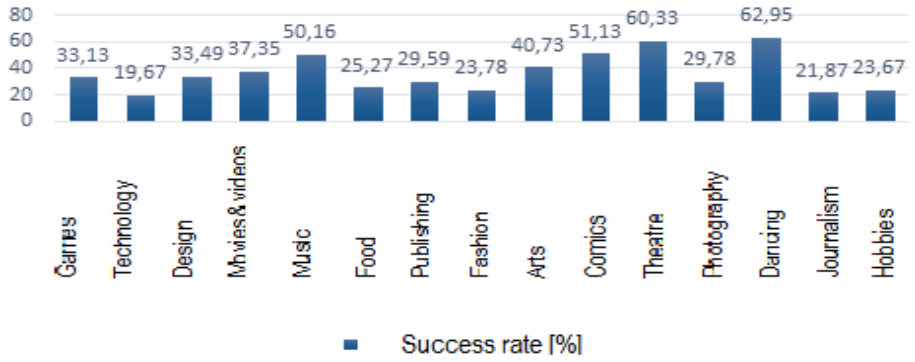

Figure 3 - Share of successful projects broken down by categories.

As estimated by the World Bank, investment via the crowdfunding model will be ca. USD 96 bln before 2025, which is twice as much as the global venture financing market in 2014 and 30 times more than the overall crowdfunding market in 2014 (USD 2.7 bln). A half of the crowdfunding market will be in China (USD 46-50 bln) (Kickstarter 2015). Crowdfunding has the potential of becoming a funding alternative for business projects at the early stage. By definition and practice, crowdfunding serves as an instrument for getting the very start-up funding, *i.e.* as a platform for future traditional funding sources of innovation projects (Ilienkov 2014).

According to the research done by Mollick (2013), a professor from the University of Pennsylvania, the crowdfunding model is ideal for most projects in need of one-time investment not more than USD 1 mln. This mechanism allows for accepting and following the policy of quick introduction of innovations with their further commercialization to ensure growth of financial return on investment activity.

2. Concept headings

According to study results gained within research and development under the public funding in accordance with the 2016 Governmental Assignment in *Creating a system of public investment (crowdinvesting) to activate small and middle-sized businesses,* it was noticed that crowdfunding proved to be a funding and investment stimulation instrument. While it is still a phenomenon of several developed countries, developing states may adopt it quickly. The foundation for crowdfunding development has already been laid, *i.e.* over 80% of Internet users communicate regularly in social media and can easily be informed about an interesting business project. This is a tremendous potential base, even considering the fact that 65% of the world's population - 4.6 bln people - still do not have the Internet access. The government can boost collective financing of businesses by passing laws to regulate crowdfunding as a separate type of activity to eliminate any legal fiscal complexities for fine businesses.

3. Results

The following fundamental results were obtained in the study of development of crowdfunding, and primarily crowdinvesting:

- According to responses provided by eight companies that participated in the questionnaire survey, total loan amount owed by certain individuals to other individuals (p2p) provided using platform data was RUB 52.2 mln for 2015, among which RUB 45.8 mln for loans up to RUB 30 thous. Total portfolio amount was RUB 167.8 mln. Average loan amount granted using the infrastructure of the questioned platforms made RUB 18.3 thous per borrower for 2015. Totally, in 2015, 2,580 individuals received loans, 2,460 individuals granted loans, among which 662 people (26.9%) for the first time.

The p2p market is known for its high concentration, one of the platforms that participated in the questionnaire survey took up 60.6% of issues and 91.9% of the portfolio of such loans in 2015. The share of issues was taken up on this platform predominantly by large loans from RUB 500 thous to RUB 1 mln. Moreover, 76% of the loans provided using the infrastructure of this platform are taken up by repeated borrowers.

Large crowdinvesting (p2p) platforms were included in the number of evaluated companies in Q4 of 2015, and their total volume of loans issued in 2015 was RUB 111.3 mln.

According to the questionnaire survey of the microfunding market and financial accessibility technique, this market demonstrates increasing lending volumes.

- Unfortunately, crowdfunding is not yet as popular in Russia as in Europe or US. Tens of various platforms were created; a great number of forums and conferences were held for 2013, but to no result yet. Smartmarket platform, which was supposed to be the locomotive of Russian crowdinvesting, and which was announced in September 2012, was closed in July 2013 and did not even commence its operation properly. The project team further created a similar crowdinvesting service StartTrack (https://starttrack.ru/).
- A technical solution may be offered to businessmen and investors to solve the current problem of interaction in the Russian Federation. On the one hand, it should not overload the businessman with organizational matters, and on the other hand, it should protect investors' interests after the campaign is finished. The following top-priority measures may be recommended:
  - creating crowdinvesting platforms under the leadership and at the expense of development institutions;
  - further promoting business angel investing, as long as this is the environment, where private initiatives to incorporate syndicates are generated;
  - further developing an eco-system of venture entrepreneurship;
  - developing activity of the industry-related Russian Association of crowdfunders to create a crowd-infrastructure and enhance transparency of the Russian crowd-market;
  - stimulating joint investment in public-private and public business accelerators and accelerating programs;
  - creating a package of documents to conclude syndicated agreements.

- Legal crowdinvesting models in Russia were proposed (Gruzina *et al* 2016):
  - grant funding:
    - advantages: the simplest contractual form and lowest mutual expectations;
    - disadvantages: the grant will be subject to taxation at receipt; amounts over USD 10,000 are subject to Russian and international money laundering laws. If the donor and recipient are for-profit organizations, they may have problems with fiscal inspections.
  - issue of securities:
    - advantages: securities are easy to sell and purchase; Rights of shareholders and issuers are comprehensively covered and protected;
    - disadvantages: the recipient must always be a joint-stock company. Issuing process is always regulated. Prohibitively high process cost.
  - participation interest:
    - advantages: limited Liability Company is the easiest business structure to establish and operate;
    - disadvantages: prohibitive complication of re-registration of new members - by restating incorporating documents; at most 50 donors; meeting of members is required for all important resolutions.
  - acquisition of proprietary rights via the public fund:
    - advantages: this paradigm is replicated, flexibility for recipients (any proprietary rights may be offered);
    - disadvantages: this paradigm requires a federal law. This paradigm requires exclusions from the provisions of corporate law and securities law. Donors have to trust (or not to trust) intermediary of the public fund. Control over proprietary rights in the hands of a single party.
  - secured purpose loan (convertible bond)
    - advantages: simple contracts; easy law enforcement; similarity to the well-established British-American practice that is currently used;
    - disadvantages: complicated simultaneous actions of many creditors, limited choice of instruments, fiscal complications for the recipient (high rated loan debt burden).
  - investment partnership:
    - advantages: the paradigm is described in a standard agreement with the possibility of joining. One partnership per investment project is allowed;
    - disadvantages: The donor is a legal entity or individual entrepreneur. Investment partnerships have not been well established in practice.
  - investment via an invest fund:
    - advantages: the protection mechanisms of donors' rights in the funds have been well established.

The funds are already used to invest into start-ups.

– disadvantages: donors' money, incomes and losses are mixed together and cannot be separated. The laws and regulations of the funds cannot cover such business paradigms. A licensing management company must be established. To conclude the above, there is not any obvious solution available. Consequently, there is not any governmental support as well.

4. Discussion

Individual types of crowdfunding are not covered evenly in the scientific literature. Most academic research (62%) discovers the concept of credit crowdfunding (p2p), while equity-based crowdfunding is one of the least studied industries (21%). Comprehensive scientific studies devoted to crowdfunding as a whole and equity-based crowdfunding are rather rear in Russia (Ilienkov 2014). The following systemic studies may be marked out to study the topic comprehensively:

- a report on *Four mobilities: challenges for Russia in 2015-2030,* with one of its sections devoted to perspectives of a crowdfunding investment funding in the world and Russia, which was compiled in February 2014 by experts of the Analytical Center within the Government of the Russian Federation Yu. Amosov and Krot, A.;
- an analytical review Market of syndicated venture transactions and crowdinvesting, prepared by experts of the National Research University Higher School of Economics by order of the RVC.

Despite the availability of crowdfunding and crowdinvesting, access to them was limited by the law for a long time.

Equity-based crowdfunding (crowdinvesting) is a type of cash crowdfunding model and a collective financing instrument on Internet platforms of venture business projects, usually at early stages, which allows investors to get their share of profit or share in the business. The principal attribute that distinguishes crowdinvesting from crowdfunding is the possibility for a wide circle of individuals to participate in the share capital of a private company, which is exactly the same like at the stock market, where a public company sells a part of its share capital to get funding required for its development. In this case, investors are able to acquire a part of the business. Equity-based crowdfunding relies on a sponsor getting a share in a business company, which is usually at its earliest stage of development. Crowdinvesting provides sponsors with an opportunity to invest small amounts into non-public companies. Success of a company that participated in equity-based crowdfunding is often associated with the author being able to prove sustainability of his business idea. Crowdinvesting is built upon a classic way of participation in the share capital of a company. Individual investors acquire company's securities in exchange of their money.

There is a distinction between two crowdinvesting subtypes (Larionov 2014):

- investment into company's securities, in which case investors acquire a part of the issuing company;
- participation in company's proceeds or profit. Depending on the investment amount, a share of profit is determined to be gained by investors of the issuing company. Investments in crowdinvesting are mostly passive, as long as investors do not acquire any rights to actively participate in company's life. In other words, even while investors gain a share in the share capital or profit of the issuing company, they are not able to affect any managerial decisions of the company.

Lending-based crowdfunding implies monetary relations between a sponsor and project author, which are similar to a bank loan in their form. At the same time, the project author borrows money from the sponsors and repays with interest. Accordingly, crowdlending is similar to typical banking loan products; however, money-lenders are not large financial organizations, but scattered groups of individuals. Researches distinguish between the following subtypes of crowdlending:

- a traditional loan agreement - standard terms and conditions of loan or credit agreement are applied, and payments are made at the given interest rate. Loan payments may be secured or not in this case;
- an excusable loan - loan payments are not made, unless the borrowing company starts generating any profit or gains its first proceeds.

Equity-based crowdfunding is in many ways similar to angel investment, *i.e*. investors contribute their own funds into companies at the earliest development stage. Business angels are 'rich people, who are ready to provide funding, using their own resources, to fast growing but highly risky start-ups, like venture capitalists, however, at the far earlier stage' (Larionov 2014).

Crowdinvesting is similar in many ways to seed microfunding, but only done by average people and not business angels, while maximum funding amount is limited to USD 10-20 thous. At the same time, significant differences of the studied funding instrument from other instruments, in particular from the stock market institution or classic investment, are the following:

- crowdinvesting does not impose such strict requirements to allocating companies, as compared with stock exchanges;
- crowdinvesting is more suitable for small and middle-sized business, in particular thanks to lower transaction costs;
- crowdinvestors communicate with each other and entrepreneurs they are interested in, unlike investment at the stock market.

The above advantages of crowdinvesting explain the emergent tendency towards increased role of crowdinvesting as compared to other funding sources of start-ups (Figure 4).

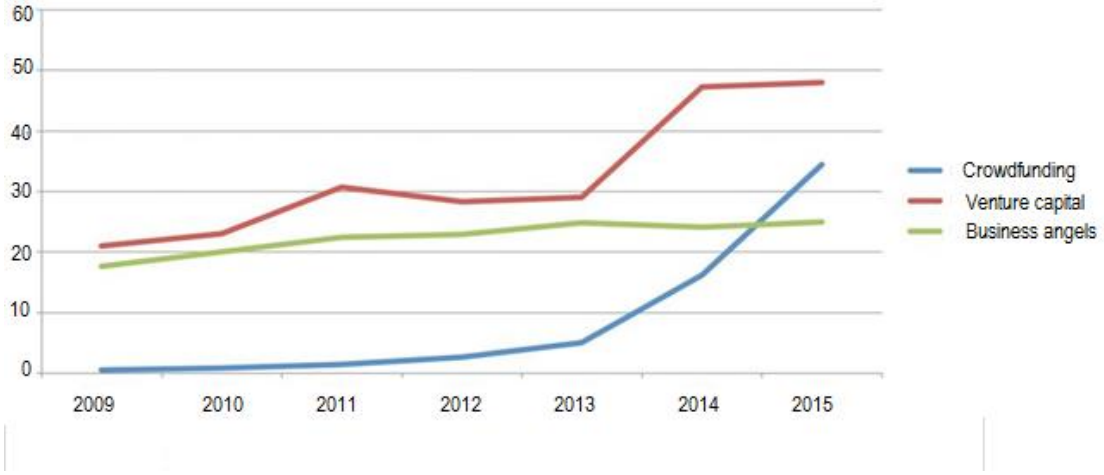

Figure 4 - Ratio of crowdfunding, venture capital and angel investment

Legal aspects associated with crowdinvesting differ by country. That said, crowdfunding was officially almost everywhere a breach of the provisions of the law regarding securities that prohibited general solicitation of securities, unless the issue project was registered, until recently. A publication of a letter of intent to attract investment that was published on the Internet by a company or entrepreneur is considered a general solicitation of securities in the context of traditional law and it is regulated or stopped accordingly. American and British financial regulators started changing the law on securities to facilitate legitimation of crowdinvesting (see Table 3).

Table 3 - Basic provisions of the JOBS Act with regard to equity-based crowdfunding (Larionov 2014)

Section	Title	Brief description
1	Reopening American capital markets to emerging growth companies	Relaxes requirements of the regulator towards emerging growth companies. These include legal entities that attracted share capital actively, and whose revenues for the fiscal year are less than USD 1,000,000,000 and the number of issued shares is less than USD 700,000,000.
2	Access to capital for job creators	The prohibition on advertising of private investment transactions involving exclusively accredited investors and qualified investment companies is lifted.
3	Capital raising online while deterring fraud and unethical non-disclosure	The concept of crowdfunding is legalized, and exemptions and requirements associated with crowdfunding and imposed on issuers, investors and mediators are described.
4	Small company capital formation	A crowdfunding exemption is introduced, and an issuer gets an opportunity to attract up to 2,000 accredited and 500 non-accredited investors, even in case, when the offer is not subject to obligatory registration according to the Securities Act.

Examples of crowdinvesting platforms are given in Table 4.

Table 4 - Description of main equity-based crowdfunding (crowdinvesting) platforms (Larionov 2014)

Platform name	Country	Amount of capital raised
CrowdCube	Great Britain	GBP 3.7 mln.
Symbid	Netherlands	< EUR 1 mln.
MyMicro Invest	Belgium	EUR 500k from professionals
WiSeed	France	EUR 2.5 mln.
Innovestment	Germany	EUR 500k

Statistics of crowdinvesting platforms shows that accredited investors and people with high private profits participate actively in the process. Symbid informs that 30% of all investment done through the platform comes from certified investors. Investment obtained from professional investors may serve as a powerful signal for other groups to join. At the same time, participation of experienced investors has to be a necessary crowdinvesting to provide protection to non-accredited investors. Moreover, professional investors contribute necessary expertise to the crowdinvesting process, while filling knowledge gaps of the public. As long as these investors are capable of investing beyond the crowdinvesting platform, the platform itself must seek mechanisms to involve and hold investors. These mechanisms that allow for a great number of investors to participate in the investing process include low cost, easy use, standardized conditions of participation, inspection, and, accordingly guaranties. The platform must also provide large investors with the same advantages offered by the crowd to individual businesses.

Let us point out core objectives of joint-stock crowdfunding: accumulation of investors and projects / businessmen on a single online platform to extend access to a greater number of investors for projects and to a great number of projects to investors; collaboration in project assessment by investors and operative environment for communication between businessmen and investors, using social communication technologies on the online platform; instruments for project selection and co-investing for professional investors (business angles and venture funds); attraction of new categories of investors to the venture funding market (from other financial market segments); co-investment of new non-professionals for the venture market of types of investors including business angels and venture funds; testing the product and market (by early clients and investors) for venture businessmen; attraction of the expertise from the platform and platform members; (businessmen and investors) to follow up the product and project; creation of brand image already at the earlier project stage.

There are proven pros and cons of giving the right to vote to the minority stakeholders. Many authors of crowdinvesting projects see one of the most significant problems for the industry development in this aspect. Opponents believe that participation in the managerial process of a great number of interested parties will degrade the overall strategy and contribute inertia into the decision-making process. This will be obvious in cases, when a businessman does not hold the majority of voting stock. Complete eradication of the right to vote of the minority stakeholders may solve this problem. However, this will weaken their position after completion of the crowdinvesting campaign. For example, their share in the business may be washed away by issue of new securities at the next investment rounds.

An approach offering nominal representative may be a solution to this problem; however, business success after completion of the campaign will fully depend on administrative and managerial principles in protection of interests of issuer's nominees. Representatives of the venture funding industry believe the necessity to support a good image of the crowdinvesting platform to be the key. This is the only way for the platform to rely on inflow of qualified investors.

A technical solution may be offered to businessmen and investors to solve the current problem of interaction. On the one hand, it should not overload the businessman with organizational matters, and on the other hand, it should protect investors' interests after the campaign is finished.

A form of profit gained by the investors is the key specific of crowdinvesting as compared to other types of crowdfunding (therefore, this type is the most beneficial instrument of innovation funding). One may distinguish between three forms overall (Ilienkov 2014):

- direct holding of company's shares. In this case, a smaller commission fee is usually collected from the businessman, provided fund raising was successful, as compared to other forms (ca. 5%). Absence of mediators is the principal advantage of this form. At the same time, the investor gains preferential voting shares;

- holding through an intermediary. The intermediary takes up the very portfolio administration for this form. The commission fee collected from the businessman in case of successful fund raising is usually higher (ca. 7.5%). Moreover, the investor pays ca. 7.5% of the income gained from the sale of his share;
- convertible loan or shares. This form cannot be applied, unless there is at least one professional investor in the portfolio. At the same time, investors acquire convertible loans.

According to the analysis of performance for 2012-2014, crowdinvesting is a more mainstream market than F&F and business angels from the point of view of a number of investors per agreement, however it attracts at the same time investors among business angels and F&F and new types of investors, thus filling the reserve between business angel and venture fund markets.

Pioneer crowdinvesting platforms demonstrated project investment raisings in 2014 approximately USD 50 mln globally. Comparing with statements of the largest crowdfunding platform in the world, Kickstarter, which announced raising in the amount of USD 480 mln, the difference is obvious, however, the fact of fund attraction itself tells many businessmen that crowdinvesting is the future of investment. AngelList covered most crowdinvesting collection and attracted USD 15 mln in 2014. The specific is that this is the platform for professional investors and it deals with such investors mostly before the crowdinvesting starts (Larionov 2014).

Total global market volume exceeded USD 280 mln in 2014. There are currently over 400 registered crowdinvesting platforms in the world. At the same time, over 60% of all capital invested through them is located in the US. Equity-based crowdfunding got widespread use in the following industries: its success is greatest in business and entrepreneurship (almost 30%) and in social projects (over 20%), while information and communication technologies rank third, taking up ca. 15% of the market (Gruzina *et al*. 2016).

Conclusion

The situation at the Russian crowdfunding market is mostly determined by the young age of such financial instrument. Most Russian crowd-projects are overall associated with fulfillment of social initiatives or non-commercial histories and are extremely rarely associated with creation of innovations or real goods.

However, they may generate a substantial pulse from the economic point of view. We are talking primarily about development of applied and consumer-oriented innovations with the help of such projects. Every person may be a consumer and at the same time the author and design team member of such project in this industry (Ovseichik *et al*. 2015). To the most part, these are FMCGs that solve our real everyday problems and affect the quality of life for each of us. This is an enormous market. Even now, non-food retail turnover exceeds RUB1 tln. However, the bulk of consumer goods (*e.g.* kitchen and household goods) that are presented at the Russian market are still developed and produced and China or Europe. The existing internal demand of such goods is a giant source of development itself. This is the very market for product of our innovators and inventors (Ilienkova *et al.* 2012).

We believe that crowdinvesting has a future in the Russian economy, as long as it can undergo perspective development due to a great number of factors:

- the technological industry is obsolete and is not capable of satisfying the demand of innovations because of obsolete logistics of financial relations;
- innovations have moved from the plane of technologies into the plane of politics and can be one of socially important lifts;
- the modern innovation system does not meet the reshaped demand anymore and is now a bottle neck, instead of innovation development stimulator;
- such challenges as shortage of resources, poor environmental conditions, climate change and medicine have grown to be global and cannot be resolved by a single government;
- global finances and collective financing technologies reduce the input threshold and educational standard abruptly for professional investors and amateurs with the idea of financial support of the innovation;
- traditional financial institutions are ready to use this model to benefit from the boost of the financing institution;
- maintaining competitive power of regional economies.

Acknowledgments

This article presents findings of the research founded out of public funds according to the 2016 Governmental Assignment of the Financial University in *Creating a system of public investment (crowdinvesting) to activate small and middle-sized businesses.*

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Methodological Approaches to Assessment for the Economic Effects of the State's Participation in Integration Processes

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Abstract:

The scientific article actualizes the problem of assessment of the economic effects of the countries' participation in integration processes; the purpose of the study is to develop methodological approaches to assessment and forecast of the economic effects (positive and negative) received by the Russian Federation from participation in the global integration processes. The methodology of the study is based on the use of methods of logical, structural, comparative, economic and statistical analysis. The scientific, analytical and reference materials of the Russian and foreign authors, as well as official statistical data of Russia, Belarus, Kazakhstan, foreign countries and international organizations were used in preparation of the paper. The most important scientific results include the development of methodological approaches to assessment of the economic effects received by the Russian Federation from participation in the global integration processes. The scientific novelty includes systematization of various options of application of the index approach for assessment of the effects of the regional economic integration; disclosure of the peculiarities of the technique of assessment of the impact of elimination of the financial and administrative barriers to the movement of goods between the Customs Union member states; description of the procedure of application of the technique of the effect analysis based on allocation of sensitive product groups; application of the technique of assessment of the effects of Russia's participation in the integration processes on the basis of descriptive approach.

Keywords: integration, effects, techniques, integration processes, participation, trade.

JEL Classification: F02, F15.

1. Introduction

The last two decades are described by an increased interest in the problems of international trade and economic integration (Johnson and Noguera 2011) and, in particular, of the formation of preferential trade agreements (PTAs). Regional trade integration has become one of the drivers of the development of international trade. Participation of countries in global and regional integration processes has some influence on its economic performance, and therefore the task of quantitative and qualitative assessment of such effects becomes particularly urgent.

In recent years, Russia has been an active participant in the integration processes, in particular, in the framework of creation of the Customs Union of Russia, Belarus and Kazakhstan. In addition, in 2012, Russia joined the World Trade Organization (WTO), undertaking international obligations in the field of trade and investment regulation. These developments undoubtedly carry certain effects, both positive and negative, for the Russian economy (Strategic Global Forecast 2030, 2011).

In the meantime, despite the importance of quantitative and qualitative assessment of the impact of Russia's participation in integration processes on its economic performance, there is a lack of fundamental papers on the topic at the moment (Turuntseva 2011). This is partly due to the fact that it has been a relatively short period of time since the creation of the Customs Union and Russia's accession to the WTO, which significantly complicates the application of a range of analytical tools and models (Volochkova and Turdyeva 2011).

2. Methodology

A number of peculiarities used in the context of this paper should be noted in developing methodological approaches to the assessment of the effects of participation in integration processes. The technique can be understood as a set of methods and procedures to perform any activity, while the methodological approach is a "fundamental methodological orientation of research, a point of view on the object of study (a method for

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determining an object), a concept or a principle governing the common research strategy" (Yudin 1997). Meanwhile, the technique does not include the theoretical basis of the result obtained, which is the task of the method. These considerations are particularly important in the context of this paper, because fundamentally different methods and assessment tools are used in assessment of the economic effects of the integration processes, each of which has its advantages and disadvantages.

Development of methodological approaches requires to form analytical and assessment profile of integration processes. This article proposes to create a methodological profile comprising the following key approaches: technique of assessment of effects on the basis of the index approach (trade intensity index, intra-industry trade index, index of comparative advantages, specialization index, leadership index and diversification index are the most suitable for this purpose in the framework of the Customs Union (CU); technique of effect analysis based on definition of sensitive product groups; technique of assessment of the impact of elimination of financial and administrative barriers to the movement of goods between the CU member states; technique of assessment from the point of view of global value chains; technique of assessment of effects of integration using econometric methods; technique of assessment of the effects of Russia's participation in the integration processes on the basis of a descriptive approach.

The techniques proposed for inclusion in the profile are aimed at assessment and analysis of various aspects of participation in integration processes and have various goals, which allows to achieve comprehensive results that reflect the diversity of the economic effects.

Official data source in Russia is the Federal State Statistics Service (Rosstat) (Federal State Statistics Service, 2009-2014), which provides information on a wide range of aspects of economic activity, including manufacturing and foreign trade. However, it should be noted that the data do not always correspond to the level of disaggregation required for the study. The data are available for Russia on a disaggregated basis by three-digit codes of Russian National Classifier of Economic Activities (OKVED). In particular, it is data on the volume of production, investment, capital, cost of production and the number of employed in the economy. These data are only available for the 2008-2012 period and only for medium and large industrial enterprises. Statistics of Russia's foreign trade is also provided by the Federal Customs Statistics Service (Federal Customs Service, 2009-2014). Official data for the Republic of Belarus are provided by the National Statistics Committee of the Republic of Belarus (National Statistical Committee of the Republic of Belarus 2009-2014). Data on Kazakhstan economy performance are provided by the Statistics Agency of the Republic of Kazakhstan (Statistics Agency of the Republic of Kazakhstan 2009-2014).

The source of data on trade between Russia, Belarus and Kazakhstan is an open UN COMTRADE database (World Integrated Trade Solution 2009-2014). The data on a disaggregated basis by 6-digit HS codes (Harmonized System of Commodity Classification) in thousands of US dollars is obtained from the database, which is fully consistent with the classification of the foreign economic activity commodity nomenclature (FEACN) adopted in all Customs Union member states at this level of disaggregation.

In case of applying the technique of value chains, there are its own particularities of the use of the databases. GTAP v.8.0 database was used to assess the value added figures. GTAP data contain symmetric "input-output" matrices for 129 countries and composite regions (if the included countries are too small), in breakdown for 57 product groups / sectors (42 manufacturing sectors and 15 service sectors). Some factors can be interpreted using the OECD (TiVA) and UNCTAD (Eora) database in the application of this technique.

3. Results

3.1. Technique of assessment of the effects of the creation of the Customs Union on the basis of the index approach

The index approach is one of the methods to assess the effects of regional economic integration to trading partners. The use of this method allows to get answers to many important questions, including:

- to what extent Russia is dependent on trade with partner countries in the framework of integration agreements, and what the level of cooperation between the countries is (indicators such as index of concentration of trade in goods and services and intra-industry trade index can be used for this);
- which economic sectors develop at the fastest rate inside the country and have the greatest competitive advantages in Russia's trade with its partner countries in the framework of integration associations (assessment can be made using the indicators of the export structure and export growth, index of revealed comparative advantage, specialization and leadership indices);

- how intense Russia's trade ties with partner countries in the framework of integration associations are (using the trade intensity indicators);
- how trade relations between Russia and the partner countries are complementary (trade complementarity index).

It is important to consider all of these indicators over time to be able to assess the effect of Russia's participation in integration associations. The positive impact of the participation of the Russian economy in the integration processes will, in particular, be expressed in deepening cooperation ties between the member countries of integration (intra-industry trade), increase in diversification of Russian exports, strengthening the intensity of trade between the partner countries, growth in the competitive advantages of the Russian economy sectors producing goods with high added value.

Trade intensity index. One way to analyze the prerequisites for the further growth of trade between the countries is the calculation of trade intensity index. The trade intensity index is a ratio of the share of the partner country in total exports of the country to the share of exports of other countries in the world to the partner country in total world exports (Formula 1).

$$\text{Trade intensity index} = ((X_{ip} / X_i) / (X_{wp} / X_w)) \quad (1)$$

where: X_{pi} is exports of country i to partner country p, X_i is exports of country i, X_{wp} is exports of other countries in the world to country p, X_w is total world exports.

If the trade intensity index takes a value greater/less than 1, this indicates that the export value is more/less than would be expected based on the partner country's place in world trade. The positive effect of creation of the Customs Union for the Russian economy should include growth of the index of intensity of trade with the partner countries.

Intra-industry trade index. The term "intra-industry trade" is used in relation to trade between countries within the same industry (cognominal groups of products or close substitutes). The study of intra-industry trade of the country allows to draw conclusions about the proportions of foreign trade exchange and integration of individual sectors of the economy into the world economy on the basis of the international division of labor, as well as to assess the quality of foreign trade – both at the level of individual industries and at the level of the economy as a whole.

The analysis of intra-industry trade, its dynamics in the previous periods and the prospects for development also allows to evaluate the possibility of expanding trade flows between the Customs Union member states. Explanation of the existence of intra-industry trade is based on the application of the model of monopolistic competition to international trade. In various countries, for industries producing the same goods on the markets of monopolistic competition and where scale effect is observed, the development of international trade means an increase in the sales market and, consequently, an increase in production and simultaneous reduction of costs resulting from the use of economies of scale. At the same time, competition in the international market leads to specialization of an industry on certain types of products and to increase in the range of goods consumed by the industry in the markets of two countries. At the same time, specialization of industries in production is possible mainly through technological innovation.

In turn, economies of scale in production expansion lead to return on innovation. In addition, economies of scale contribute to the accelerated cost recovery for production, which in turn leads to an increase in inflow of investments allocated for the modernization of production. Entry of the improved product to the world market is not only a result of the reduction in production costs per unit of output and the growth of labor productivity, but, at most, a result of the technological monopoly, which was formed as a result of innovative development. Technological monopoly on the production of a specific type of product justifies the existence and development of intra-industry specialization, which takes the form of intra-industry trade in the international exchange of goods.

Possessing technological monopoly contributes to enhancing competitiveness of the domestic industry in the global market. This, in turn, leads to the formation of possibilities to further reduce production costs and increase in labor productivity at a higher level (both qualitative and quantitative). This result leads to a new technological breakthrough and the subsequent deepening of intra-industry specialization and the growth of intra-industry trade.

The most common intra-industry trade index is the Grubel-Lloyd index (Grubel and Lloyd 1975). At the level of the i-th industry, the index has the following form (Formula 2):

$$GL = \left(\frac{(X_i + I_i) - |X_i - I_i|}{X_i + I_i}\right)100 \quad (2)$$

where: X_i is the value of exports for the i-th commodity group, I_i – the value of imports of the i-th commodity group.

The index takes a value of zero in the event that the group has no products that are both exported and imported by the country; in other words, there is a fully inter-industry trade. Equality of the index to 100 indicates that the entire volume of trade is intra-industry in nature.

It is assumed that the higher the share of intra-industry trade in total trade of the integration association member states, the higher the level of cooperation between the countries. Thus, if after the establishment of the Customs Union the intra-industry trade index for the CU member states, including Russia, has grown, it may indicate the strengthening of industrial cooperation between the countries. Strengthening of the cooperation, in turn, promotes technology transfer between enterprises of the countries, which promotes scientific and technological progress, the growth of labor productivity and the economy as a whole.

It is worth noting that the deepening of intra-industry specialization and, as a result, growth in the share of intra-industry trade in total trade is inextricably linked to the sectoral structure of the economy, as well as the structure of the country's exports. So, the result of industrial development is the formation of favorable conditions for the deepening of intra-industry specialization. Production of industrial goods is of a multi-stage nature, including a number of stages within the framework of the creation of the final product and use of intermediate goods in production process. This creates favorable conditions for the development of both horizontal and vertical intra-industry trade.

The index of revealed comparative advantage. The index of revealed comparative advantage or the Balassa index (RCA) (Balassa 1965) is the most widely used in assessment and analysis of the specialization trends of some countries on the international markets. The Balassa index calculation is based on indicators of export, trade patterns and their temporal change. With regard to the effects of the country's participation in integration processes, a major advantage of the index is that it carries information about the prospects for deepening trade relations with the partner countries in the integration in a particular industry.

The index of revealed comparative advantage calculated for some export (import) commodity group of the country is a ratio of the share of exports (imports) of this commodity group in total exports (imports) of the country to the share of world exports (imports) of a similar product group in total world exports (Formula 3).

$$RCA = ((X_{ij}/X_i) / (X_{iW} / X_w)) \quad (3)$$

where: X_{ij} is exports of product i from country j, X_i is total exports of country j, X_{iw} is world exports of product i, X_w is total volume of world exports.

Thus, in accordance with the definition, the country has a revealed comparative advantage in trade of certain goods, if the share of these goods in the country's exports exceeds that of the same goods in total world exports*, i.e*. the Balassa index takes a value greater than one. Similarly, the rest of the world has revealed comparative advantage over the country if the Balassa index for imports is higher than one.

The competitiveness of individual sectors of the country within a given region can be evaluated using the Balassa index. In this case, the indicator of regional exports (imports) for both a separate product category and the overall volume is used instead of the index of world exports (imports).

Calculation of the Balassa index and analysis of its dynamics over time allow to make an assessment of changes in competitiveness of individual sectors in Russia during the periods before and after the establishment of the Customs Union and Russia's accession to the WTO. Besides, this index allows to show which industries in Russia currently have the highest competitiveness in the world market and how the competitiveness of industries is changing over time. The positive effect of Russia's accession to the WTO and the establishment of the Customs Union should be the growth of competitiveness of Russian industries with higher added value.

It is important to note that the measures of state intervention in trade in the form of the introduction of tariff and non-tariff barriers may lead to a distortion of the results of the calculation of the index, which is based on real figures of exports and imports. Thus, we can say that the index does not account for the impact of measures aimed at protecting a particular industry and the impact of subsidies when it leads to an increase in exports. However, these distortions should be minimal if the index is used to assess the effects of the creation of the Customs Union, as the theory of trade integration itself implies the reduction or complete elimination of tariff and non-tariff barriers.

The Balassa index allows to determine only the presence or effect of creation or diversion of trade as a result of the formation of integration association, but does not give an answer to the question of the size of such effects. It is also important to note that the index does not take into account factors such as economies of scale, increased bargaining power of the country and increasing competition (Karakaya 2002).

Another disadvantage of the index is the fact that the effects calculated with its help can heavily depend on the size of the economy, for which they are calculated. In theory, the situation is possible where a particular country is a world leader in the export of a certain product, but other countries, lagging behind it in export volumes, are more specialized in this product. As a result, the Balassa index calculated for the leader will say that the country needs to increase exports of this product. An essential complement to the Balassa index may be at least two other indices, namely the specialization index and the leadership index described below.

The specialization index. This index reflects the degree to which the region's GDP structure is shifted toward exports by replacing the total country/region's exports and total world exports in the formula for calculating the Balassa index for corresponding GDP values (Formula 4):

$$sp_{i,c,t} = \frac{\frac{x_{i,c,t}}{GDP_{c,t}}}{\sum_c \frac{x_{i,c,t}}{GDP_{w,t}}} \quad (4)$$

where: $x_{i,c,t}$ is the volume of exports of product *i* by country/region *c* in year *t*; $GDP_{c,t}$ is GDP of country/region *c*, $GDP_{w,t}$ is world GDP? If the value of this index is higher than one, it indicates the presence of a competitive advantage.

Compared to the Balassa index, the specialization index has several advantages. For example, if we assume that the country's export structure consists of only two products from a variety of manufactured products, but the volume of exports of these products is large enough, the specialization index for both products can have a value greater than one, while the Balassa index, due to the peculiarities of its construction, will be greater than one for one of the products but less than one for another, even if both products are actively exported.

In turn, the specialization index also has some drawbacks. For example, for individual countries exporting finished products, in the production of which expensive imported components were used, the index will be somewhat overstated due to the fact that the value added due to foreign trade will be significantly less than the volume of exports, which is calculated through the full price. However, it is impossible to solve this problem without further large-scale studies.

The leadership index. This index allows to select products, for which the country has a significant share in the world market (given the country's exports). The index is calculated using Formula 5:

$$RLI_{i,c,t} = LI_{i,c,t} / av_i(LI_{i,c,t}) \quad (5)$$

where: $av_i(LI_{i,c,t})$ is the arithmetic mean of the leadership index for country *c*.

$$LI_{i,c,t} = X_{i,c,t} / max_c(X_{i,c,t}) \quad (6)$$

The country has a competitive advantage in a particular industry if the relative leadership index is greater than one. The use of the leadership index allows to eliminate the effects expressed in the fact that the country leading in terms of the export of a certain product may appear slightly specializing in the trade with this product by the value of the Balassa index. In other words, such a product in accordance with the index of the revealed advantage is potentially able to generate additional growth in exports, though it may be incorrect.

The diversification index. One of the most important objectives for the Customs Union member states is the diversification of the commodity structure of exports, an increase of the weight of high value added products, volume and stability of income from foreign trade. There is no doubt that one of the major opportunities for this is offered on the markets of the Customs Union, because due to the positive inertia of post-Soviet economic relations, the structure of the exports of the member states in this area has always been much more difficult than in the markets of third countries.

The diversification ratio is an inverse indicator to the Herfindahl-Hirschman concentration index. Initially, the Herfindahl-Hirschman index was developed in order to assess the extent to which a relatively small number of firms dominate in a particular industry. Meanwhile, the index later was applied to assess how a particular industry dominates the economy. This means that the index can be calculated for various aggregation levels for any economy (The World Bank).

The trade diversification index can take a value from 0 to figure equal to the number of headings based on which the calculation was carried out. The larger the index value, the more diversified the trade. Calculation of this indicator can be made at the level of 4-digit FEACN headings within the investigated product groups using the following formula (7):

$$\textit{Diversification ratio} = \frac{1}{\sqrt{\sum_{i=1}^{n}\left(\frac{X_i}{X}\right)^2}} \quad (7)$$

where: X is total value of exports/imports, X_i is total value of exports/imports for the *i*-th heading, *n* is the number of headings.

The positive effect of the creation of the Customs Union between Russia, Belarus and Kazakhstan for the Russian economy will be growth of the diversification index, especially for Russian exports. A comparison of indicators of diversification of trade between the Customs Union member states and similar indicators of other countries that are members of trade integration associations can also be made.

3.2. Technique of analysis of effects based on the allocation of sensitive commodity groups

The effect for Russia from the establishment of the Customs Union can be estimated by analyzing the trade in products located in the zone of potential conflict (let's call them sensitive commodity groups). They are export products of the Customs Union member states in the direction of partners that after the establishment of the Customs Union and Russia's accession to the WTO has become replaced by imports from third countries. The reasons for such trends can include increased competition from suppliers from third countries, lower competitiveness of products of the Customs Union member states due to the increased openness of the domestic market of the association, the increase in domestic demand in the Customs Union states and as a consequence – the inability to meet the growing needs with its own forces, etc.

The situation in trade with these products requires a deeper analysis, as the development of current trends could lead to a misunderstanding between the Customs Union member states and is contrary to the basic tasks of creating integration association, because it leads to the inhibition of the development of exports of high value added products (the largest group of these products is "Machinery, equipment and vehicles") and, consequently, to a decrease in the rate of export diversification of the Customs Union member states, which are each other's main markets for these products.

Selection of the most sensitive product groups can be made by 6-digit FEACN headings in imports of the Customs Union member states in accordance with the following criteria:

- share of the partner in imports of the country for this heading in 2009 amounted to more than 10%;
- share of the partner in imports of the country for this heading in the reporting year amounted to no more than 50%;
- in the period since 2009, there was a decline in the share of the partner in imports of the country for this heading;
- total country's imports of this heading in the reporting year amounted to at least $10 million.

The negative effects of the creation of the Customs Union will be expressed in a general decline in the share of Russian products for these product groups in imports of Kazakhstan and Belarus as a result of the so-called trade diversion effect. In addition, the impact of the integration process can be judged by the proportion of the high value-added products in "sensitive product groups."

3.3. Technique of assessing the effect of elimination of financial and administrative barriers to the movement of goods between the Customs Union states

In addition to the positive effects of the creation of the Customs Union, Russia is faced with negative aspects. Elimination of financial and administrative barriers to the movement of goods between the Customs Union states and almost complete lack of control on the part of Russia for a large part of the external borders of the Customs Union (borders between Kazakhstan and China, Belarus and the European Union) greatly complicated the control of the movement of goods and their proper accounting.

For example, large amounts of contraband goods, mainly light industry products, enter the territory of the Customs Union, especially Russia, through the Kazakhstan-China border at the moment, which leads to both direct losses of CU budgets in the form of unpaid customs duties and indirect losses related to the deterioration of the position of manufacturers of these products located in the CU due to unfair competition.

Based on an analysis of data on China's exports to Kazakhstan, as well as on the data about number of goods received from the territory of the PRC declared by Kazakhstan, it is possible to calculate the overall effect of the entry of contraband goods into the territory of the Customs Union on the Russian Federation budget. This effect can be calculated by multiplying the undeclared goods for each product group by the rate of customs duty applied in respect of this product group and by the standard distribution of customs duties for Russia. The resulting value describes the Russian budget shortfall of budgetary funds resulting from unpaid customs duties.

Similarly, the losses of the federal budget of the Russian Federation resulting from the entry of European goods to the Russian territory via Belarus, which are not reflected in the customs statistics, can be estimated.

3.4. Technique of assessment in terms of global value chains

One approach to the assessment of the effects of participation in integration processes is consideration in terms of value chains (VC). This approach has recently acquired special urgency in view of the fact that today the majority of the goods are produced in more than one single country but in several economies at different stages of production in view of the technological level, the possible costs of production, access to resources and markets, industrial and trade policies in each country. Thus, the product is produced by the "whole world" (Made in the World). In this case, traditional statistical methods take into account the final cost of goods when they cross the border. The share of the foreign components in the exported product may be great, but the export value of the goods at times exceeds the real added value generated by national companies. This leads to a misinterpretation of the place of the national economy in the international trading system. Thus, according to OECD-WTO joint research, the overall level of overstatement of global gross exports compared with world exports in value added terms was 19.4% in 2009.

The most discussed issues in the context of the value chains (VC) are aspects of the competitiveness of domestic production, access to markets, role of capital, services and intellectual property sector, as well as understanding of the structure of world trade and trade balances of countries, identification and analysis of the most important comparative advantages of national economies. According to research of a number of international organizations, the country's economy inclusion in the VC has a direct correlation with respect to a number of key macroeconomic parameters such as GDP per capita growth and the pace of export growth.

Due to changes in production processes and their internalization, a modern trade policy is often applied not so much in the purely internal national interests, but taking into account the policies of other countries, which is determined by the interests of national business working with foreign partners. In connection with such an effect of "corporate protectionism," regional processes in the world are often developed on the basis of the generated value chains. The Customs Union of Russia, Belarus and Kazakhstan can be considered an example of this kind of integration.

With regard to the participation of the Customs Union member states (Russia, Belarus and Kazakhstan) in the international VCs, today international organizations conduct a number of studies to assess the Russian value added in the global value chains, while an information pattern with regard to Belarus and Kazakhstan is not represented in entirety.

In this regard, it is necessary to evaluate the participation of the CU member states in the VCs and to determine the potential of the use of own regional chains that are created on the basis of deepening industrial cooperation. Indicator of added value can be assessed both for the economy as a whole and for individual sectors. For this purpose, the share of the cost of foreign intermediate goods to the output of this industry is first calculated for each sector of Belarus, Kazakhstan and the Customs Union as a whole. Further, on the assumption that each industry produces only one product, the share of the cost of foreign intermediate goods is multiplied by the share of exports of this product in total exports of the country (the ratio of exports of this product to the country's total exports). The latter operation is possible due to the assumption of the equal share of the added value of similar goods for domestic consumption and for export. Thus, value added for individual industries is calculated. The result for the country as a whole is calculated by summing the figures for individual industries.

It is necessary to make one important remark concerning the methodology of calculation of the indicators described above. The described methods of calculating the indicators do not include an accurate assessment of the share of imported intermediate goods spent on creation of domestic intermediate goods, as well as spent on the production of the domestic intermediate goods, which were used in the production of domestic intermediate goods in the previous step, etc. Such assessment can be made using international "input-output" tables, which indicate how many goods from each country were spent on the final and intermediate consumption in each country. GTAP database does not provide such data, so we can actually evaluate only a first approximation to the

real indicators describing the involvement of the Customs Union states in world trade and in the global value chains. A more accurate assessment requires building internationally agreed "input-output" tables.

3.5. Technique of assessment of effects of integration using econometric methods

Effects on import and production. As a rule, preferential trade agreements (PTAs) lead to an increase in mutual trade of the participating countries, reducing the flow of trade with third countries, but in general this is not true, since, for example, in the formation of the Customs Union, customs duties in relation to the third countries are subject to change both upward and downward. Domestic production in this case is subject to the influence of integration processes in different directions, but a decline in production due to increased competition from the industries of the Customs Union member states and weakening of competition from third-country industries can be distinguished among the main effects. The latter effect can also have the opposite direction at the same time, if import duties in the industry for third countries decline as a result of the formation of the Customs Union.

Evaluation of the sectoral effects on trade and production can be done by estimating a system of equations for the import of integration partners and third countries, as well as domestic production at a disaggregated level (Formula 8):

$$\begin{cases} \ln \mathrm{Im}_{i,t}^{k,TC} = a_0 + a_1 \ln Y_t^k + a_2 \ln P_{i,t}^{\mathrm{Im},k,TC} + a_3 \ln P_{i,t}^{\mathrm{Im},k,RoW} + a_4 \ln P_{i,t}^{X,k} + D_i + u_{i,t} \\ \ln \mathrm{Im}_{i,t}^{k,RoW} = b_0 + b_1 \ln Y_t^k + b_2 \ln P_{i,t}^{\mathrm{Im},k,TC} + b_3 \ln P_{i,t}^{\mathrm{Im},k,RoW} + b_4 \ln P_{i,t}^{X,k} + D_i + v_{i,t} \\ \ln X_{j,t}^k = c_0 + c_1 \ln P_{i,t}^{\mathrm{Im},k,TC} + c_2 \ln P_{i,t}^{\mathrm{Im},k,RoW} + c_3 \ln P_{i,t}^{X,k} + D_i + w_{i,t} \end{cases} \quad (8)$$

The index *k* refers to the member state of the integration association (Russia, Belarus and Kazakhstan), the TC index is used to refer to the country's partners in the Customs Union (for example, in the first equation evaluating for Russia, the TC index will denote the union of Kazakhstan and Belarus); $Im_{i,t}^{k,TC}$ is imports into country *k* from the customs union partners of the country of commodity *i* over period *t*, $Im_{i,t}^{k,RoW}$ is imports into country *k* from third countries of the *i*-th commodity over period *t*, $X_{i,t}^k$ is production of the *i*-th commodity in country *k* over period *t*, $P_{i,t}^{X,k}$ is price of the commodity of the domestic production of industry *i* in country *k* over period *t*, Y_t^k is GDP level of country *k* over period *t*, $P_{i,t}^{Im,k,TC}$ is price for import of the *i-th* commodity into country *k* from the customs union partner countries over period *t*, $P_{i,t}^{Im,k,RoW}$ is price for import of the *i*-th commodity from third countries into country *k* over period *t*, $Ex_t^{k,RoW}$ is the exchange rate between the *k*-th country and the rest of the world over period *t*, D_i is fixed industry effects, D_t is fixed time effects.

The result of evaluation of this system of equations is quantitative estimates of elasticity of demand for imported goods (from the integration partner countries and from third countries) and domestic production at the price of import from the Customs Union states, price of import from the rest of the world and price of domestic production. The calculation of this elasticity allows to evaluate the effects of changes in internal tariffs (through the price of import from the Customs Union states) and the effects of the establishment of the common external tariff (through the prices of import from the rest of the world).

Evaluation of the system of equations should be carried out separately for Russia, Belarus and Kazakhstan. It is offered to evaluate the system as the system of seemingly unrelated equations, in which the correlation for errors in all three equations is assumed. The need to use such an approach is due to the fact that the level of import and production can be influenced by the factors that are common to all three parameters, while they cannot be directly included in the evaluated equations. From a technical point of view, it is proposed to evaluate the system of equations using a two-step method of feasible generalized least squares (FGLS), which allows to take into account the correlation of errors in the system of equations.

It should be noted that the free trade zone existed in the CIS even before the formation of the Customs Union, where trade tariffs between Russia, Belarus and Kazakhstan were zero. Thus, all the changes in imports and production calculated by the model are caused only by changes in import duties for third countries and the corresponding change in the price.

Using the estimates obtained from the model, it is possible to calculate the effects of the integration for the Customs Union member states. In particular, changes in imports are calculated using the following Formula 9:

$$\frac{\Delta \mathrm{Im}_i^k}{\mathrm{Im}_i^k} = \exp(\hat{a}_j \ln(\frac{t_2}{t_1})) - 1 \quad (9)$$

where: Im_i^k is volume of imports from region *k* (the Customs Union or third countries) of product *i*, $\hat{\alpha}_j$ is assessment of the import elasticity at the price of imports from third countries resulting from the model **Error! Reference source not found.**, t_1 and t_2 are import duty rates before and after the change, respectively. The effect on the level of domestic production can be calculated in a similar way.

Effects on intra-industry trade. The regression equation shown in the paper of (Akkoyunlu, Kholodilin, Siliverstovs 2006) can be used to assess the effects of the Customs Union on the intra-industry trade:

$$\ln\left(\frac{IIT_{it}^{j}}{1-IIT_{it}^{j}}\right)=\beta^{j}X_{it}^{j}+\varepsilon_{it}^{j} \quad (10)$$

where: IIT_{it} is the Grubel-Lloyd index of intra-industry trade of the Customs Union member state *j* with an integration partner *i*; X_{it}^{j} is a matrix, which includes indicators such as real GDP and real GDP per capita in the integration partners *i*, the difference in the size of economies and income levels between country *j* and its integration partner *i*, the distance from country *j* to country *i,* the imaginary variable that takes the value 1 for the partner countries *i*, members of the Customs Union, the imaginary variable equal to 1 for the validity periods of the Customs Union; index *j* is the CU states, *i* is their partners; and ε_{it}^{j} is the error.

3.6. Technique of assessment of the effects of Russia's participation in the integration processes on the basis of descriptive approach

Analysis of the consequences of the country's participation in integration processes often uses descriptive approaches based on the analysis of the study of the dynamics of individual economic indicators for the period before and after the integration. Such an analysis can be made for the economy in general, as well as separately for industries that have the potential to be the most sensitive to changes in the level of customs duties. In order to make the most holistic assessment of the effects of the creation of the Customs Union and Russia's accession to the WTO, it is necessary to analyze the system of indicators, which includes:

- dynamics of the total volume of Russia's trade in goods with all the countries and the Customs Union member states (value terms, growth rates, a comparison with the world average growth rates);
- structure of Russia's trade in goods with the Customs Union states and the rest of the world, and its change over time (growth rates of exports and imports by certain headings, share of products with high added value in total exports and imports of Russia);
- dynamics of the total volume of Russia's trade in services with all countries and the Customs Union member states;
- structure of Russia's trade in services with the Customs Union member states and the rest of the world and its changes over time;
- dynamics of the growth of accumulated and raised foreign direct investment (FDI) in Russia from the Customs Union states and third countries, as well as FDI exported from Russia;
- structure of accumulated and raised foreign direct investment in Russia from the Customs Union states and third countries, as well as FDI exported from Russia in terms of types of activity, and its changes over time.

Analysis of these indicators is important for understanding the changes that have taken place in the economy as a whole in the aftermath of the integration and liberalization. Meanwhile, it is even more important to analyze the impact the obligations assumed by Russia under the Customs Union and WTO accession had on individual sectors of the economy, because the level of obligations (including the rates of customs duties) significantly differs across industries. In our opinion, the analysis in terms of industries, for which the impact of integration and liberalization process is essential, is the most expedient. Among them are the following: agricultural sector; primary industrial sectors: aviation industry, motor industry, light industry, metallurgy, forest industry, construction; transport sector.

It is proposed to pay particular attention to indicators such as changes in the level of production, export and import of goods in the industry, share of imported products in the volume of domestic consumption, inflow of foreign direct investment to the industry, dynamics of the level of prices for basic commodities, changes in the financial position of companies operating in the sector, etc.

4. Discussion

There are many papers with an attempt to build formal (gravity) models providing the dependence of trade flows on various indicators Tinbergen (1962), Linneman (1966). The gravity models can be also applied to the study of regional trade agreements and the effects arising from their presence.

Another important application of gravity models is the study of the dependence of volumes of trade on the size of tariff and non-tariff barriers. The basic idea in studies of this functional gravity models (Christie 2001) is to evaluate the countries' potential to trade and see if the existing tariffs are optimal (Wall 1999).

Currently, there are quite many papers that contain an empirical analysis of various modifications of the gravity model (Santos Silva and Tenreyro 2006, Bergstrand 1985).

Another problem is that one of the possible consequences of Russia's accession to the WTO is change in the fiscal revenues. The period of Russia's membership in the WTO coincided with a significant slowdown in economic growth and foreign trade in the country. Current statistics also recorded negative trends in the part of the formation of Russian federal budget (see Table 1). The average annual growth rate of revenue from foreign trade decreased from 36.9 to 1.3% over 2011-2013, and taxes on imported goods decreased from 37.6 to 4.5%.

Table 6 – Dynamics of foreign trade and profitability indicators of the foreign trade and imports of goods, 2011-2014, % (composed and calculated according to data from the Federal Customs Service, the Bank of Russia, the Ministry of Finance of the Russian Federation)

Indicator	2011	2012	2013	2014
Commodity exports (FCS data)	30.1	1.5	0.5	-1.2
Commodity exports (methodology of balance of payments)	31.3	2.3	-0.8	-0.6
Revenues from foreign operations	36.9	13.1	1.3	..
Commodity imports (FCS data)	33.6	3.7	-0.7	-5.8
Commodity exports (methodology of balance of payments)	29.7	5.4	1.7	-6.3
Taxes on goods imported into the territory of the Russian Federation	37.6	12.2	4.5	..

There is a decline in the share of proceeds from foreign operations in the structure of the federal budget of Russia (see Table 2). In particular, the share of taxes on goods imported into the territory of Russia fell from 14.4 to 11.9% over 2010-2014.

Table 7 – Changes in the structure of the federal budget of Russia, 2010-2014, % (composed and calculated according to data from the Ministry of Finance of the Russian Federation and the Rosstat central database of statistics).

Types of revenues	2010		2011		2012		2013		2014	
	I	II	I	II	I	II	I	II	I	II
Total revenue, including	17.9	100.0	20.4	100.0	20.7	100.0	19.5	100.0	..	100.0
Revenues from foreign trade	7.0	38.9	8.4	41.0	8.0	38.6	7.5	38.5	..	36.6
Taxes on goods imported into the territory of the Russian Federation	2.6	14.4	2.8	13.6	2.8	13.3	2.6	13.3	..	11.9

According to forecasts, the share of customs duties for oil and gas over 2012-2016 will fall from 31.5 to 25.0%. This is due to the change in the ratio of oil and gas and other sectors of the economy in the GDP, and the validity of the budgetary rule according to which oil and gas revenues are not spent but allocated to a range of stabilization (reserve) funds, as well as the fall in world prices for energy resources. However, the changes will also affect customs proceeds net of oil and gas revenues – their share will drop from 6.1 to 4.5%.

In this regard, there is a need to assess the shortfall in fiscal revenues of Russia in the framework of its accession to the World Trade Organization. It is assumed to use scenario calculations based on official forecasts of socio-economic development of the Russian Federation, developed by the Ministry of Economic Development of the Russian Federation, for the numerical analysis of the consequences of Russia's accession to the WTO for the formation of federal budget. The forecasts and estimations of the development of the Russian economy and international trade made by economic organizations (IMF, World Bank, WTO) may be used as alternatives. The source information base is the current foreign trade statistics of the Federal Customs Service of the Russian Federation with the most detailed data.

Scenario calculations suggest changes in foreign trade volumes (commodity import is taken as a base). Next, the effective rates of import tariff for aggregated commodity groups are calculated (in two versions – for FEACN and branch approach) using the detailed data on the customs tariff for 2011 taking into account the ad valorem and specific parts of all tariff headings. The final level of binding of customs import duties is calculated in accordance with the parameters of the agreement on the terms of Russian accession to the WTO.

The difference between the initial data and values that describe the new state of foreign trade (imports), subject to adjustments in import tariffs, will allow to evaluate changes in proceeds to the budget from foreign operations. Calculations will be made in US dollars. A simple import taxation scheme using only tariff charges, excluding excise duty and VAT, will be applied at the first stage of the study.

Conclusion

As a result of the study, methodical approaches were summarized that allow to assess the impact of Russia's participation in global integration processes on the economic performance of the country in the most complete and comprehensive way.

These approaches include: technique of assessment of integration effects on the basis of the index approach; technique of analysis of the effect of participation in integration processes based on definition of sensitive product groups; technique of assessment of the impact of elimination of financial and administrative barriers to the movement of goods between the CU member states; technique of assessment from the point of view of global value chains; technique of assessment of integration effects using econometric methods; technique of assessment of the effects of Russia's participation in the integration processes on the basis of a descriptive approach.

In this study, we were unable to determine the most effective tools for analysis, and further testing of the provided methodological approaches to the assessment of the economic effects of the country's participation in integration processes is required.

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Performance Comparison Between Real Estate Securities and Real Estate Investment Using Stochastic Dominance and Mean-Variance Analysis

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Abstract:

Unlike in the past, different choices for real estate investment are now available for investors. Real estate securities were introduced as another alternative investment vehicle for real estate investors. To promote efficient investment in real estate and real estate securities, this paper explores the relative performance of different types of real estate investment including land, town home, single house, and real estate securities in Thailand from April 2008 to May 2016 by applying mean-variance and stochastic dominance techniques. The results of this examination suggest that the real estate market is not efficient and asset allocation plays important role in real estate investment performance. Mean-variance and stochastic dominance analysis report the same result that town home investment dominates single house investment and land investment dominates condominium investment. Beside trying to choose the best real estate or real estate security in their portfolio, investors should put extra effort in finding the proper types of real estate for their portfolio.

Keywords: performance, investment, real estate, real estate securities, mean-variance analysis, stochastic dominance.

JEL Classification: G11, G14, O53.

1. Introduction

The real estate asset class is one of the common asset classes in many investors' portfolios for many reasons. For example, real estate is considered a low risk asset. It has value even when the economy is extremely poor. The imperfect correlation of its return and other assets' return helps in lowering a portfolio's diversifiable risk. It is in the long-term and safe investment class which is appropriate for people in aging society. Recently, real estate securities were introduced to let low-wealth investors be able to invest their money in real estate. However, the increase in real estate investment's choices brings about more difficulty for investors in making proper investment decision. Besides, the knowledge about the investment in real estate and real estate securities is quite limited since there are not many researches in this area.

This paper applies the mean-variance and stochastic dominance techniques to compare the performance of the different types of real estate and real estate securities to promote more understanding on real estate investment. The findings should help investors to gain more understanding on real estate and real estate securities investment and provide academic researchers additional evidence about the existence of market efficiency in real estate investment and comparative natures of the performance of different types of real estate investment. The study focuses on the relative performance of different types of real estate investment in Thailand because of its lucrative real estate and real estate securities investment's opportunity which comes from the introduction of ASEAN Economic Community (AEC) in 2015.

2. Literature reviews

Several researchers have investigated real estate investment in relation to other investment vehicles and showed the diversification advantage of adding the real estate asset class on investors' portfolio. (Ibbotson and Siegel 1984) reports that the correlation between the returns of real estate investment and other investments is low and (Westerheide 2006) concludes that real estate securities are different from other securities. In other words, adding real estate into an investor's portfolio could help to lower his/her portfolio's diversifiable risk. In addition, (Hoesli *et al.* 2004) confirms that real estate could be used to lower the unsystematic risk effectively.

For the comparison of the different types of real estate investment, (Andrew and Glenn 2003) and (Brounen and Eichholtz 2003) argues that the returns of real estate and real estate securities are not significantly correlated and (Clayton and MacKinnon 2003) reports the existence of the difference between the performance of direct and indirect real estate investments for the test on short horizon. However, the study by (Giliberto 2009) finds evidence that real estate and real estate securities might be influenced by the same fundamental factors. In addition, many long-run studies, (Oikarinen *et al*. 2011) and (Hoesli and Oikarinen 2012) report that, in the long-

run, REIT and direct real estate investments are highly related and REIT investment could be used as a substitute for direct real estate investment.

Many reviewed literatures on real estate investment, hence, obviously point on practical implication for investors to add real estate and real estate securities in their portfolio for diversification benefit. The next important issue is which type of real estate should be added into investors' portfolio so that their wealth will be maximized.

As aging society becomes important issues nowadays, another useful group of studies is related to the performance of different types of real estate investment in long-term. (MacKinnon and Al Zaman 2009) discovers the supportive evidence for real estate investment and claims that the risk of real estate investment becomes lower when its investment horizon increases. In contrast, (Fugazza *et al.* 2007) finds that there is mean reversion in long-run investment for the European listed real estate and the risk of investment in the listed real estate is higher than other asset investments.

For the examination of the relative performance of different types of real estate and real estate securities investment, there are at least two important methods; stochastic dominance and mean-variance analysis. Both methods could be used as tools for judging for the better type of real estate to investors' portfolio. Mean-variance analysis is continuously extensively used in investment performance analysis, for example, (Markowitz *et al.* 2000), (Alexander and Baptista 2002), (Björk *et al*. 2014) and (Shinzato 2015). The Stochastic dominance compares the outcome and probability of the two examined candidates. The technique is developed to overcome the drawback of mean-variance analysis which could not be used for ranking the investment choices. Stochastic dominance was mainly improved by (Hadar and Russell 1969), (Whitmore 1970) and (Levy 1992) and widely applies in many researches in economics and finance related areas.

In Thailand, very few literatures are done on examining the performance of different types of real estate and real estate securities investment. Hence, the investors who would like to allocate their funds for different real estate sub-classes have very limited information to help for making appropriate investment decision. This paper should fill up the mentioned gap and provide academic area additional evidence of the real estate investment's performance.

3. Data collection and research methodology

Data collection

The data used for the paper's investigation are the monthly returns of different types of real estate investment from April 2008 to May 2016. The returns of real estate including land, town home, single house and condominium are calculated from their price appreciation from the Bank of Thailand's database and the returns of real estate securities are market weighted average returns which are calculated from the return of securities listed under property fund and REIT section of the stock exchange of Thailand.

Research methodology

The research method used in this study is stochastic dominance and mean-variance analysis. Stochastic Dominance analysis is developed from the model introduced by (Levy and Wiener 1998).

Mean-variance analysis

First, mean $\bar{r}$ and standard deviation (S.D.) of the return of each type of real estate investment are calculated as follows:

$$\bar{r} = \frac{\sum_i^N r_i}{N} \quad (1)$$

$$S.D. = \frac{\sum_i^N (r_i - \bar{r})^2}{N-1} \quad (2)$$

where r_i is the return of month *i* and *N* is number of months.

Then, both mean and standard deviation are annualized for analysis as follows:

$$\bar{r_a} = (1 + \bar{r})^{12} - 1 \quad (3)$$

$$S.D._a = S.D. \times \sqrt{12} \quad (4)$$

General rule of mean-variance analysis is that a better investment is the investment which has higher return at the same level of standard deviation or has lower standard deviation at the same level of return. The investment cannot be claimed as a better investment if it does not meet this condition. When low risky investment has low return and high risky investment has high return according to risk-return trade-off nature, no investment dominates other investment.

Stochastic dominance analysis

The test for stochastic dominance is done in three levels: first-order, second-order, and third-order stochastic dominance. When the result shows the first-order stochastic dominance, there exist the second and the third-order stochastic dominance. Also, when the result shows the second-order stochastic dominance, it implies the third-order stochastic dominance exists.

- Conditions for first order stochastic dominance (FOD)

Let FA(r) and FB(r) be two continuous distribution functions for random return r ∈ [a, b]. Then, FA(r) first order stochastically dominates (FSD) FB(r) if and only if

1. $F_A(r) \leq F_B(r)$ for all r ∈ [a, b]

and

2. $E_A\ U(r) \geq E_A\ U(r)$ for all non-decreasing utility function.

where: A and B are two different types of real estate investment.

- Conditions for second order stochastic dominance (SSD)

Let FA(r) and FB(r) be two continuous distribution functions for random return r ∈ [a, b]. Then, FA(r) second order stochastically dominates (SSD) FB(r) if and only if for any r:

1. $\int_{-\infty}^{r} [F_B(t) - F_A(t)]\ dt \geq 0$

2. $E_A U(r) \geq E_B\ U(r)$ for all non-decreasing utility function and concave utility function U.

- Conditions for Third order stochastic dominance (TSD)

Let FA(r) and FB(r) be two continuous distribution functions for random return r ∈ [a, b]. Then, FA(r) third order stochastically dominates (TSD) FB(r) if and only if for any r:

1. $\iint_{-\infty}^{r} [F_B(t) - F_A(t)]\,dt\,dz \geq 0$

2. $E_A U(r) \geq E_B U(r)$ for all non-decreasing utility and concave utility function U which are positively skewed.

For the test, each pair of investment is examined one by one for the stochastic dominant level. Once a stochastic dominant level is found, the investigation will stop or the further investigation will stop after the third order test has been examined.

4. Findings

4.1. Descriptive analysis

The descriptive data based on data of 98 months during April 2008 to May 2016 in Table 1 shows that generally, risk and return are positively correlated. The real estate securities investment has the highest standard deviation and average monthly return at 2.88% and 0.88%, respectively. It also has the lowest minimum return at -16.86% and the highest maximum return at 6.02%. The town home investment has the lowest standard deviation at 0.76% and has the second lowest return at 0.46%. Among the different type of real estate investment, its minimum return is the highest at -1.6% and its maximum return is the lowest at 2.52%. The single house investment has the lowest average monthly return at 0.41% and the second lowest standard deviation of 0.88%. In addition, the nature of real estate securities investment is quite different from the group. Besides its high average return and standard deviation, its return distribution is obviously skewed to the left and its kurtosis is the highest.

Table 1 - Descriptive data of the monthly returns of each type of real estate investment in Thailand from April 2008 to May 2016.

	Single House	Town Home	Condominium	Land	Real Estate Sec
Mean	0.41%	0.46%	0.49%	0.68%	0.88%
Median	0.25%	0.49%	0.47%	0.61%	1.23%
Standard Deviation	0.88%	0.79%	1.70%	1.46%	2.88%
Kurtosis	0.412	0.231	0.676	-0.508	14.119
Skewness	-0.012	-0.070	0.425	0.0488	-2.7119
Range	5.22%	4.12%	9.66%	6.60%	22.88%
Minimum	-2.19%	-1.60%	-3.55%	-2.50%	-16.86%
Maximum	3.03%	2.52%	6.12%	4.10%	6.02%
Count	98	98	98	98	98

Source: The Bank of Thailand and Reuter Database

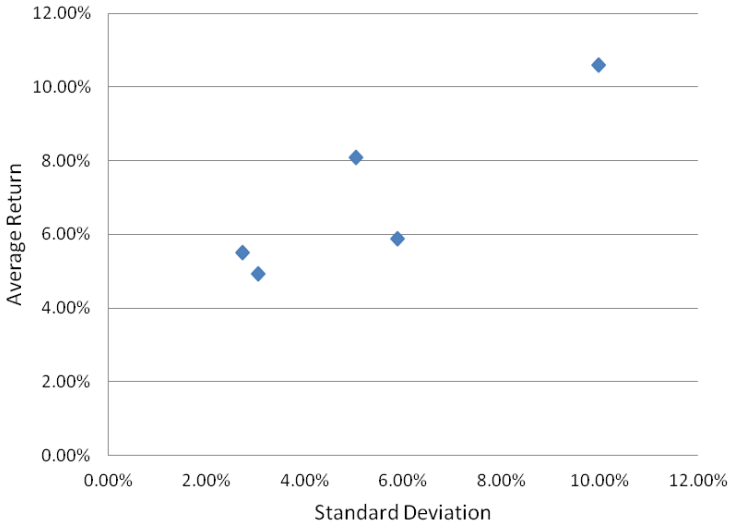
4.2. Mean-variance analysis

For mean-variance analysis, Table 2 and Figure 1 show that the town home, land, and real estate securities investment are not dominated by any investment. Higher standard deviation is accompanied by higher return. The single house investment is dominated by the town home investment. The average annual return of the single house investment (5.05%) is lower than the average annual return of town home investment (5.66%), the standard deviation of the single house investment (3.06%) is higher than the standard deviation of the town home investment (2.73%). The condominium investment is dominated by the land investment. The average annual return of the condominium investment (6.05%) is lower than the average annual return of land investment (8.41%), the standard deviation of the condominium investment (5.88%) is higher than the standard deviation of the land investment (5.05%). The real estate securities investment has highest average annual return (11.14%) and highest standard deviation (9.98%).

Table 2 - Relationship between standard deviation and return of different types of real estate investment in Thailand based on data of 98 months from April 2008 to May 2016.

Types	Standard Deviation per Year	Average Return per Year
Single House	3.06%	5.05%
Town House	2.73%	5.66%
Condominium	5.88%	6.05%
Land	5.05%	8.41%
Real Estate Securities	9.98%	11.14%

Source: The Bank of Thailand and Reuter Database

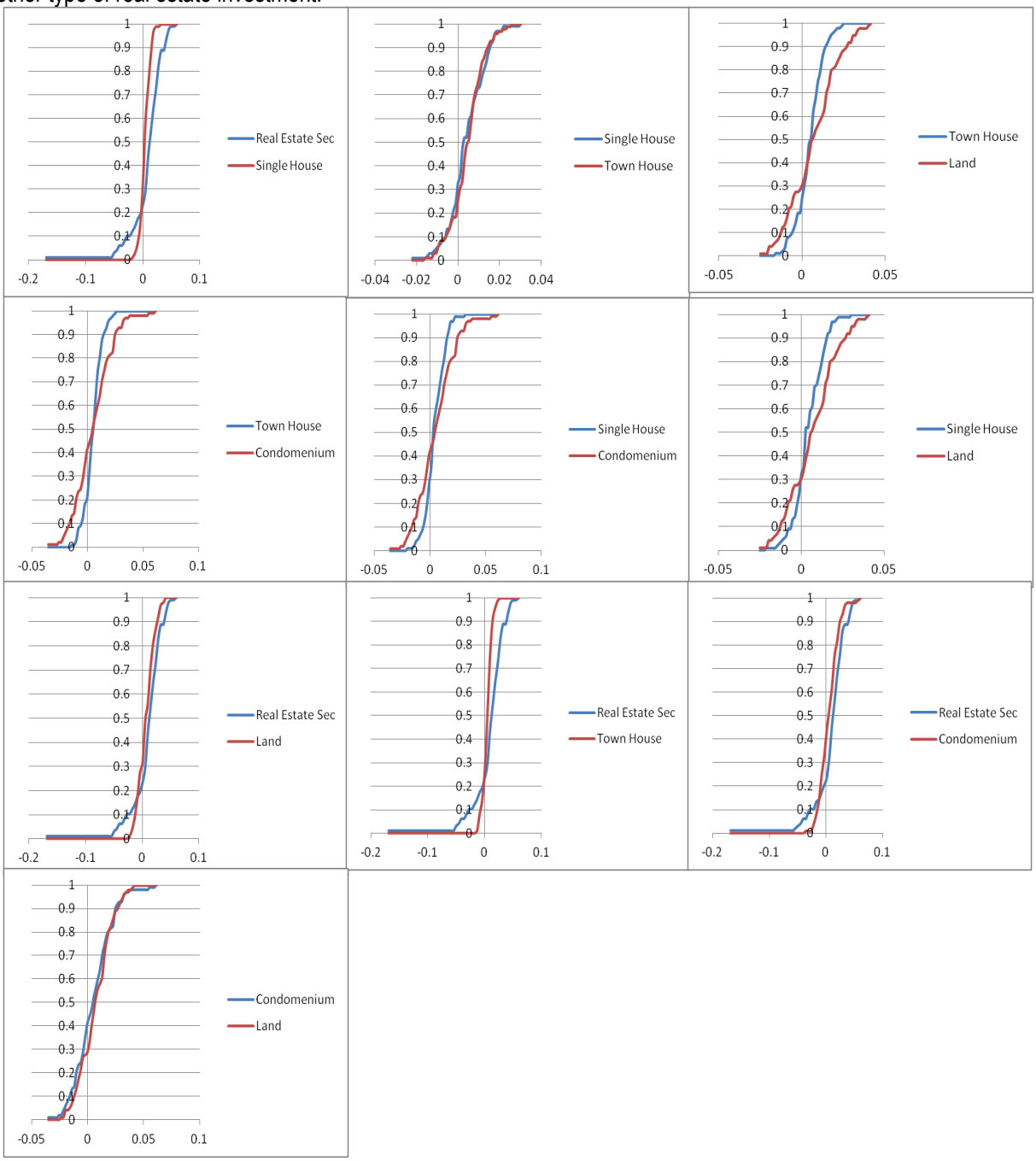


Source: The Bank of Thailand and Reuter Database

Figure 1 - Graph Shows the Relationship between Standard Deviation and Average Returns in Thailand based on Data of 98 Months from April 2008 to May 2016

4.3. Stochastic dominance analysis

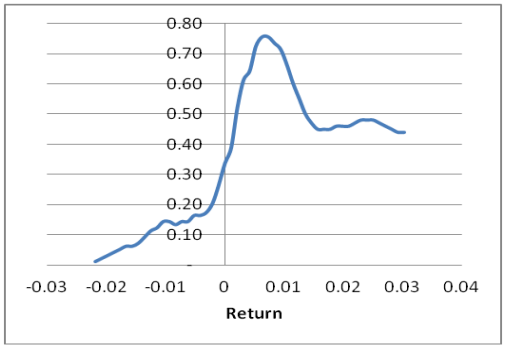
For stochastic dominance analysis, Figure 2 shows the cumulative distribution of each pair of investment types and it appears that there is no type of real estate investment first-order stochastically dominates (FSD) the other type of real estate investment.



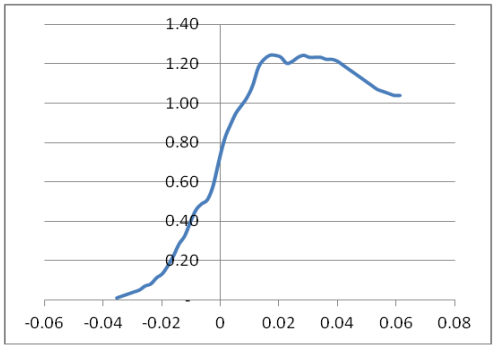
Source: The Bank of Thailand and Reuter Database

Figure 2 - Cumulative distribution of each pair of types of real estate investment in Thailand based on data of 98 Months during April 2008 to May 2016

Second-order stochastic dominance analysis shows the results in line with mean-variance analysis (Figure 1). Figure 3 shows that town home investment second-order stochastically dominates (SSD) single house investment and land investment second-order stochastically dominates (SSD) condominium investment. Consequently; Town home investment third-order stochastically dominates (TSD) single house investment and land investment third-order stochastically dominates (TSD) condominium investment too.



A. Value of the Difference between Cumulative Value of Cumulative Probability Distribution of the Return of Single House and Town Home Investment.

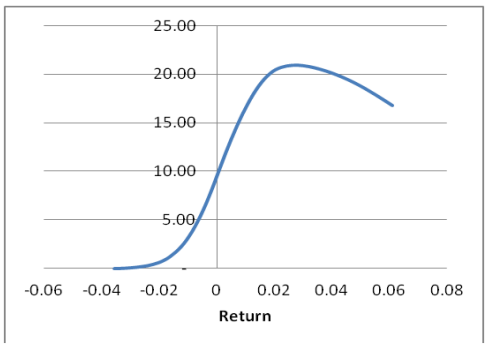


B. Value of the Difference between Cumulative Value of Cumulative Probability Distribution of the Return of Condominium and Land Investment.

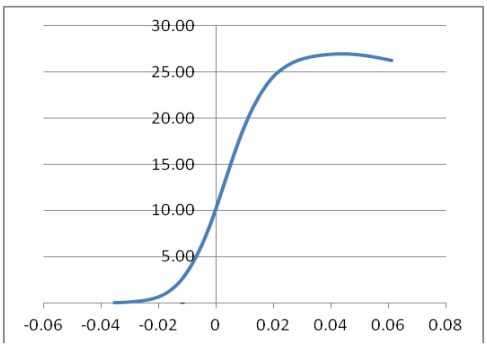
Source: The Bank of Thailand and Reuter Database

Figure 3. - Value of the difference between cumulative probability distribution of the return of each pair of real estate investment with second-order stochastic dominance in thailand based on data of 98 months during April 2008 to May 2016.

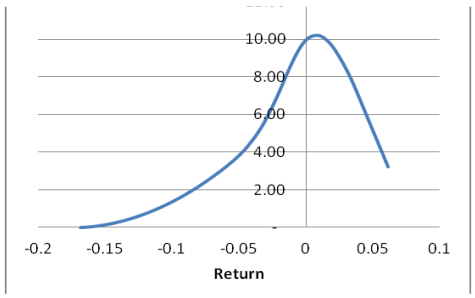
The other pairs with no second-order stochastic dominance (SSD) are then examined for the existence of the third-order stochastic dominance. The results in Figure 4 show that single house investment third-order stochastically dominates (TSD) condominium investment and real estate securities investment. Town home investment third-order stochastically dominates (TSD) condominium investment and real estate securities. Condominium investment third-order stochastically dominates (TSD) real estate securities investment and land investment third-order stochastically dominates (TSD) real estate securities investment.



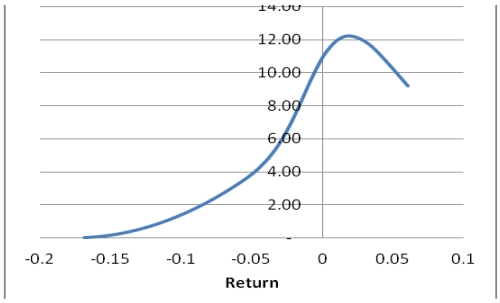
A. Value of the Difference between Cumulative Value of Cumulative Value of Cumulative Probability Distribution of the Return of Condominium and Single House Investment.



B. Value of the Difference between Cumulative Value of Cumulative Value of Cumulative Probability Distribution of the Return of Condominium and Town Home Investment.



C. Value of the Difference between Cumulative Value of Cumulative Value of Cumulative Probability Distribution of the Return of Real Estate Securities and Condominium Investment.



D. Value of the Difference between Cumulative Value of Cumulative Value of Cumulative Probability Distribution of the Return of Real Estate Securities and Land Investment.

Source: The Bank of Thailand and Reuter Database

Figure 4 - Value of the difference between cumulative value of cumulative value of cumulative probability distribution of the return of each pair of real estate investment with third-order stochastic dominance in Thailand based on data of 98 months during April 2008 to May 2016.

The pair of town home and land investment and the pair of single house and land investment shows no existence of first-order stochastic dominance, second-order stochastic dominance, and third-order stochastic dominance from the investigation. The summary of the findings is in Table 3.

Table 3. - Summary of Stochastic Dominance Test

Level of Stochastic Dominance	Pairs of investment
First Order Stochastic Dominance (FSD)	▪ None
Second Order Stochastic Dominance (SSD)	▪ Town home investment SSD Single house investment; ▪ Land investment SSD condominium investment.
Third Order Stochastic Dominance (TSD)	▪ Single house investment TSD condominium investment; ▪ Town home investment TSD real estate securities investment; ▪ Town home investment TSD condominium investment; ▪ Land investment TSD real estate securities investment.

Source: The Bank of Thailand and Reuter Database

Conclusion

The problem of real estate investment on the lack of investment tools is less significant since there are many types of real estate investment available for investors in many markets. This study analyses the relative performance of different types of real estate and real estate securities investment by using mean-variance and stochastic dominance techniques to provide more information to investors to use in improving their portfolio.

The examination by mean-variance analysis apparently points that town home investment dominates single house investment and land investment dominates condominium investment. When stochastic dominance analysis is applied, the study finds that there is no type of real estate investment first-order stochastically dominates other types of real estate investment. However, at the second-order stochastic dominance analysis, the results appear the same as mean-variance analysis. In addition, when the further analysis on stochastic dominance is applied, the investigation shows that, for traditional real estate, single house investment and town home investment third-order stochastically dominates condominium investment. All of traditional real estate investment third-order stochastically dominates real estate securities investment.

In theory, the existence of the dominated types of real estate investment is the evidence which is against the idea of market efficiency. In practice, the results imply that investors should pay attention not only on the selection of the specific real estate or real estate security but also on the choosing of the types of real estate investment to avoid having the inferior sub-asset class in their portfolio.

Nonetheless, there are at least two obvious limitations on this study. First, the period of study might be too short. The seasonality impact might not be completely counted into the findings. Second, the scope of the data is limited to only Thailand market. Hence, the further study should be done to overcome these limitations and to provide more complete results.

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Managing Regional Consumer Market Based on the Improved Approach to Evaluating Customer Needs for Food Commodities

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Abstract:

Regional consumer market can be regarded as an economical category occupying an important position in the social reproduction system and reflecting the conditions of the regional economy. Being the final stage of the regional reproduction process, consumption is a predetermining factor of improving the economic system efficiency. In this regard, developing the system of customer preference evaluations is one of the ways for supplying the population demand in the region and, simultaneously, for increasing the return levels of local commodity producers. The customer needs analysis allows the companies to develop the strategy that is adequate to the market conditions and thus to affect the improvement of the investment climate in the region. This stipulates the necessity to develop better mechanism for identifying the unsatisfied needs and for formulating, based on this mechanism, an action plan that would ensure the solution to this problem.

The objective of this study is to improve the widely-accepted marketing approach to studying the consumer needs for food commodities for the purposes of optimization of the regional consumer market management. The undertaken marketing research identifies the factors that predetermine the effective demand for food commodities and the degree of consumer satisfaction with the existing consumption level.

Keywords: regional consumer market, needs, food commodities, analysis, evaluation.

JEL Classification: P42, P46, R58, M31, L66.

1. Introduction

Within the framework of the earlier investigations dedicated to studying the investment climate in the region it has been established that the consumer potential represents the most significant indicator for evaluating the readiness of the regional economy for attracting and implementing the investments (Golaydo and Soboleva 2015, Soboleva, Golaydo and Lygina 2015, Soboleva and Parshutina 2016). Based on developing the marketing approach to managing the regional food market, the authors of this study suggested the process algorithm for regulating the demand (Soboleva and Parshutina 2015), (Soboleva, Lygina and Rudakova 2015). This model is founded on the consumer needs. Insofar, as the food commodities possess the largest specific weight within the whole amount of the products consumed by the population, the values of the needs for them should be among the basic indicators for developing the food-manufacturing industry and retail sector. In this regard, development and practical implementation of the approach to the profound analysis of consumer needs for food commodities will make it possible for the producers to maximize their profits through the complete satisfaction of the needs of the population. In modern environment customer affairs become ever more significant for each participant of the market relations (Stroeva, Shinkareva, Lyapina and Petruchina 2015). The abovementioned facts highlight the actual importance of the problem of identifying and studying the consumer needs for food products.

2. Customer preference analysis

Interaction between the production process and the consumers, between supply and demand is the most important part of the process of social reproduction whose theoretical and methodological foundations were developed in the works of the classics of economic theory: Ricardo, D., Smith, A., Marx K., (Schumpeter 2004). The problems of theoretical and methodological principles for developing the food market were considered by.

Nazarenko (2011), Fetyukhina (2011), Stukanova (2015) and other scientists.

The issues of marketing research studies on consumer needs always used to draw academic attention. Among modern researchers a significant role is played by the studies of Iacob, Oancea (2015), Abalkin (2004), Greenberg (2010), Gerchikova (1995), Sinyayeva (2011), Bakayeva *et al.* (2013), Macak *et al.* (2014). Theoretical and methodological problems of satisfying the population needs for mass-market products have been studied by Soyan (2012), Rimashevskaya *et al.* (2012), Astratova (1996), Pervan *et al.* (2015), Safiullin *et al.* (2015). The analysis of the available literature enables the conclusion that the needs of the population for food products are studied within the framework of different areas of knowledge: theoretical economics, management, commerce, marketing, social studies. Marketing research studies represent foundations for the models of studying the consumer needs. Given the strategic objective of this study that is based on evaluating and predicting the development of the regional food market, there is a necessity to improve the marketing approach to the consumer needs investigations.

Generalizing the opinions of the researchers on the criteria that explain the consumer choice (Kennedy 2004, Gracia and Albisu 2001, Chernev and Sternthal 1997), the authors of this study developed the model of the effects produced by certain factors on forming the needs on the food market (Figure 1). The basis of the suggested model of the factors that affect the formation of needs on the market of foodstuffs is represented by widely known models of purchasing behavior (Kotler 1984, Naumov 2009).

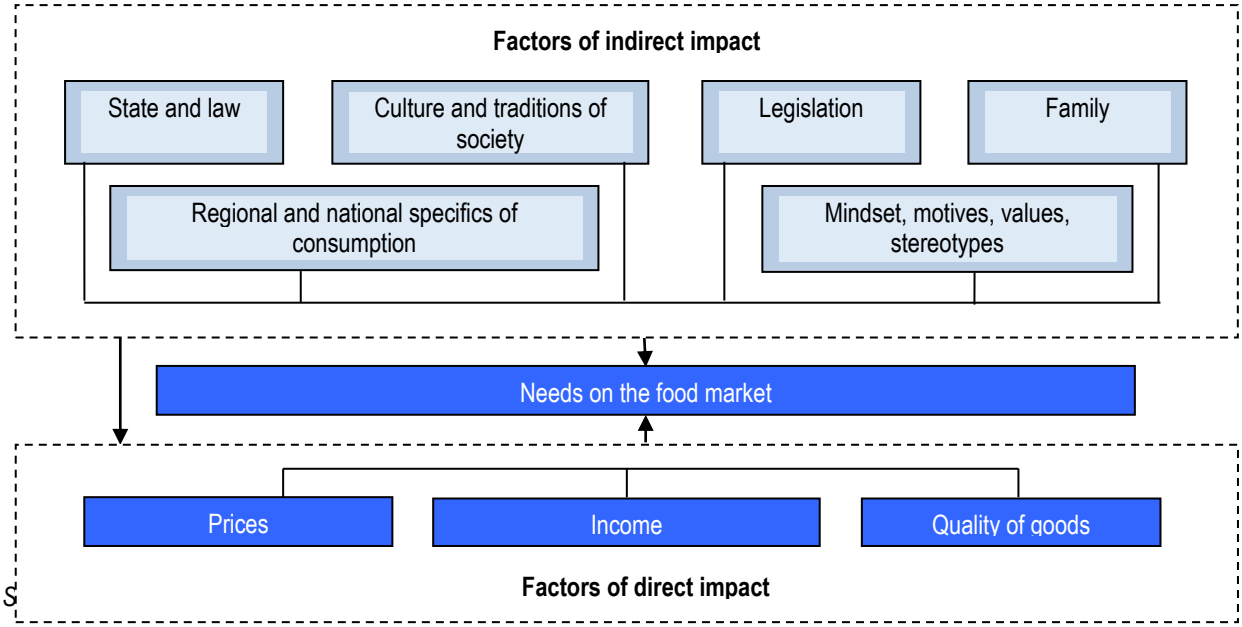


Figure 1 - Methods of evaluating preference patterns

The developed model is founded not on the consumer behavior but on the needs, that are formed on the food market. This is explained by the fact that it is exactly the needs that generate the purchasing behavior and the demand and thus represent the initial link in the motivation chain.

Marketing research has been undertaken to evaluate the factors that precondition the consumer preference system on the regional food market and that reflect the degree of customer satisfaction with the existing level of consumption. The selected method of the investigation was represented by questionnaire survey. Simple unrepresentative sample was used for the purposes of the investigation. The object of the investigation was represented by the food consumers, the inhabitants of the city of Orel in one of the regions of the Central Federal District of Russia. Population of Orel makes 318.550 people. This figure was taken as an entire assembly. Applying the sample calculation method based on confidence interval the authors came to the conclusion that to obtain the objective evaluation of customer preference, 376 inhabitants of Orel should be interviewed.

The marketing study had the objectives as follows:

- evaluate the factors affecting the nature of food consumption;
- determine the level of customer loyalty towards the foodstuffs and to identify the basic factors that would make for its increase;

- determine the degree of customer satisfaction with the existing level of food consumption broken down by the parameters as follows: satisfaction with the amount of the consumed products, satisfaction with product quality, satisfaction with the food product mix, satisfaction with retail arrangements, emotional satisfaction.

For the purposes of the first of the marketing study objectives a question list has been developed that consisted of seven closed-ended questions. The answers have been obtained for the following factors affecting the customer choice: significance of nutritional well-being for the customer; place of purchasing products within the retail format; motives for purchasing; attitude toward novelty goods; preference toward local manufacturers; characteristics that predetermine the product choice; authenticity and sufficiency of the information about the products on the market; effects of the price changes produced on the customer choice. The results of the survey made it possible to identify the profile of the customer in the region under investigation.

To identify the degree of customer satisfaction with the food products on the market, the authors of this study developed a questionnaire that enabled evaluating customer satisfaction with the commodity line split into four characteristics (Table 1).

Table 1 – Questionnaire for identification the degree of satisfaction of customer needs

Commodity line	Index			
	Quantity-related satisfaction	Satisfaction with the quality	Satisfaction with the choice	Emotional satisfaction
Assess by the scale from «1»to «10» points for every of the suggested indices				
Meat and meat food				
Milk and dairies				
Sugar and confectionery				
Bread and cereal products				
Eggs				
Vegetables				
Potatoes				
Vegetable oil				

Source: Developed by the authors

3. Results and discussion

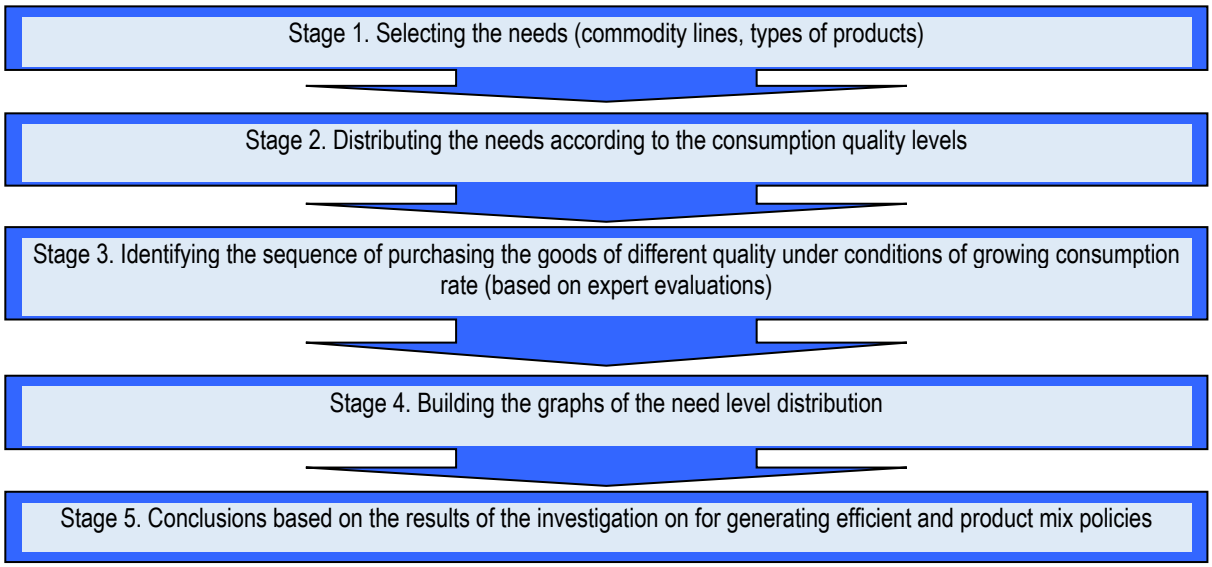
3.1. Recommendations on investigating customer preference system

The disadvantage of the interview is that it is focused on the issues that the researcher sets before himself (Milevich 2015). In order to neutralize the factors that detrimentally affect the results of the survey, the authors suggest that the procedure should be supplemented with the preference system evaluation. The methodology for evaluating customer preferences developed within the framework of the investigation is shown in Figure 2.

At the first stage of the method the consumer needs are selected. Thereat, the needs in this case are supposed to be understood as commodity lines or some definite products within the selected commodity line.

The second stage envisages distributing the needs according to the levels of the consumption quality. This quality should be understood as the level of satisfying the needs. It is deemed practicable to distinguish no less than four such levels: complete satisfaction, good level of satisfaction, average level and minimal satisfaction of the needs. Another, larger number of gradations can also be adopted; however, the authors believe that everything higher than six levels will be misconceived by the respondents.

At the third stage, it is necessary to identify the sequence of purchasing goods of different quality as the general rate of consumption grows. One point will be assigned to the goods that satisfy the consumer needs in the best possible manner. By way of illustration the authors recommend that the diagrams of the consumption level distributions should be built. For this purpose, the axis of ordinates will show the values that characterize the sequence of purchasing the goods and the axis of abscissas will represent the quality of consumption (the degree of satisfying the needs). At the same time, it has to be taken into account that the quality of satisfying the needs decreases as the value on the axis of abscissas gets higher.



Source: Developed by the authors

Figure 2 - Factors affecting formation of needs on food market

Based on the results of the undertaken evaluation, the conclusions are made on setting the prices for the products given their ability of satisfying the needs of the customers and the company's product mix policy is adopted based on customer preferences.

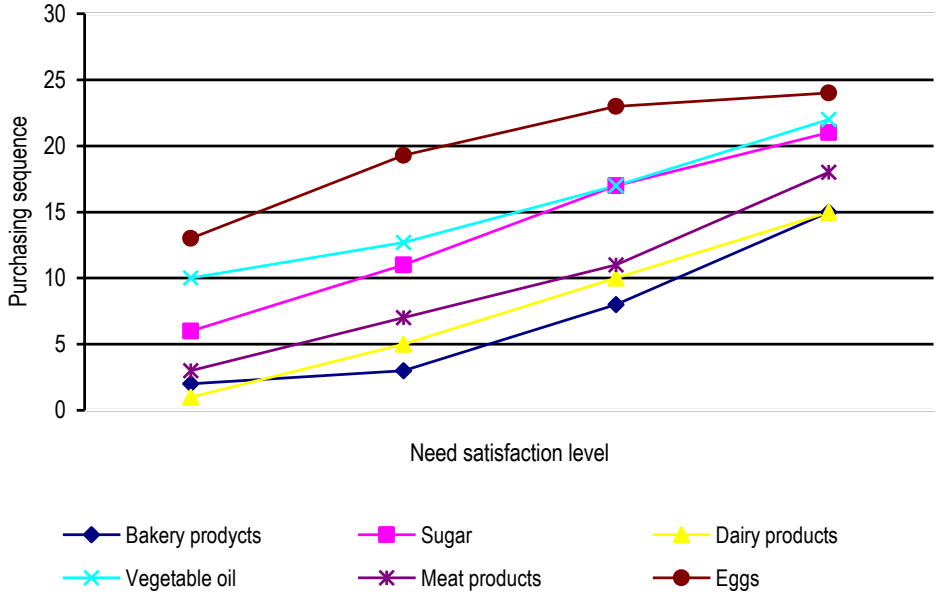
The suggested evaluation system represents an important feature of customer needs evaluation. Maximum score is calculated based on the number of the commodity lines under analysis and based on the distinguished levels of satisfying the needs for those products. The authors of this study investigated customer preferences broken down by six commodity lines and split into four characteristics that reflect the quality of consumption. Table 2 sets priorities in purchasing goods starting from 1 (the most significant commodity that can satisfy the needs to the fullest extent) to 24 (the commodity which role in satisfying the needs is insignificant and which is the last thing to be purchased). Such evaluation can be carried out engaging different number of experts.

Table 2 – Customer preferences system assessment - *in points*

Needs (commodities)	Quality of consumption (level of satisfaction with needs)			
	1	2	3	4
Bakery products	1	4	8	15
Dairy products	2	5	9	16
Meat products	3	7	11	19
Sugar	6	12	17	21
Vegetable oil	10	13	18	22
Eggs	14	20	23	24

Source: Developed by the authors

To obtain the average evaluation of all experts, it is recommended that the relevant mean evaluations should be calculated. The results are represented in graphic form (Figure 3).



Source: Developed by the authors

Figure 3 - Results of evaluating customer preference system

Based on the results of the evaluation it is possible to make conclusions that the retail sector in the region should always be provided with bakery products in the first place. Notwithstanding the fact that the profitability of sales in this commodity line is insignificant, this product line has to be presented extensively to attract the customer to the retail locations and to satisfy the needs for these products as far as possible.

3.2. Mechanism for evaluating degree of customer satisfaction

An important aspect of food product consumption is represented by quality. In the course of social development, the requirements set by the members of society to these goods became strict. In this regard, along with the idea of product quality, there is also the idea of "quality of consumption" that gives priority to the customer, to his expectations, requirements and demands. The approach to understanding the quality of the food products from the perspectives of customer satisfaction has been profoundly studied in the works belonging to Russian and foreign researchers (Potter 1995, Deming 2012, Niv 2005, Astratova 1996).

To evaluate the degree of satisfying customer needs for food products, the authors suggest that the integrated factor of diet quality should be calculated taking into account quantitative and qualitative characteristics of consumption together with the relative level of satisfying the needs of the population for food products. The elements revealing the essence of the method are shown in Figure 4.

Degree of satisfying the needs		
Quantitative level of satisfying the needs	Relative level of goods quality	Relative level of customer satisfaction

Source: Developed by the authors

Figure 4 - Elements of evaluating the degree of satisfying the needs for food products

Quantitative level of satisfying the needs will be evaluated based on the data on the actual consumption of food products and based on the standardized rates of consumption (Table 3).

Table 3 – Recommended and actual consumption of food products on the territory of the Russian Federation – kilo/person/year

Commodity line	IN RAMS Standards	UN WHO Standards	The standards included in the consumer basket	Actual consumption in 2015
Meat and meat products	72.5	70.1	58.6	85
Milk and dairy products	330	359.9	290	266
Eggs, pcs.	260	243	210	216
Bakery products	100	120.5	126.5	95

Commodity line	IN RAMS Standards	UN WHO Standards	The standards included in the consumer basket	Actual consumption in 2015
Potatoes	97.5	96.7	100.4	59
Sugar	26	36.5	23.8	31
Vegetable oil	11	13.1	11	11
Vegetables	130	140.3	114.6	98

Sources: The Federal state statistics service. Available from: http://www.gks.ru Federal Law of the Russian Federation as of 03.12.2012. No 227-FZ "On the consumer basket in the whole in the Russian Federation." Order of the Health Ministry of the Russian Federation as of 02.08.2010. No 593n "On Approval of the recommendations on the norms of rational consumption of foods that meet the modern requirements of a healthy diet"

It is possible to calculate qualitative estimation of customer satisfaction with food products applying the equation 2.1:

$$QAS = LK_A \div LK_R \times 100\% \quad (1)$$

where: QAS is quantitative evaluation of satisfying the needs for the product; LK_A – actual rate of consumption of this product; LK_R - rational rate of consumption of the product.

Table 4 represents the results of evaluating this indicator.

Table 4 – Evaluation of the quantitative level of satisfaction of Russian customers' needs f in 2015 – in %

Commodity line	The level of customer satisfaction with respect to		
	IN RAMS Standards	UN WHO Standards	Minimum standards
Meat and meat products	117.2	121.3	145.1
Milk and dairies	80.6	73.9	91.7
Eggs, pcs.	83.1	88.9	102.9
Bakery products	95.0	78.8	75.1
Potatoes	60.5	61.0	58.8
Sugar	119.2	84.9	130.3
Vegetable oil	100.0	84.0	100.0
Vegetables	75.4	69.9	85.5

Source: Developed by the authors

The majority of experts consider that the criteria of reasonable needs for consuming the food products are represented by the orientation of the products on maintaining health, their balanced nutritional value, safety and naturalness. In the course of studying the structure of food product consumption, the authors undertook a comparative analysis of the basic food products actually consumed by the population and the standards recommended by the Institute of Nutrition, Russian Academy of Medical Sciences, and also the norms recommended by the UN World Health Organization. As the Table above shows, the actual consumption rate of some basic food products (particularly, milk and dairy products, bakery products, potatoes and vegetables) does not correspond to the norms calculated to be necessary for ensuring good nutrition. Thus, the consumption of milk and dairy products by the population amounts to 80.6% of the normal value recommended by IN RAMS and to 73.9% of the norm recommended by WHO; vegetables: 75.4% and 69.9% accordingly; potatoes: 60.5% and 61.0%; bakery products: 95.0% and 78.8%; eggs: 83.1% and 88.9%.

The analysis of actual consumption of the basic food products in relation to the minimum norms (that are supposed to satisfy the bodily needs at the minimal level and that differ considerably from the norms recommended by IN RAMS) showed that the levels of consumption in many commodity lines increase the minimum norms: meat and meat products: by 45.1%, eggs: by 2.9%, sugar: by 30.3% that testifies of the relatively satisfactory level of consumption. At the same time, actual consumption rates of milk and dairy products, bread, potatoes and vegetables are not sufficiently high and show the insufficient level of satisfying the needs for the balanced nutrition and also show that it is necessary to develop (along with increasing the incomes) the culture of consumption, and, particularly, food culture.

Calculations of consumer budgets and formation of the consumer goods basket should take into account the norms that ensure the consumption level covering the metabolic costs of adults and children, child growth and development, maintaining health in old age. The authors believe that this indicator does not reveal the full picture of consumption, as it does not reflect its qualitative aspect. To eliminate this disadvantage, it seems practicable to calculate the relative level of quality (Eq. 2.2). The quality of goods that come to the domestic market can be

determined as a ratio of the indicator of the product under analysis to that of the basic (benchmark) product.

$$RLQ = \sum_{i=1}^{n} K_I \times L_{KI} = \frac{I_{I1}}{I_{I0}} \quad (2)$$

where: RLQ is relative level of the product quality; K_i – weight factor adopted for i-indicator of the product quality; L_{KI} – relative level of the product quality determined based on the value of i-indicator of quality; n - number of quality indicators that are accounted for; I_{i1} - value of *i*-indicator of quality of the product under analysis; I_{i0} – value of *i*-indicator of quality of the basic (benchmark) product.

For the purposes of this study the evaluation of the relative level of product quality was carried out based on the statistical data that characterize the quality of the products that come to the consumer market. Initial data for calculations are represented in Table 5.

Table 5 – Quality of goods coming into the consumer market of the Russian Federation (according to Rospotrebnadzor) - % of the number of samples

Food	Inadequate quality has been found			
	2014		2015	
	domestic	imported	domestic	imported
Meat and Poultry	2	4	5	3
Noodles	1	0	1	0
Fish products (food commodity)	4	18	8	19
Whole-milk products	4	2	6	3
Cereals	1	11	1	1
Flour	0	0	1	0
Confectionery	2	25	4	6
Butter	4	2	4	0
Vegetable oils	0	2	0	0
Cheese	3	4	2	5

Source: The Federal state statistics service. Available from: http://www.gks.ru.

The results of evaluating the relative quality of food products broken down by basic commodity lines are represented in Table 6.

Table 6 – Evaluation of the relative quality of food products - in units

Food products	Relative level of quality
Meat and Poultry	0.95
Fish products (food commodity)	0.92
Whole-milk products	0.94
Cereals	0.99
Four	0.99
Confectionery	0.96
Butter	0.96
Vegetable oils	1.00
Vegetables	0.91
Sugar	0.99
Potatoes	0.95
Eggs	1.00

Source: Developed by the authors

The third component of evaluating the degree of customer satisfaction with food products (Figure 3), the relative level of satisfying the customer needs for the product was determined within the framework of this study applying the data obtained in the course of the survey (Eq. 2.3).

$$RLSN = \frac{1}{n}(RLSN_Q + RLSN_P + ... + RLSN_n) = \frac{1}{n} \times \sum_{i=1}^{n} RLSN_I \quad (2.3)$$

where: RLSN – relative level of customer satisfaction with the product; $RLSN_Q$ – relative level of satisfying

the needs for the certain amount of the product; $RLSN_P$ – relative level of customer satisfaction with the price of the product; n - the number of satisfaction indicators under investigation.

In the course of investigating the level of satisfaction with food product consumption, the consumers were suggested to estimate, using ten-point scale, a number of consumption parameters: levels of quantitative and qualitative satisfaction with consumption (sufficiency of consumption), level of satisfaction with consumer choice, level of emotional satisfaction (consumer benefit).

The evaluation should have included the mark, where 0 was the least possible and 10 was the maximum possible score. Upon summing up the obtained evaluations for each of the commodity lines, they were divided by four according to number of the indicators of the evaluation. As a result, for each of the ten commodity lines under investigation a value of the relative level of satisfying the customer needs was obtained. The results of the interview are represented in Table 7.

Table 7 – Results of evaluation of the degree of satisfaction of the needs - in units

Commodity line	The average value of the index for all respondents				The relative level of satisfaction
	Quantity-related satisfaction	Satisfaction with the quality	Satisfaction with the choice	Emotional satisfaction	
Meat and meat products	7	6	7	8	7
Dairy products	7	8	7	7	7.25
Sugar and confectionery	8	7	8	8	7.75
Bread and bakery	9	8	6	9	8
Eggs	8	10	8	7	8.25
Vegetables	5	7	8	7	6.75
Potatoes	10	7	10	8	8.75
Vegetable oil	10	6	8	6	7.5

Source: Developed by the authors

The ultimate indicator that, according to the methods of this study, would reflect the level of satisfying the needs should be represented by the integrated factor that would take into account three consumption characteristics described above. It is recommended that this indicator should be determined given the minimal, the rational and the actual parameters of consumption (Eq. 2.4):

$$FACTOR = RLSN \times RLQ \times QAS \times \frac{N\min}{H_R} \quad (4)$$

where: FACTOR – integrated factor of diet quality for the commodity line; $N_R(N_{min})$

N_R (N_{min}) – rational (minimum) consumption norm.

Initial data and calculations of the integrated factor of diet quality for certain commodity lines are represented in Table 8.

Table 8 – Calculations of the integrated factor of diet quality

Commodity line	Consumption (in kilograms)					
	actual	rational	minimum			
Meat and meat products	85	72.5	58.6	7.0	0.95	6.3
Vegetables	95	100	126.5	6.75	0.91	7.4
Milk and dairies	266	330	290	7.25	0.94	4.8
Bakery	216	260	210	8.00	0.96	5.2
Vegetable oil	59	97.5	100.4	7.50	1.00	4.7
Potatoes	31	26	23.8	8.75	0.95	9.1
Sugar	11	11	11	7.75	0.99	7.7
Eggs	98	130	114.6	8.25	1.0	5.5

Source: Developed by the authors

Total integral factor of diet quality should be determined as a sum taking into account the number of the commodity lines under investigation (Eq. 2.5):

$$FACTOR_{total} = \frac{1}{n} \times \sum_{Z=1}^{n} FACTOR_Z \quad (5)$$

where: $FACTOR_{total}$ – total integral factor of diet quality; $FACTOR_Z$ – integral factor of diet quality for commodity line Z; n - number of commodity lines.

$FACTOR_{total}$ = 1/8 x (7.4 + 6.3 + 4.8 + 5.2 + 4.7 + 9.1 + 7.7 + 5.5) = 6.3

Given the fact that maximum possible value of this indicator makes 10, the obtained result proves insufficient satisfaction of customer needs for food products. The commodity lines "of special concern" are as follows: bakery products, vegetable oils, dairy products. These commodities require that special efforts should be undertaken to saturate the market with goods, to improve satisfaction with the choice and with the quality.

Conclusion

The problem of identifying the needs of the population is not new. Many studies have already been dedicated to the issue. However, identifying and forming the customer needs at the regional food market represent special case of these issues; therefore, their scientific studies have not been sufficiently extensive. In the course of this study, for the purposes of improving the regional consumer market management, the authors have developed recommendations for further more profound investigations of consumer preferences; particularly, the model of forming the needs on the food market has been developed. Based on the accomplished marketing research study, the factors have been identified that predetermine the effective demand for food products and the degree of customer satisfaction with the existing level of consumption. To eliminate the abovementioned disadvantages that occur in the process of carrying out the survey on customer preferences, the authors of this study suggest that it should be supplemented with the evaluation of the preference system. The most important aspect of food product consumption is represented by product quality. For the purposes of taking into account the quantitative and qualitative parameters of food consumption, including the subjective descriptions of quality by customers, the authors suggest that the method of calculating total integrated factor of diet quality should be applied that should account for the relative level of satisfying the needs for food of the population apart from the quantitative and qualitative characteristics.

Complex application of the marketing and the statistical approaches to identifying and to evaluating the suggested indicators, and, on this basis, of applying the analytical approach to generalizing the results will make it possible to improve the efficiency of the regional consumer market management and to adjust the supply of goods taking into account the customer requirements on regular basis. To optimize the procedure of the marketing research on the needs, a mechanism was suggested for evaluating the preference patterns. For the purposes of improving the regional consumer food market management, it was recommended that the integrated diet quality indicator should be calculated. This would make it possible to take into account quantitative and qualitative parameters of food consumption together with the relative level of satisfying the consumer needs.

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Spatial Analysis of Income Poverty and Social Exclusion in European Union - 28 in 2014

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Abstract:

The aim of the article is to compare the conditions of income poverty and social exclusion in the European Union - 28 member countries in 2014 in terms of 3 dimensions: income poverty and income inequality, material deprivation and labour-market exclusion. Each dimension is mapped by means of several indicators, majority of which is used for monitoring progress of Europe 2020 strategy in the area of poverty and social exclusion. Due to correlations among the indicators, we used factor analysis to create mutually independent factors determined by several source indicators. The factors characterize the particular dimensions, and serve as a basis for a cluster analysis used in the article, in order to gain relatively homogeneous clusters of European Union - 28 countries in terms of income poverty and social exclusion, while countries of various clusters would significantly differ in one or more dimensions.

Regarding the observed dimensions, the resulting findings provide a rather comprehensive view of the conditions of poverty and social exclusion in the European Union. The paper puts emphasis on the visualisation of results obtained by statistical methods, therefore, the analyses were carried out by means of SAS JMP.

Keywords: income poverty, social exclusion, material deprivation, low work intensity, unemployment, cluster analysis.

JEL Classification: I32, C38, E24.

1. Introduction

Poverty and social exclusion have become serious social problems concerning even the most advanced European countries. The European Union (EU) is well aware of that fact. Hence, among the main priorities of the Europe 2020 strategy, a target was laid out to reduce the number of persons in the EU who are threatened by poverty or social exclusion by 20 million. According to Mareš and Rabušic (Mareš and Rabušic 1996) a sole, correct scientific definition of poverty does not exist and therefore a universally valid method of its measurement cannot exist either. Only certain concepts of poverty are measurable. We agree with the opinion of the authors Betti et al. (Betti *et al.* 2015) that to be able to evaluate the condition of poverty, deprivation and social exclusion a multidimensional approach to those phenomena is necessary. This article is based on a 3-dimensional concept of poverty and social exclusion used by Eurostat to monitor progress of EU in achieving the abovementioned key target of the Europe 2020 strategy. The concept reflects 3 dimensions: income poverty, material deprivation and low work intensity. Eurostat uses an aggregate indicator *at risk of poverty or social exclusion* (AROPE) combining three rates: at-risk-of-poverty rate, severe material deprivation rate and low-work-intensity rate.

Poverty, material deprivation and labour market exclusion are serious problems to which the EU will have to pay much closer attention since, according to the European Commission, meeting the Europe 2020 strategy goals in the area of poverty and social exclusion seems improbable (European commission 2016). Between years 2009 and 2012, the rate of population at risk of poverty and social exclusion kept growing (Frazer *et al.* 2014), and only in 2012 there began a slow decrease in the total of people whose income was either below the at-risk-of-poverty threshold or were materially deprived or lived in households with low work intensity[9]. In 2014 more than 112 million people representing 24.4% of the total population of the EU-28 countries lived at risk of poverty or social exclusion (Eurostat 2015). In other words, nearly ¼ of the EU-28 population disposed of an equivalised income below the at-risk-of-poverty threshold and/or could not afford at least 4 out of 9 monitored material deprivation items and/or lived in households with low work intensity - less than 20%. The largest part of that population suffered from income poverty (17.2%). 11% of the EU-28 population lived in low work intensity

[9] http://ec.europa.eu/eurostat/web/europe-2020-indicators/europe-2020-strategy/headline-indicators-scoreboard (accessed August 25, 2016)

households and 9% of the EU-28 population experienced severe material deprivation. According to Eurostat (European commission 2015) the at-risk-of-poverty-or-social-exclusion (AROPE) rate increased in 2014 compared to 2008 by 0.6 p.p., meaning that in 2014 there were more people at risk of poverty and social exclusion than in 2008 by 2.4 million.

The aim of the article is to map income poverty and social exclusion in EU-28 countries and present a spatial comparison of those phenomena based on the most recent available data from EU-SILC survey and selected statistics provided by Eurostat. Because of the complexity of the data, we chose the year 2014 as the reference period. Due to relatively strong correlations among the dimensions of poverty and social exclusion mentioned in the introduction, we used a correlation and factor analysis in the 3rd part of the paper to prepare a database for cluster analysis. The 4th section of the article provides an interpretation of results obtained both through the cluster analysis by factors designed in the 3rd part of the article, and in terms of the original source indicators. The 5th part deals with the impact of particular dimensions on overall poverty and social exclusion in EU-28 countries and country clusters. The final, analytical part of the article (6th section) compares the income poverty and social exclusion in EU-28 countries based on an integral indicator determined by the factors obtained in the factor analysis. Eventually, the results of our analyses are compared with the ranking list of countries in Social Progress Index.

2. Source indicators

Within the 3-dimensional concept, income poverty is traditionally given the closest attention in the scientific literature but gradually, ever more studies appear that evaluate income poverty in relation with other dimensions rather than in isolation, *e.g.* (Guio and Maquet 2007), (Nolan and Whelan 2010), (Labudová, Vojtková and Linda 2010), (Želinský 2010a), (Želinský 2010b), (Horáková *et al.* 2013), (Vojtková 2014) and (Mysíkova, Večerník and Želinský 2015). Deprivation indicators were first introduced into poverty measurement by Peter Townsend (Townsend 1979). But Townsend's choice of deprivation indicators was criticised, and Mack and Lansley (Mack and Lansley 1985) elaborated their own concept of socially perceived needs. In 1995 (Hallerod, Bradshaw and Holmes 1995) the technique was modified for weighted items according to proportions of population who owned those items and a new technique known as *prevalence weighting* was developed. Deprivation items currently used by Eurostat are based on the indicators proposed by Guio (Guio 2009). Guio, Gordon and Marlier (Guio, Gordon and Marlier 2012) designed a robust concept of material deprivation measurement utilisable on both national and international levels. The concept was designed based on the analysis of a complete corpus of indicators studied in EU-SILC survey in 2009. The analysis resulted in a completion of two scales of deprivation items – one consisting of 13 items for the whole population and one child-specific, consisting of 18 items. The alternative 13-item scale of material deprivation measurement includes items reflecting the current life standards better than the 9-item scale which is still in use (Guio and Marlier 2013). Though, as Eurostat continues to publish the material deprivation rate and severe material deprivation rate based on the "original" 9-item scale, our analyses were based on that concept as well. As material deprivation provides a clear picture of social exclusion, the number of studies and analyses of material deprivation measurement continues to grow. While writing the paper, we were inspired by several scientific works dealing with material deprivation such as (Gerbery 2012), (Stávková, Birčiaková and Turčínková 2012), (Želinský 2012), (Guio and Marlier 2013), (Israel and Spannagel 2013) and (Šoltés and Ulman 2015).

In addition to income poverty and material deprivation, the 3-dimensional concept of poverty and social exclusion monitors also the exclusion from labour market and work intensity of households. Unemployment and low work intensity have a significant negative impact on the height of disposable income manifested in income poverty and material deprivation. Several studies have proven a very close relation between poverty and labour market exclusion or unemployment, such as (Hungler 2012), (Štreimikienė and Barakauskaitė-Jakubauskienė 2012), (Kretowicz *et al.* 2012), (Gerbery 2013), (Leskošek and Dragoš 2014) and (Mysíkova, Večerník and Želinský 2015).

The article maps and compares the conditions of income poverty and social exclusion in the member countries of EU-28 in 2014 in terms of 3 dimensions: income poverty and income inequality, material deprivation and labour market exclusion. In addition to the mentioned indicators we also used some other indicators from the EU-SILC survey – *European Union Statistics on Income and Living Conditions* and unemployment rates. As the partial indicators of the aggregate indicator AROPE map "only" the occurrence of income poverty and social exclusion but not the depth of those negative phenomena, we decided to use also some indicators characterising the severity of poverty and social exclusion in the European Union to create a more objective and more complex

picture. Each dimension of poverty and social exclusion was captured in the paper by means of 3 indicators. For the dimension of *Income poverty and income inequality* we used the following indicators:

- The *at-risk-of poverty rate after social transfers* (AROP)[10] defined as the percentage of persons in the total population with an equivalised disposable income below the at-risk-of-poverty threshold (60 % of the national median equivalised disposable income). *Equivalised disposable household income* is disposable household income divided by equivalised household size. For calculation of equivalised household size, modified OECD scale is used in EU-SILC survey, on the base of which coefficient 1 is assigned to each first adult household member, coefficient 0.5 to each second and other adult household member and 14 years old and over persons and coefficient 0.3 to each child below 14 years. This calculated equivalised disposable household income is then assigned to each person within household.
- The *relative median at-risk-of-poverty rate gap* (PG)[11] calculated as the difference between the median equivalised disposable income of people below the at-risk-of-poverty threshold and the at-risk-of-poverty threshold, expressed as a percentage of the at-risk-of-poverty threshold (cut-off point: 60% of median equivalised income).
- The **inc**ome quintile share ratio **or** S80/S20 ratio **(**S80_S20_ratio)[12], a measure of the inequality of income distribution. It is calculated as the ratio of total income received by the 20% of the population with the highest income (the top quintile) to that received by the 20% of the population with the lowest income (the bottom quintile).

The dimension of *Material deprivation* was represented by the following indicators:

- The *material deprivation rate* (MD)[13] defined as the percentage of population with an enforced lack of at least three out of nine material deprivation items in the economic strain and durables dimension. In calculation of indicators these following nine items are taken into account:
  - arrears on mortgage or rent payments, utility bills, hire purchase instalments or other loan payments,
  - capacity to afford paying for one week's annual holiday away from home,
  - capacity to afford a meal with meat, chicken, fish every second day,
  - capacity to face unexpected financial expenses set as amount corresponding to the monthly national at-risk-of-poverty threshold of the previous year,
  - household cannot afford a telephone (including mobile phone),
  - household cannot afford a colour TV,
  - household cannot afford a washing machine,
  - household cannot afford a car,
  - ability of the household to pay for keeping its home adequately warm.
- The *severe material deprivation rate* (SMD) defined as the enforced inability to pay for at least four of the above-mentioned items.
- The *mean number of deprivation items among the deprived* (Depth_MD)[14] defined as the average number of deprivation items of materially deprived persons.

The dimension of *Exclusion from labour market* was represented by the following indicators:

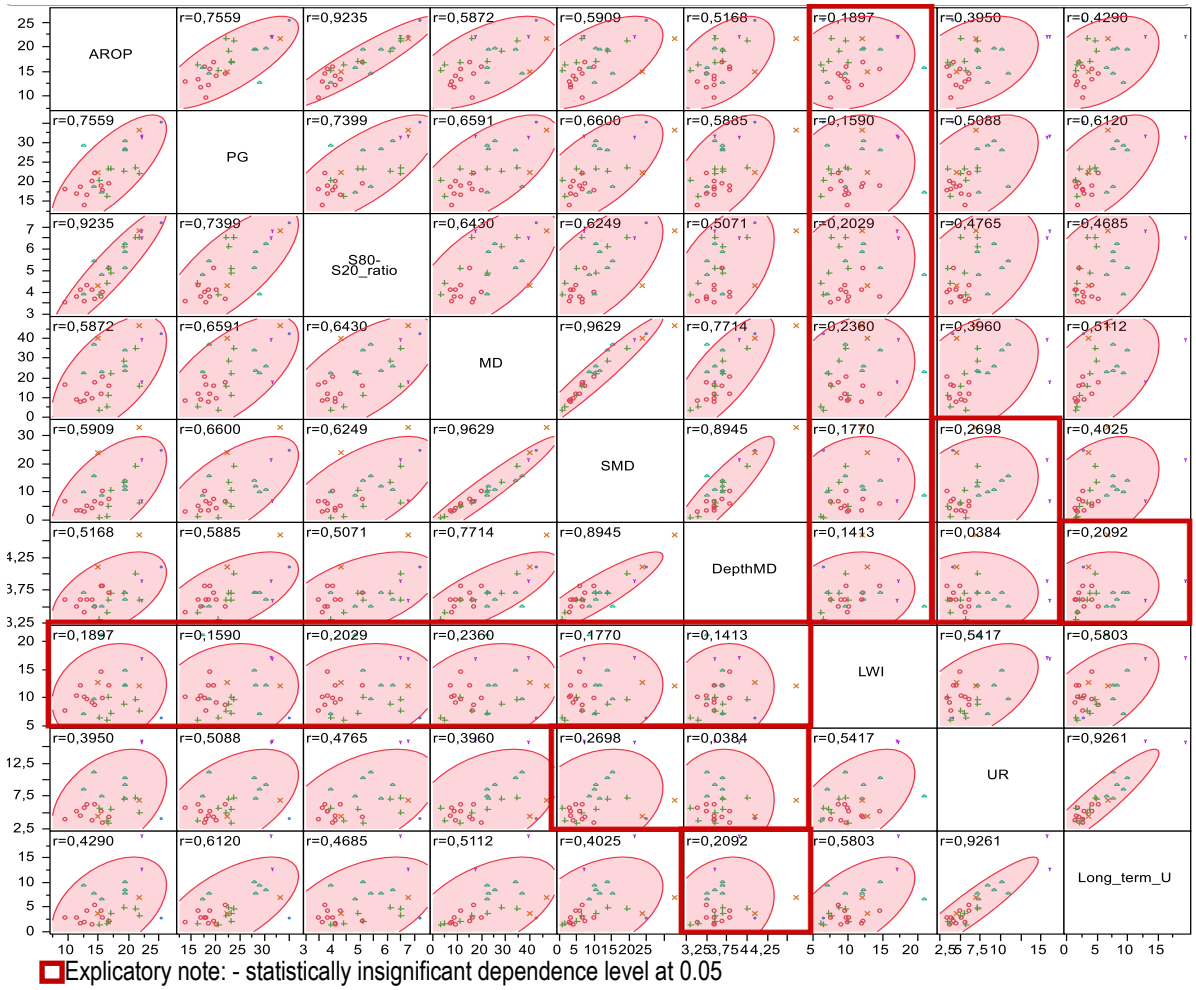
- The *low work intensity rate* (LWI)[15] defined as the percentage of persons, who live in households with very low work intensity (less than 20 %), to population aged 0-59. Work intensity of household refers to the ratio between the number of months that all "working age" household members have been working during the income reference year and the total number of months that could theoretically have been worked by the same household members. Definition of working age refers to persons aged 18 to 59 years old with exception of persons, who are students aged 18 to 24 years old.

[10] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_rate (accessed August 25, 2016)
[11] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_gap (accessed August 25, 2016)
[12] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Income_quintile_share_ratio (August 25, 2016)
[13] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Material_deprivation (accessed August 25, 2016)
[14] http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_statistics_on_income_and_living_conditions_%28EU-SILC%29_methodology_-_material_deprivation_by_dimension (accessed August 25, 2016)
[15] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Persons_living_in_households_with_low_work_intensity (accessed August 25, 2016)

- The *unemployment rate* (UR)[16] the number of unemployed persons as a percentage of the labour force based on International Labour Office (ILO) definition.
- The *long-term unemployment rate, % of active population aged 15-74* (Long_term_U)[17]. The long-term unemployment rate is the number of persons unemployed for 12 months or longer as a percentage of the labour force (*i.e.* economically active population). The unemployment rate is the number of unemployed persons as a percentage of the labour force (the total number of people employed and unemployed) based on International Labour Office (ILO) definition. Unemployed persons comprise persons aged 15 to 74 who fulfil all the three following conditions: are without work during the reference week; are available to start work within the next two weeks and have been actively seeking work in the past four weeks or have already found a job to start within the next three months.

3. Analysis of source variable dependence and data preparation for cluster analysis

The monitored phenomena often pertain to the same groups of people, especially if they belong to the same dimension. Therefore, we assume that the source variables are mutually dependent. The dependence was confirmed by a correlation matrix (Figure 1) and a coloured map of dependence intensity (Figure 2) among the source indicators.

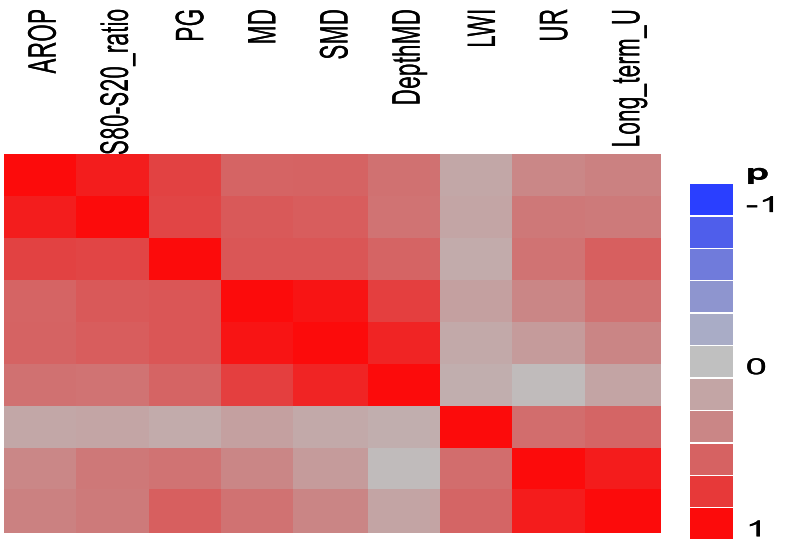


Explicatory note: - statistically insignificant dependence level at 0.05

Source: Eurostat, self-processed in SAS JMP[18]

Figure 1 - Correlation matrix of source indicators

[16] http://ec.europa.eu/eurostat/en/web/products-datasets/-/TIPSUN20 (accessed August 25, 2016)
[17] http://ec.europa.eu/eurostat/web/products-datasets/-/tipslm70 (accessed August 25, 2016)
[18] SAS JMP output uses decimal comma instead of decimal point.



Source: Eurostat, self-processed in SAS JMP

Figure 2 - Correlation map of source indicators

It is visible from the correlation matrix that the most intense dependence existed among the material deprivation indicators. A relatively strong relationship occured among the indicators of poverty and income inequality as well, where we could register a very strong positive correlation between the at-risk-of-poverty rate and the income quintile share ratio. The intensity of dependence was rather weaker in the case of the analysed labour market indicators. A moderate linear relationship was confirmed between both low work intensity rate and unemployment rate and low work intensity rate and long-term unemployment rate of the active population aged 15 to 74. On the other hand, the two monitored unemployment rates were in strong direct linear correlation.

Looking at the intense dependence among the indicators of various poverty and social exclusion dimensions, we can detect a moderate correlation in majority of cases. It is above all the material deprivation indicators that correlate with the poverty and social exclusion indicators. A strong dependence between income poverty and material deprivation has been identified in several scientific papers, *e.g.* (Fusco, Guio and Marlier 2011) among others. It is remarkable that the low work intensity rate is not significantly correlated with either material deprivation or poverty and social exclusion indicators. On the one hand, the analysed indicators characterise poverty and social exclusion from various perspectives, on the other hand, those perspectives more or less overlap as the significant correlations among the monitored indicators testify. As a result, for the purpose of cluster analysis, the set of original indicators had to be redesigned into a set of new, mutually independent variables. Factor analysis was implemented to serve that purpose. We attempted to create such factors that would be determined by those source indicators which would facilitate their interpretation. Simultaneously, we wanted to decrease the number of dimensions, *i.e.* to achieve a reduced number of factors compared to the original indicators while those factors would still carry at least 85% of information provided by the original indicators.

To assess the suitability of source indicators for factor analysis, we applied the Kaiser-Meyer-Olkin measure (Stankovičová and Vojtková 2007). The KMO statistics (Table 1) showed average to above-average suitability of the source variables for factor analysis.

Table 1 - Values of Kaiser-Meyer-Olkin measure for source indicators

Kaiser's Measure of Sampling Adequacy: Overall MSA = 0.69781917								
AROP	PG	S80-S20	MD	SMD	Depth MD	LWI	UR	Long_term_U
0.762	0.868	0.748	0.680	0.646	0.606	0.641	0.642	0.677

Source: Eurostat, self-processed in SAS EG

If we applied the Kaiser's rule for eigenvalues in correlation matrices which states that only factors with eigenvalues greater than average eigenvalue should be used (the average eigenvalue of a correlation matrix is 1) then we would consider only 2 factors (Table 2). But our aim was to preserve at least 85% of the original

information, *i.e.* to take into consideration those factors which explain minimum 85% of the variability of the original data. Based on that criterion we set the number of factors to 3.

Table 2 - Eigenvalues of the correlation matrix (PCA method)

Eigenvalues of the Correlation Matrix: Total = 9 Average = 1				
	Eigenvalue	Difference	Proportion	Cumulative
1	5.2146	3.4079	0.5794	0.5794
2	1.8067	0.8892	0.2007	0.7801
3	0.9176	0.3710	0.1020	0.8821
4	0.5466	0.2640	0.0607	0.9428
5	0.2826	0.1723	0.0314	0.9742
6	0.1103	0.0367	0.0123	0.9865
7	0.0736	0.0339	0.0082	0.9947
8	0.0397	0.0312	0.0044	0.9991
9	0.0084		0.0009	1.0000

Source: Eurostat, self-processed in SAS EG

After orthogonal equamax rotation we obtained factor loadings shown in Table 3. Based on those factor loadings, we found out that the 1st factor had strong positive correlation with the indicators of material deprivation, the 2nd factor demonstrated strong positive correlation with the indicators of income poverty and income inequalities and the 3rd factor showed strong positive correlation with the indicators of labour market exclusion.

Table 3 - Factor loadings after orthogonal equamax rotation

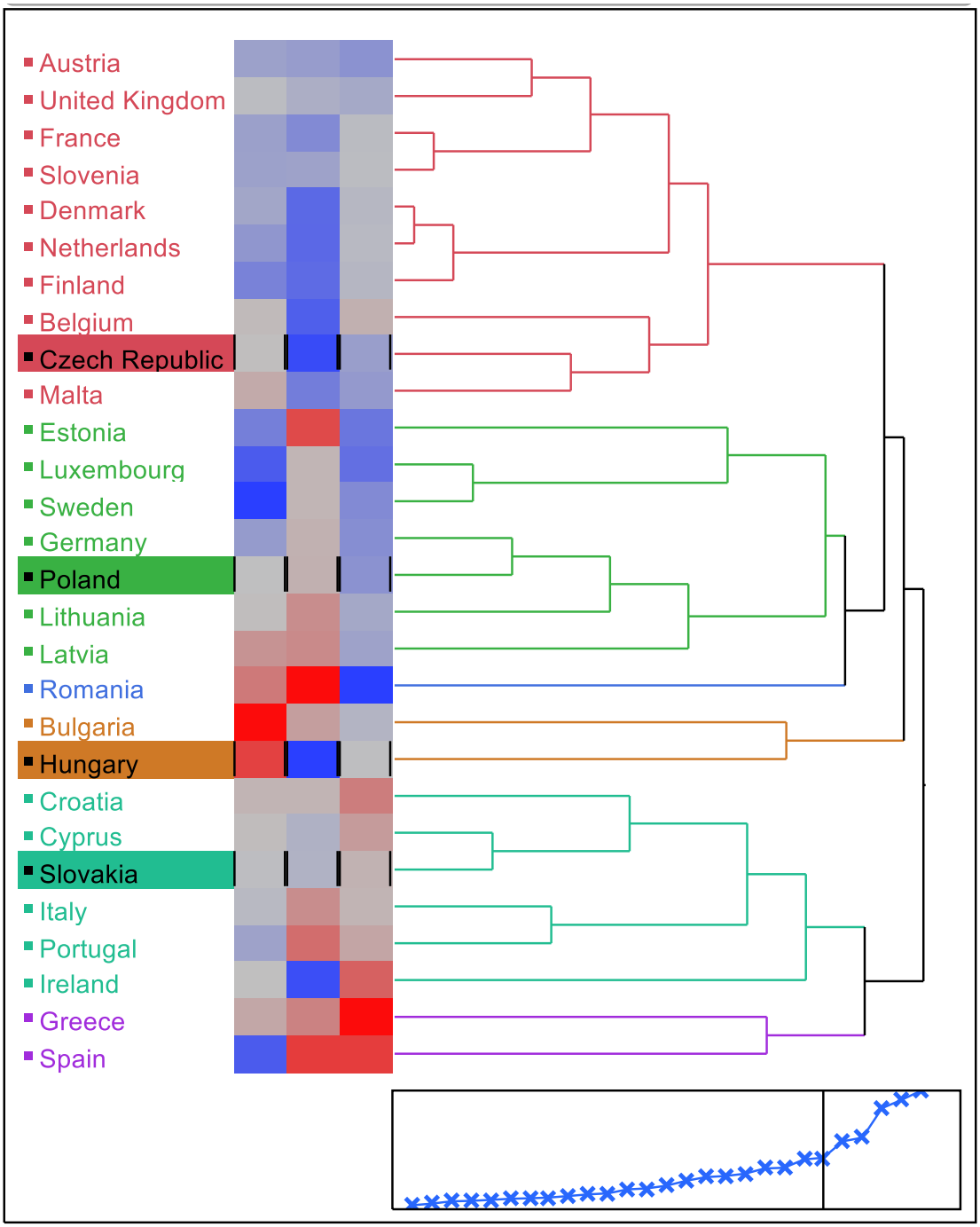
Rotated Factor Pattern			
	Factor1	Factor2	Factor3
AROP	0.3193	0.8762	0.1285
PG	0.4198	0.7491	0.2659
S80-S20_ratio	0.3347	0.8645	0.1857
MD	0.8318	0.3681	0.2699
SMD	0.9129	0.3453	0.1458
DepthMD	0.9279	0.2372	-0.0203
LWI	0.1647	-0.1188	0.8333
UR	-0.0317	0.4070	0.8629
Long_term_U	0.1470	0.3716	0.8674

Source: Eurostat, self-processed in SAS EG

4. Cluster analysis of EU-28 member countries in terms of income poverty and social exclusion in 2014

The factor analysis resulted in 3 mutually independent factors, each representing one dimension of poverty and social exclusion. These factors were appropriate for cluster analysis with the aim to create clusters of EU-28 member countries where countries falling into a common cluster would be most similar in terms of poverty and social exclusion while countries in different clusters would be significantly different. Using Ward`s method (Hebák *et al.* 2005) which due to its excellent results belongs among the most popular hierarchical procedures (Loster and Pavelka 2013), we obtained a dendrogram in Figure 3. The dendrogram is supplemented by colour maps of the 3 source factors. The colour map in the 1st column refers to the 1st factor representing the material deprivation dimension, the colour map of the 2nd factor representing the dimension of income poverty and income

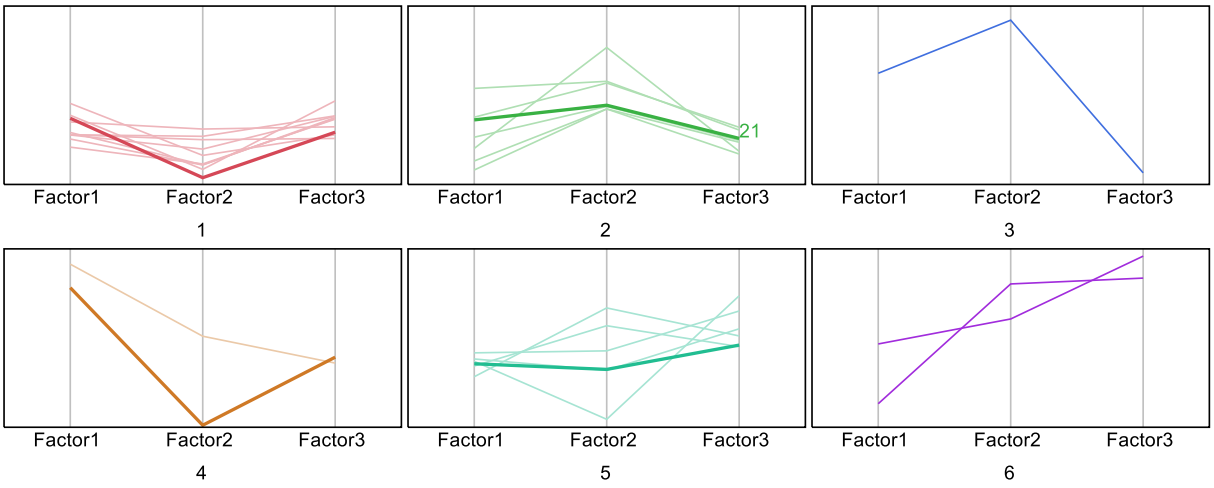
inequality is shown in the 2nd column, and we can find the colour map of the 3rd factor characterising labour market exclusion in the 3rd column. The dendrogram demarks the particular clusters by colour (the colour demarcation is retained in the following graphs as well) and in addition we highlighted the V4 countries. It is noteworthy that the countries of the V4 group were classified in various clusters. Based on the colour maps of factors defined by factor analysis, we can see that among the V4 countries Poland and Slovakia are the most similar though they were linked together only in the final step of clustering. According to the cluster analysis, in 2014 the conditions of poverty and social exclusion were the most alike in Denmark and the Netherlands.



Source: Eurostat, self-processed in SAS JMP

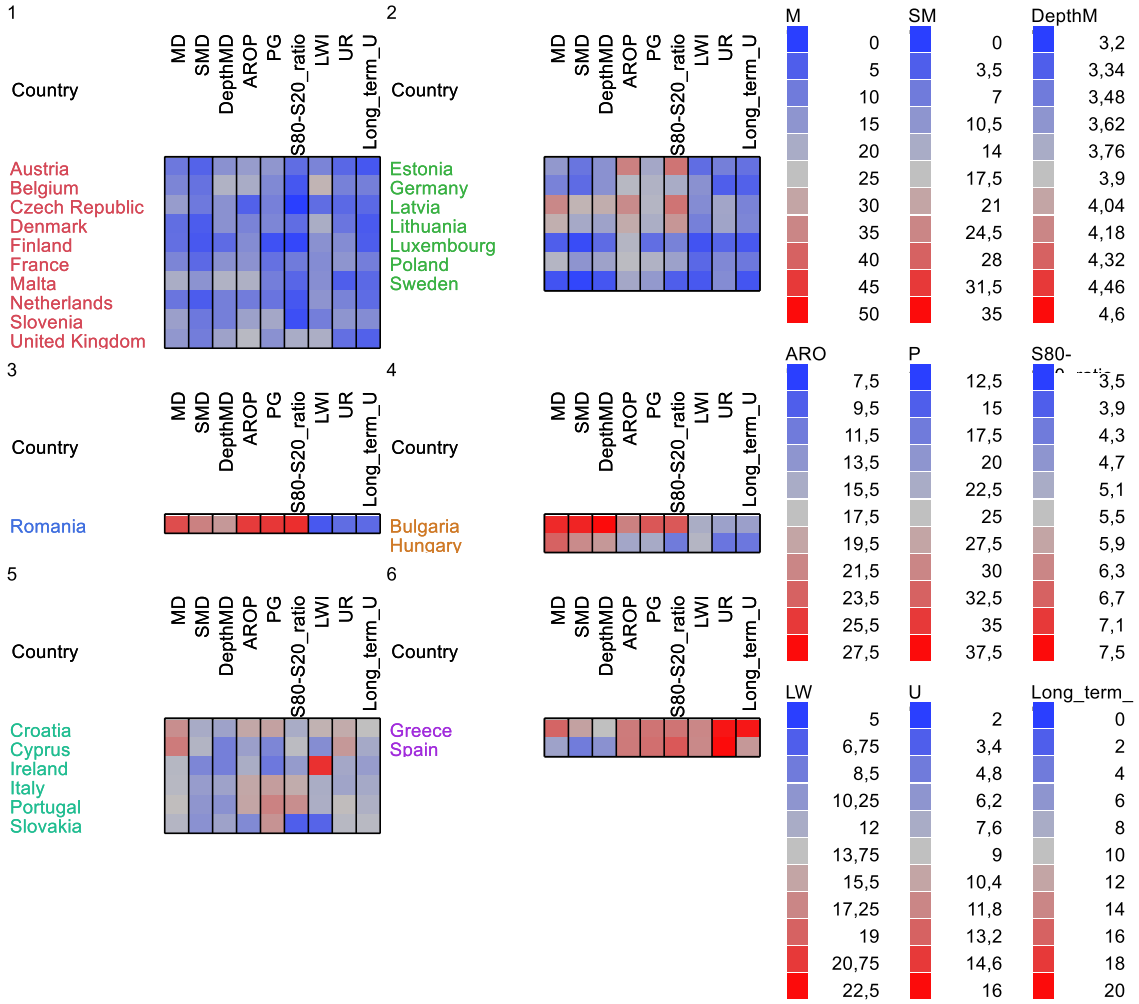
Figure 3 - Dendrogram of EU-28 country clusters according to poverty and social exclusion factors in 2014

We used the colour maps in Figure 3 together with the parallel factor graphs in Figure 4 and colour maps of the original indicators in Figure 5 for characterisation of the clusters.



Source: Eurostat, self-processed in SAS JMP

Figure 4 - Parallel factor graphs by particular clusters



Source: Eurostat, self-processed in SAS JMP[19]

Figure 5 - Colour maps of the original indicators for separate EU-28 member countries grouped by clusters

Based on Figures 3 to 5, we could state that cluster 1 achieved above-average results in all three dimensions. Countries of that cluster (Austria, the United Kingdom, France, Slovenia, Denmark, the Netherlands,

[19] SAS JMP output uses decimal comma instead of decimal point.

Finland, Belgium, the Czech Republic and Malta) presented the lowest risk of income poverty and income inequality (2nd factor).

Cluster 2 included Estonia, Luxembourg, Sweden, Germany, Poland, Lithuania and Latvia, and compared to cluster 1 it achieved similar or in some cases (*e.g.* Sweden, Luxembourg) even better results in the dimensions of material deprivation and labour market exclusion, but showed significantly higher risk of income poverty and income inequality. The first two clusters were the most populous; they included 17 countries of EU-28 (cluster 1 – 10 countries and cluster 2 – 7 countries). Geographically, they were mostly countries of Western, Northern and Central Europe. Considering the postsocialist countries - Slovenia, the Czech Republic, Poland and the Baltic States found their way into those two clusters. But the Baltic States, in contrast to other countries in the clusters, manifested above-average risk of income poverty and income inequality. In addition, Latvia demonstrated high risk of material deprivation which was even higher than in clusters 4 and 5.

The other clusters included mostly countries of Southern and Southeast Europe (except Slovenia and Malta belonging to cluster 1). The most populous among the other clusters was cluster 5 including Croatia, Cyprus, Slovakia, Italy, Portugal and Ireland. The cluster was characterised by above-average labour market exclusion (only cluster 6 exhibited worse results), while it achieved average values in the dimension of material deprivation. Cluster 5 indicated high variability in income poverty and income inequality factor mostly caused by Portugal which registered high levels of severe poverty and income inequality and by Ireland whose level of income poverty and income inequality resembled the countries of cluster 1. Ireland was included into that cluster as the last one, because it exhibited the least similarity with the other countries of cluster 5. On the one hand, Ireland registered in 2014 low risk of income poverty and income inequality, on the other hand, high degree of labour market exclusion, specifically as a consequence of high rate of low job intensity.

The remaining 3 clusters were much less populous, as poverty and social exclusion in the countries of those clusters were quite specific. The cluster 3 included only Romania which showed the highest level of income poverty and income inequality risk but in terms of labour market exclusion, Romania belonged among the countries with both lowest unemployment and lowest rate of low job intensity. Frequent and deep material deprivation was equally typical for Romania. Within that dimension (represented by the 1st factor), Romania was comparable with Bulgaria and Hungary.

Bulgaria and Hungary created a separate cluster (cluster 4) specific for extreme material deprivation levels (especially in Bulgaria). Compared to Romania, those countries achieved lower levels of income poverty and income inequality (especially Hungary). Labour market exclusion in that cluster showed positive results (i.e. relatively low) though not as low as in Romania.

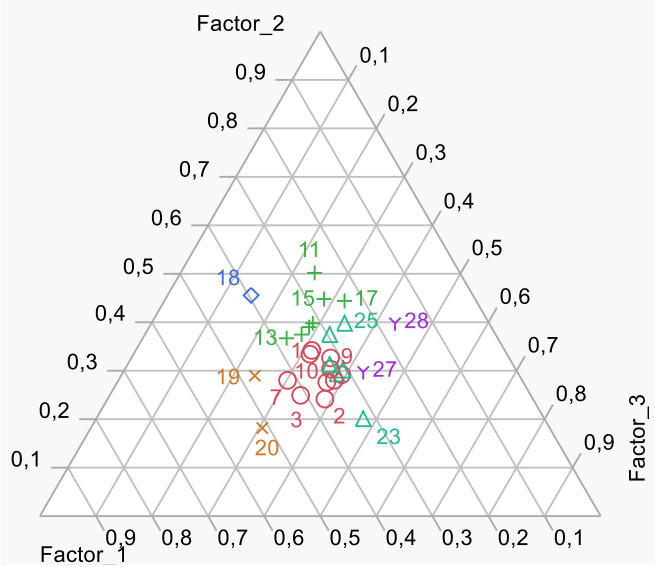
As stated earlier, above average level of labour market exclusion was evidenced in cluster 5 (especially due to countries of Southern Europe), but an extremely high level of unemployment and long-term unemployment rate of active population was registered also in cluster 6 formed by Greece and Spain. Moreover, the income poverty and income inequality of those two countries belonged to the highest within EU-28. On the other hand, it is remarkable that material deprivation in Spain was among the lowest in the EU-28 countries.

5. Influence of particular dimensions on poverty and social exclusion in EU-28 member countries

In this section of the article we compared the degree of determination of income poverty and social exclusion by the particular factors: 1st factor – material deprivation, 2nd factor – income poverty and income inequality, 3rd factor – labour market exclusion. Working with a three-dimensional concept, a triangular graph was used as an appropriate illustration of the impact of the dimensions, in which the rates of the 3 factors are presented in an equilateral triangle.

As visible in Figure 6, countries belonging to various clusters are differentiated by the same colours that were used in the previous section. To make the graph more legible, the identification numbers of some EU-28 countries were added (the countries are aligned according to their cluster number and within the cluster in alphabetic order based on the English name of the country).

The countries of cluster 1 gravitate around the centroid of the equilateral triangle depicted in Figure 6 suggesting a relatively balanced representation of all three dimensions. Three countries of that cluster (Austria, Slovenia and the United Kingdom) have a nearly identical representation of all three dimensions because they are situated in a spot where each factor is determined by 30% to 40% of income poverty and social exclusion.



Explicatory notes:
Cluster 1: 1. Austria, 2. Belgium, 3. The Czech Republic, 4. Denmark, 5. Finland, 6. France, 7. Malta, 8. The Netherlands, 9. Slovenia, 10. The United Kingdom,
Cluster 2: 11. Estonia, 12. Germany, 13. Latvia, 14. Lithuania, 15. Luxembourg, 16. Poland, 17. Sweden,
Cluster 3: 18. Romania,
Cluster 4: 19. Bulgaria, 20. Hungary,
Cluster 5: 21. Croatia, 22. Cyprus, 23. Ireland, 24. Italy, 25. Portugal, 26. Slovakia,
Cluster 6: 27. Greece, 28. Spain

Source: Eurostat, self-processed in SAS JMP[20]

Figure 6 - Triangular graph of poverty and social exclusion factors for EU-28 member countries in 2014

The analysis in the previous section showed that cluster 2 is threatened by an increased risk of income poverty and income inequality in contrast with very positive results in the other 2 dimensions. This finding is accertained by the triangular graph as well, in which the countries of cluster 2 demonstrated the impact of the 2nd factor – income poverty and income inequality at a level around 40% and in the case of Luxembourg even at 50%.

Romania, as the only country of cluster 3, registered a high degree of material deprivation, high risk of income poverty and income inequality but positively low labour market exclusion. This specific situation is equally reflected in the triangular graph according to which 40% of the overall risk of poverty and social exclusion in the country was determined by the 1st factor, 45% by the 2nd factor and only 15% by the 3rd factor – labour market exclusion.

Cluster 4 registered the highest degree of social exclusion as a consequence of material deprivation which was corroborated as well. In 2014 around 50% of poverty and social exclusion risk in Bulgaria and Hungary was determined by material deprivation.

Most of the countries in cluster 5 had a relatively balanced representation of all components of poverty and social exclusion. In that cluster, Ireland was quite noteworthy, as it demonstrated very good results in the area of income poverty and income inequality risk but a high degree of labour market exclusion at the same time. These facts resulted in a finding that in 2014 50% of its poverty and social exclusion was caused by the 3rd dimension – labour market exclusion, and only 20% by the 2nd dimension – income poverty and income inequality which was after Hungary the 2nd lowest impact of that dimension.

Eventually, we considered Greece and Spain constituting cluster 6. This cluster was characterised by the highest degree of labour market exclusion. As these countries achieved poor results in the other dimensions too, the impact of the 3rd dimension was not as distinctive as in the case of Ireland, though, it was still over 40% while in other countries of EU-28 (except Ireland) it was below that level. Spain demonstrated in 2014 relatively good results in the 1st dimension – material deprivation which in combination with negative results in the other two

[20] SAS JMP output uses decimal comma instead of decimal point.

dimensions led to the result that less than 20% of poverty and social exclusion was determined by material deprivation.

It is remarkable that only 4 countries showed an impact of any factor at a level equal or less than 20%, namely Spain (1st factor), Hungary (2nd factor), Ireland (2nd factor) and Romania (3rd factor). This finding, nevertheless, indicated negative values in other factors and ambiguity of the particular dimension. In Spain, the 3rd dimension, in Hungary the 1st one, in Ireland the 3rd one and in Romania both the 1st and the 2nd dimension were questionable. We need to remark that the triangular graph only illustrates the relative rates among the dimensions, and so it may not fully reveal the severity of the studied phenomenon. Therefore, it may happen, as in our analysis, that Greece was situated close to Finland despite the fact that those two countries stand at the opposite ends of the risk of poverty and social exclusion scale among the EU-28 countries.

6. Evaluation of poverty and social exclusion in EU-28 member countries based on an integral indicator

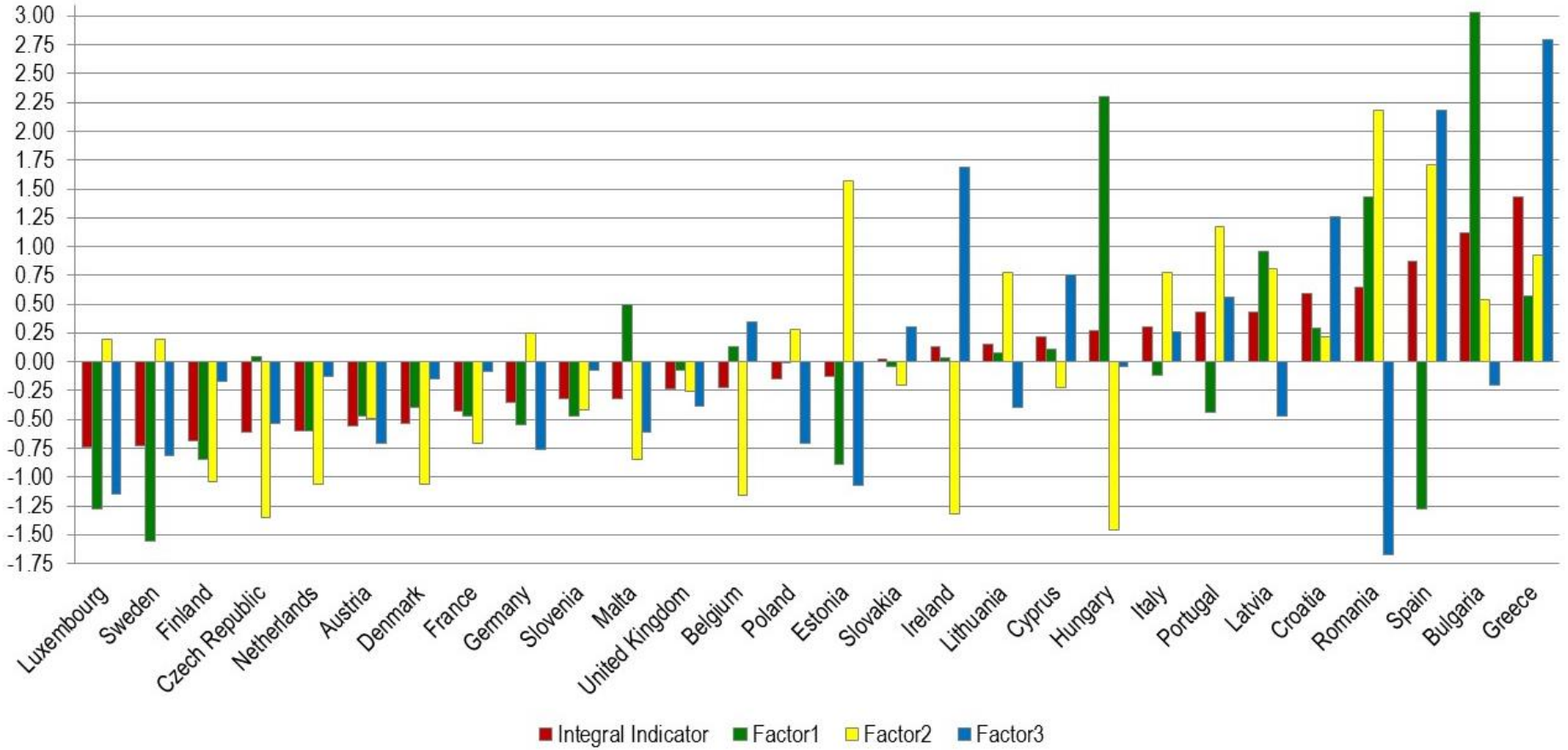
In the last section of the paper, we used the factors obtained by factor analysis in the 2nd part of the article for designing an integral indicator of income poverty and social exclusion. Based on that integral indicator combined with the particular factors, we compared the phenomenon of income poverty and social exclusion and its components in EU-28 member countries. The integral indicator was calculated as an arithmetic average of the applied factors, each representing the abovementioned dimensions of income poverty and social exclusion.

Acording to the integral indicator, the conditions of income poverty and social exclusion were above average in countries belonging to clusters 1 and 2. The only exceptions were Latvia and Lithuania with positively low levels of labour market exclusion, but that dimension was overshadowed by negative results in the other two dimensions. The third Baltic Sate – Estonia was a different case. Estonia showed much higher level of income poverty and income inequality risk, but good results in the other two dimensions atoned the extremely poor results in the dimension represented by the 2nd factor, actually the second-worst among EU-28 member states after Romania. Both the Baltic States and the remaining countries in cluster 2 (Luxembourg, Sweden, Germany and Poland) registered above average risk of income poverty and income inequality.

Slovakia reached an average value of integral indicator in 2014. The slightly increased risk of labour market exclusion was compensated for by a lower income poverty and income inequality risk. All countries placed to the right of Slovakia in fig. 7 registered an increased risk in at least one dimension. In the case of Greece and Croatia, all three factors showed disfavourable values. In particular, extremely high labour market exclusion led in Greece to the worst value of the integral indicator among all the EU-28 member states. Extremely high degree of labour market exclusion was found in Spain and Ireland too, but it was considerably compensated for in those countries by good results in other dimensions (Spain presented very good results in material deprivation dimension and Ireland in the income poverty and income inequality dimension). The second-worst indicator after Greece was identified in Bulgaria due to extremely high material deprivation. The material deprivation dimension was in 2014 in a bad shape also in Hungary which led in the final evaluation of poverty and social exclusion to its classification into a shared cluster with Bulgaria (cluster 4). On the other hand, in the final evaluation of poverty and social exclusion Hungary did not belong to the bottom end of the ranking list thanks to the lowest degree of risk of poverty and income inequality among the EU-28 member countries. Other countries reached even worse results of the integrated indicator, namely Greece, Bulgaria, Spain, Romania, Latvia, Italy and Portugal. In those countries, the dimension of income poverty and income inequality was the most harmful and the material deprivation dimension the least one. Portugal achieved below average level of material deprivation and in those terms it equaled Austria, Germany, France and Slovenia.

The obtained results match considerably the global ranking of states according to their social progress index (SPI[21] – Social Progress Index) which evaluates the countries of the world according to their efficiency in social and environmental performance. The countries situated in the top quarter of EU-28 ranking, showing the lowest degree of income poverty and social exclusion, according to the integral indicator, achieved the top 11 places in the social development ranking (except the Czech Republic placed 23rd and Luxembourg – not included). Majority of EU-28 countries were in 2014 globally ranked in terms of SPI index between 10th and 30th place. Latvia (31st place), Hungary (32nd place), Lithuania (33rd place), Greece (35th place) and Croatia (39th place) were according to their social development ranked between 30th and 40th place. Similarly, to the ranking based on the integrated indicator, the worst positioned EU member countries were Romania (51st place) and Bulgaria (44th place).

[21] http://13i8vn49fibl3go3i12f59gh.wpengine.netdna-cdn.com/wp-content/uploads/2016/06/Social-Progress-Index-2014-Executive-Summary.pdf (accessed September 2, 2016)



Source: Eurostat, self-processed in MS Excel

Figure 7 - Comparison of the integral indicator of poverty and social exclusion and its factors in EU-28 in 2014

It is necessary to state that although according to the integral indicator of poverty and social exclusion Spain and Portugal belonged among the countries with the worst results, their social and environmental performance measured by SPI index in 2014 showed relatively good results (21st and 22nd place globally). Spain and Portugal were grouped in the 2nd tier of countries with highly efficient social and environmental progress which in 2014 included 13 states (starting with Austria - 11th place to the Czech Republic – 23rd place). We may remark that Slovakia was ranked 24th and it opened the 3rd tier of countries in social development.

Conclusion

The paper evaluates and compares poverty and social exclusion in EU-28 member countries based on statistical analyses of selected indicators in 2014. Multidimensional statistic methods were used for that purpose, such as correlation analysis, factor analysis, cluster analysis, analysis of poverty and social exclusion determination by various dimensions, and a comparison of total poverty and social exclusion and its dimensions by means of factors and an integral factor derived from them. Each method provides a different view of the researched topic, it confirms and above all complements the results obtained by other methods. The factor analysis identified 3 factors in the original set of indicators of poverty and social exclusion representing 3 dimensions: 1 income poverty and income inequality, 2 material deprivation, 3 labour market exclusion. The correlation analysis confirmed the strong dependence among indicators included in each dimension. In that section of the article a concise synthesis of results was presented.

In terms of poverty and social exclusion, the cluster of the following countries exhibited the best results in 2014: Austria, the United Kingdom, France, Slovenia, Denmark, the Netherlands, Finland, Belgium, and Malta. Poverty and social exclusion was in those countries determined quite evenly by all three dimensions. The integral indicator of poverty and social exclusion confirmed the above average positive social performance in those countries of EU-28 with a note that Malta registered an above average risk of material deprivation and Belgium an above average risk of labour market exclusion.

The situation in Luxembourg and Sweden was in 2014 according to the integral indicator even better than in the countries of the previously mentioned cluster and comparable to Germany. Though, a slightly above the EU-28 average risk of income poverty and income inequality was registered in those three countries. Nevertheless, we need to realise that in terms of income poverty only relative concepts are used, therefore, the poverty risk threshold is set differently in various countries. While in Luxembourg the at-risk-of-poverty threshold for a one-member- household in 2014 was set at 20,000 euro and in Western and Northern Europe at 12,000 to 17,000 euro, in the postsocialist countries it was under 5,000 euro (except Slovenia – 7,146 euro) and in Romania only 1,317 euro. The reason for including Luxembourg, Sweden and Germany into the same cluster with Poland and Estonia showing average values of the integral indicator and with Lithuania and Latvia where the integral indicator was below the EU-28 average, was the above average income poverty and income inequality in those three countries.

While countries of Western Europe and Scandinavia registred a relatively low level of poverty and social exclusion risk, the postsocialist countries (except the Czech Republic and Slovenia) together with the countries of Southern Europe recorded above average risk of poverty and social exclusion in at least one dimension of that phenomenon. As mentioned earlier, the Baltic States registered a high degree of income poverty and income inequality, though, combined with a relatively low unemployment and labour market exclusion. The highest risk of poverty and social exclusion among the Baltic States was quantified in Latvia recording in 2014 a high level of material deprivation as well.

Based on the integral indicator, the overall risk of poverty and social exclusion was in 2014 the highest in Geece, Bulgaria, Spain, Romania and Croatia. Greece showed an increased risk in all three dimensions and the absolutely highest degree of labour market exclusion of all EU-28 member countries.

Though Bulgaria registered below average degree of labour market exclusion, the relatively good result in one dimension could not compensate for negative values in the other two. Bulgaria had to face extremely high levels of material deprivation, the most serious in the whole EU-28.

Spain did not have problems with material deprivation in 2014 but similarly to Greece, it recorded a high degree of unemployment and labour market exclusion. The risk of poverty and social exclusion was in 2014 so similar in Greece and Spain that the two countries created a separate cluster.

Romania had to face in 2014 the highest risk of income poverty and income inequality eventhough it had the lowest poverty threshold among all EU-28 countries. It is remarkable that Romania recorded in 2014 the lowest risk of labour market exclusion, so that only 15% of poverty and social exclusion was determined by that

dimension while income poverty and income inequality had a three times stronger impact on the overall poverty and social exclusion in that country. Romania registered the least typical representation of the dimensions and their shares in the formation of poverty and social exclusion which was reflected in the cluster analysis where Romania was presented as a separate cluster.

Croatia completes the quintuple of EU-28 countries with the highest risk of poverty and social exclusion. Croatia and Greece were the only two countries where the risk of poverty and social exclusion was above average in all three dimensions. But Croatia recorded significantly better results than Greece in all three dimensions. Labour market exclusion was the most detrimental dimension for Croatia, reaching the 4th worst level among the EU-28 countries.

Several EU-28 countries that according to the integral indicator did not face as high levels of poverty and social exclusion as Croatia, still recorded significantly higher risks in some other dimensions than Croatia. It was Ireland and Hungary besides the already mentioned Estonia which recorded the 2nd highest degree of income poverty and income inequality risk after Romania. Ireland, as a consequence of high degree of low job intensity registered the 3rd highest level of labour market exclusion (after Greece and Spain). In Hungary, the 2nd highest level of material deprivation was listed (after Bulgaria). In both cases (Hungary and Ireland) the negative results in the mentioned dimensions were compensated for by a low risk of income poverty and income inequality, the lowest among the EU-28 countries.

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Archaic Forms of Economic Activity in Peripheral Regions and Problems of Systematic Structural Reforms of the Russian Economy

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Abstract:

The article analyzes the role and scope of the rooted economy of peripheral regions, which constitute the significant portion of archaic, traditional economic practices of the population, resources and informal institutions governing them.

The study of traditional economic practices is carried out within the framework of the concepts of peripheral economy, rooted economy and ethno-economy. The given statistic empirical evidence demonstrates the basic role of traditional economic practices of the population in the reproduction of resources of the rooted economy sector of the region. The hypothesis about the high level of commercialization of economic structures of ethno-economics is justified and confirmed by the sample of the economic-sociological research. It is shown that an integral part of the concept of structural reforms of the Russian economy should be the strategy of capitalization of economic resources of the archaic peripheral regions.

Keywords: archaic economy, rooted economy, traditional economic practices, economic structure, peripheral economy.

JEL Classification: A1, R12.

1. Introduction

The modern theory of economics basically operates categories of market economy, in the optics of which it becomes more and more problematic to provide the description and interpretation of a number of objects, structures, processes and relations of economic reality.

In today's world, especially in the countries that have returned to the market economy recently, entirely take place processes that reanimate the archaic economic structure – traditional economic practices, historically developed in specific natural-landscape and the economic-geographical conditions of living of the nations and ethnic groups.

Consideration of the market economy mechanisms as a self-sufficient, not needing taking in account the economic features of non-market and quasi-market forms of economic activity in theory and practice of economic reforms in Russia (where the extensive economic periphery with a large proportion of archaic economic practices of the population and traditional social institutions takes place) slows the economic growth and increases the risks of modernization of the Russian economy, especially makes complex the choice of an adequate model of structural reforms in the economy.

In this regard, it raises the necessity to update the problems of identification and evaluation of the potential of archaic, traditional economic practices in Russia, especially the problems connected with the search of strategies and mechanisms for their inclusion in the processes of modernization, the determination of the place of this segment in the models of structural reform of the Russian economy. So, archaic economic structures on an example of a typical peripheral regions of Southern Russia were considered in this study namely as an integral part of a mixed economy of Russia, which must become an operational strategic target in structural reform policy.

2. Research framework

In the theoretical and methodological part of this study we used concepts of the archaic economy, archaic socio-economic relations, the theoretical model of a peripheral economy, including the identification of its resident, rooted sector. During the empirical verification of theoretical positions there were used methods of economic and sociological research – questionnaires, survey of experts, document analysis method and the press.

In the process of selective field study of economic subjects (which represent the segment of traditional, ethnically oriented forms of economic practices of the population of the typical peripheral region of the North Caucasus with a mixed economy – the Karachay-Cherkess Republic) there were interviewed according to the standard questionnaire 64 individual entrepreneurs, 70 heads of peasant (farmer) properties, 286 owners of personal peripheral (home) economies – 420 people in total (the sample size was 3.5%). Moreover, a survey of 7

experts was conducted – heads and professionals of specialized departments of rural district administrations of Zelenchugsk and Malokarachayevsk areas, and also state support programs for small business and "Strategies" of socio-economic development of the Karachay-Cherkess Republic (KCR), the local district press materials were systematized and investigated. Students, graduate students and teachers of Karachay-Cherkessia Branch of the Southern Federal University took part in the field study of economic and sociological positions.

3. Heterogeneity and multiformity of the russian economic space: characteristics and operating functions of economic archaic

The key problem of the Russian economy, as it is recognized by all the expert community, as well as by the economic unit of the Russian Government, is the modernization of its structure through the invention of high-quality socio-economic environment for entrepreneurship, the abatement of the state's presence level in the economy, the formation of institutions and technological platforms of innovational economy, reindustrialization, realization of import-substitution programs (Ivanter 2016, Suslov 2015, Chereshnev and Tatarkina 2015)

Furthermore, the emphasis is basically on the tasks of the widespread introduction of breakthrough technologies in manufacturing (additive technology, 3-D Printing, Internet, etc.), the accelerated development of the industry entirely on the basis of 5 - 6 technological structures (Suslov 2015)

One of the institutions that is considered to support the interests of business in this area was the development of the Agency for Technological Development with full powers and functions for the promotion of Russian innovative companies and the formation of technological chains. The transition to an innovative economy which is based on a new technological platform is definitely a key element in the restructuring strategy of the Russian economy, but the strategy itself is not limited by it.

The peculiarity of the Russian economic space, historically developed on its vast territory, is, as we know, first of all, its deep socio-economic heterogeneity, secondly, its multiformity, which reflect not only the significant differences in natural conditions, economic and geographical location (distance from cities and highways), available resources and the conditions of conducting economic activities, but also the ethnic diversity of the population, historically developed social institutions and forms of business practices' organization (ethnic groups); thirdly, the existence of a deep asymmetry in the organization of the economic space in the system of "center-periphery" in favor of the periphery of the segment with its extensive economic archaic.

According to Rosstat data, the decile coefficient of inter-regional economic differentiation across the regions of the Russian Federation entirely was 3.46 in 1995 and 3.73 in 2013.

According to the former Russian Ministry of Regional Development the volume of average per capita GDP in the subjects of the Russian Federation (at extreme points) differ in 67 times, and the average salary – by 6 times (the decile coefficient is observed in the range of 1.5 – 2 times in France, the US and Germany). According to recent data, the gap between the outer regions of the highest GDP per capita (the Tyumen Region and the Republic of Ingushetia) was 15.7 times (Bakhtizin *et al*. 2016).

Ratio of the incomes of 10% of the most extreme and least well-secured (the Gini coefficient) in 2014 was 16 times according to the official statistics, according to the expert estimates (including the hidden income), its value ranges from 25 to 40 times (Sdasyuk and Baranskiy 2016). The process of economic development of the Russian periphery has two limitations:

- the latitude and the historical unsettled economic space, which requires inclusion inputs for the development of infrastructure and the space (for example, mountain and foothill areas) in the outlays of the production;
- rising costs for energy and heat support due to the severe climatic conditions, which significantly increase the cost of energy-intensive goods. These natural and geographical limitations are an additional source of reproduction of the periphery of many Russian regions.

According to the famous geographer Nefedova (2008), 70% of the Russian territory can be regarded as outer periphery, and about 15% as the inner. The economy of the Russian periphery is represented not only by large industrial complexes, centers of high-tech industries, including manufacturing and mining production, transformation nodes and service-oriented production, but also by the vast territory with the dominance of traditional, pre-industrial economic activities and ethnically oriented forms of its social organization and institutional regulation (economic archaic), rural type of settlement of the population with its remoteness from centers of economic activity, isolation and exclusion.

More than 60% of the Russian population are occupied in the economy of the Russian periphery, and a significant part of the gross national products is produced on its territory. Moreover, it is produced more than 50%

of the gross volume of agricultural products in this segment of the economy, as well as other goods and services of mass consumption.

The operation of the principles and mechanisms of the market economy (when the concentration of business activity, capital and manufactures in limited areas makes it possible to obtain significant economic benefit and achieve large-cap resource area) makes the issue of economic periphery to become the problem of the system value within the Russian economy.

The total consecution of the market trend, as a result, leads in the Russian conditions to socio-economic heterogeneity, the reduction of social localities and depopulation of the periphery. Archaization of the economic practices of population reduces reproductive capabilities and support of the structural modernization of the Russian economy, stops economic growth and reduces the level of social solidarity in society.

Therefore, an integral part of the Russian economy's system of structural changes (the object of regional economic policy) should be a broad sector of the periphery of the Russian economy, the base of which consists of traditional, ethnically oriented form of management (economic archaic), statistically identified as private farms, households, farms, individual entrepreneurs and, in particular, small businesses.

We also should point out one more important functional feature of this segment of the Russian economy – it is a resident sector of a multiformity of economy. If the corporate sector is directly included in the global finance market system and depends on it technologically, operates in largely transnational additional cost production chain, so the economic structures of the "resident" sector are registered and skimmed in the region, they are the basis of the regional growth of wealth and well-being of the population, and the economic entities of such sector objectively become the part of the drivers from the point of view of economic and social development of the region.

The "optics" of the market allows us to identify not all the resources that are involved in the reproduction process. A large part of it operates outside the market – in the sphere of archaic, pre-market forms of exchange, satisfying the primary demands of the population for victual, products and services of common demand.

Domestic market of regions and localities substantially consists of goods of archaic and rooted sector of the economy. Therefore, the modernization strategy for "rooted" and archaic sector economies of peripheral regions should be effectually included in the concept of structural reform of the Russian economy, on an equal basis with the development of high-tech large-scale, corporate, transnational sector.

In other words, we should discuss the strategy of transition to a more complex structural economic policy, which would be able to contribute to a targeted modernization of the "second" economy - the "rooted" (archaic, ethnically oriented) sector of the peripheral economy of Russian region, as well as the strategy of transition to the creation of institutional conditions for the productive interaction of all the peripheral sectors of the economy – modern, high-tech, archaic, and historically rooted in the reproductive structure of the peripheral regions.

We should investigate, in the context of this particular methodological approach, the role and significance of rooted (resident) sector of the economy, including a large segment of archaic business practices, on the example of a typical peripheral region – the Russian Caucasus – Karachay-Cherkess Republic.

4. The traditional economic organization and the archaic structure of the economy of Karachay-Cherkess Republic: The results of socio-economic research

Operationally the resources and economic structures of private farms, peasant farms, private commercial farms, households, and private business are presented in the empirical investigation of the traditional economic organization (ethno-economics). Its extent can be characterized by the following statistics.

In 2015 in the state register of the Karachay-Cherkess Republic there were registered 95 thousand of private farms, of which almost 80% are located in rural areas, 2538 peasant farms, 10,016 individual entrepreneurs. In general, it turned out to be 107,825 people employed in the mentioned (archaic) sector of the economy, which corresponds to 48% of the economically active population of the Republic. It is quite natural that minor salable production in its mass forms agrarian and service profile of KCR economy, which illustrates the structure of gross value added (GVA).

Table 1 - Structure of gross value added (% of total)

Agriculture, hunting and fishing	18.5
Extraction of mineral resources, energy production, manufacturing, construction	32.4
Services (trade, transportation, communications, health, education, state management, and others)	47.7
Other types	1.4
TOTAL:	100.0

There was developed the certain specialization between households and peasant farms: labor-intensive products are produced mainly in households (eggs – 79.2%. milk – 72.9%. potatoes – 65.5%. cattle meat and poultry – 48.7%. vegetables – 40.5%). in farms there takes place more capital-intensive forms of agricultural products (wool – 66.4%. sunflower – 42.5%. sugar beet – 37.8% grain – 37.8%. potatoes – 19.1%. milk – 19.3%).

In the productive structure of the rooted economy sphere (ethnoeconomy) an average of 61% of the labor-intensive agricultural products and 37% of the capital-intensive agricultural products are produced. In other words in this area of the ethnoeconomy actually 50% of the resource base of the Karachay-Cherkess Republic's economy are produced and in the agricultural sector – 70.4%.

We should also add to this category of producers the enterprises, which are registered as operating in the sphere of small business – 3.7 thousand with the average payroll number of 10.2 thousand people, the volume of produced goods and services was 37.0 million rubles (Rosstat 2014).

The retailing turnover of a small business is more than 50%. This once again confirms that the basis for economic well-being of the peripheral region of the population are, firstly, the resources reproducible in the field of traditional economic practices of economic archaic (ethnoeconomy), and secondly, redistribution and realization of the production in the system of local (regional) markets demonstrates the high level of their marketability, which certainly makes this business segment of the economy partially integrated into the system of market relations.

This distinctive characteristic of the archaic economy, which demonstrates a significant role of its resources in the structures of the market economy of the peripheral region, was verified in the course of the empirical research of economic activity in the region.

According to specialized experts (*i.e.* the most appropriate natural landscape conditions and natural resources locality) economic activities in rooting sector of the economy in the territory of these areas (experts rated them as "high" and "medium" level of development) are: distant-pasture cattle-breeding; collecting activity (mushrooms, berries, herbs); bottling of water from mineral springs; construction and repair works; local tourism, maintenance of slopes; hotel service; catering in places of rest and tourism; equestrian services; transport services (carting); repair of clothes, shoes; provosion and processing of timber; trade of products made from other manufacturers.

The products of these types of economic activity of the population, according to experts, covers 80-100% of the total volume of goods and services sold on the local markets.

It turned out to be very characteristic distribution of trading places in the specialized and common markets among the different forms of entrepreneurship. 71% of trading places are occupied by individual entrepreneurs, peasant farms occupy 7% of trading places households (individuals) – 17.7% private farms – 3.1% and legal entities – 1.2% of the local market.

So, local individual entrepreneurs and individuals, who sell products produced in private farms and households of the population or who resell the goods, dominate in the local market.

Peasant (farmer) economies represented in the trading places in the local markets to a lesser extent, because the realization of this production is carried out mainly through the large network trading firms.

According to the analysis of the survey of entrepreneurs, farmers and smallholders' owners we can confirm the hypothesis of a high level of marketability of their business activities and significant scale involvement in the economic turnover of the resources. More than 60% of farmers and smallholders' owners operate in the sphere of livestock (sheep, cattle, meat, milk), 65% of individual entrepreneurs in the sphere of wool and knitwear production, and only 10% of vegetables production.

The main resources available to farmers, farms, smallholdings, individual entrepreneurs – are land and productive outbuildings. The average size of land owned by 70% of the surveyed – is up to 1 hectare (ha). At the same time, there are large-scale enterprises – 13% of peasant farms, smallholdings, which have a land area of 1 ha to 5 ha and 17% of the land resource is from 50 hectares to 250 hectares. As a rule, residential buildings have a total usable area of an average of 100 acres. Farm owners (peasant) and smallholdings highly appreciate the profitability of their business – 70% of them have profitability at the level of 20-30%, about 10% of them more than 30% and 25% of farmers evaluate the profitability of their businesses at the level of 10%.

This study showed that the trade and economic cooperation relations between enterprises of small businesses and large companies is the rather exception than the rule. Only 4% of the surveyed households have such relations with large companies, but mainly with purchasing trading companies. These large enterprises of KCR are: LLC "Mercury", of PPAR "Kavkaz Meat", JSC "Firm South-milk", LLC "FH Company Saturn", JSC "Dahanago", JSC "Visma", Ural Mining and Metallurgical Company (UMMC) "Eurocement", Agrokombinat "South", Factory for processing of wool, automobile factory "Derways".

Business survey showed that even if there are governmental programs to support small businesses in the country, including those in the agricultural sector –they are in scale and institutional support not adequate for carried out federal government structural reforms, including modernization of the archaic economy improving capitalization of their resources. The survey showed that only 5% of businesses have received funds from the regional budget for business development.

We should emphasis that the population in the mountainous regions of the Republic is not growing, but every year is decreasing. The main reason for this phenomenon is not the severe conditions of life in the highlands but the limited resources and the complexity of business activities.

Most of the inhabitants of mountain regions would find jobs through the establishment of commodity farms local businesses of productive and service profile. However, this is impossible without the initial capital and the support from the government.

According to the survey, we can deal not only with small, but also with medium-sized businesses in the highlands creating larger firms on a cooperative basis. And this requires the development of the infrastructure of mountain settlements, roads, power systems, gas and water supply. These projects in a fragmented locality mountainous periphery cannot be implemented without the support of the state and big business.

The most vital for the surveyed entrepreneurs issues, from the point of view of terms of expectations of external assistance and support were limited by the following resource and institutional constraints: acute deficiency of capital for the strengthening and development of economic and business activities; mono-producing nature of the economic environment – the predominance of the economy of one industry or agriculture; low professional culture of entrepreneurship; narrow labor skills profile of the population; limited financial support from the municipalities; inefficacy poor quality and limited sources of information for small businesses; failure to resolve a number of organizational and legal issues of land (cadastral value of land. rents. etc.); insufficient consideration of the basic norms of customary law (“adats”) of highlanders; rare use of the initial loan capital by entrepreneurs; high administrative and management costs; weak implementation of the advantages of rapid conversion of business; extremely strong dependence on local authorities and the local market; the presence of specific "shadow" sides of management.

There are institutions of small business development, traditional forms of management in Karachaevo-Cherkess Republic: Entrepreneurship Support Fund. Guarantee Fund for Entrepreneurship Support municipal funds to support entrepreneurship. as well as implementing a state support program and development of small and medium-sized enterprises in the years 2014-2017 with the volume of total funding 173,417,2 thousand. rub., including the expense of the republican budget KCR 19.500.0 thousand rub.

However, according to the survey, as well as analysis of the local press, there are serious bureaucratic barriers for inclusion in the program and reception of financial and organizational support for these structures. Therefore, the process of modernization of archaic business practices in the process of structural reforms of the peripheral economy should include a strategy for removing the institutional and resource constraints, and requires a deep structural reform throughout the state system of interaction and large businesses with structures of ethnoeconomy, which is the base segment of economy in rooted peripheral regions.

Conclusion

Therewise, the study confirmed the proposition that economic archaic (ethnoeconomy) is the systemic (not an afterthought. alien) element of the economy of Russian multiform peripheral regions and fulfills the key role in the reproduction process.

Small-commodity nature, social institutions regulating economic activities and archaic technological structure of this economy segment reflect not only its historical limitations and objective natural-economic conditions (scarcity of resources, isolation, fragmentation, lack of communication, harsh climatic conditions, landscape, etc.) to which the local population have to adapt to, creating a form of economic and social institutions, meeting these requirements. The evolution of forms of organization of production through the creation of large corporate structures is quite limited.

Economic practices of the population, as a rule, reflect the ethnic feature, have multi-specialized production and are regulated mainly by informal institutions, based on the authority and resources of the family, clan, type, neighborhood community, social communities, ethnic kinship and others.

The family labor, inherent economy, households ("court"), private farms, peasant farmers’ economy play the role of the main economic entity in this segment of the economy. As an object of strategic management of economic archaic (ethnoeconomy), firstly, appears as a certain integrity of resources, forms of economic activity regulation of social institutions and infrastructure.

Identification (operationalization) in the practice of public management of this economic sector is insufficient, incomplete, and reduces the level of control of the system in this area only as a "small business" (which is reflected in the practice of creation of "programs" for State support of small business in all regions). So, the entire sector of ethnoeconomy should become the object of control and strategy development based on a variety of forms and resources of family-labor farms that form the base of rooted sector of economy in the region. Secondly, the economic archaic is only partially regulated by market institutions and mechanisms. The main part of it is under the control of non-market and quasi-market regulation factors, that require a substantial expansion of indirect forms of state support to the population and economic activities in peripheral regions, especially the institutional (legal regulation of economic transactions in the interests of family-labor farms, organization (support for cooperative intentions of business entities), information (creation of unified information environment for access to the technologies. materials. investment), infrastructure (road development. logistics. marketing. service centers. etc.), including the expansion access of business entities of ethnoeconomy at the public procurement market, simplifying the interaction with regulatory. supervisory and law enforcement agencies.

The provided economic and sociological research fully confirmed the hypothesis that the marketability of business practices of the population of the region and the base value of reproducible resources for the economy of the Republic of Karachay-Cherkessia are at the high level.

The objective of a particular attention and importance in this case are the measures to reduce institutional deficits in the development of entrepreneurship in all sectors of multistructure economy in peripheral regions, convergence fragmented markets in the region on the basis of creating a modern transport and logistics infrastructure and the development of forms of cooperation links between producers, peasant farms with, forming a large network of business-structures.

So, the content of structural reforms in Russia conceptually cannot be restricted by more than once manifested tasks of macroeconomic proportions, the redistribution of financial flows in favor of the innovative economy sector, the decentralization of government, and the reduction of the government's share in the economy, and others.

The most important systemic part of the structural economic reforms should be the creation of institutional and infrastructural conditions for the capitalization of the resources of the vast economic sector of the archaic (ethnoeconomy) peripheral regions, based on the initiative and activity of family-labor economies which could become an additional source of economic growth in Russia.

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Re-Examination of Calendar Anomalies in the Indonesian Stock Market

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Abstract:

This study re-examines three well-known calendar anomalies of stock returns, including the effects of month-of-year, the turn-of-month, and the weekend in the Indonesian stock market during the period 2001 to 2014. The multiple regression analysis with dummy variables is employed to empirically re-examine differences of the stock returns in each calendar anomalies period. Out of the three calendar effects re-examined, the study only found the existence of two calendar effects, i.e., the turn-of-month and the weekend effects.

Two major findings are documented. Firstly, the returns were abnormally high on the last trading days of the month and on the first four-trading day of the subsequent month, respectively. Secondly, the returns were abnormally high on the Friday, but it was abnormally low on the Monday. The existence of these anomalies has imperative implications for the hypothesis of efficient market and the investors' trading behavior. These findings shed some lights for the investors in determining the right timing for investing their monies as well as for gaining abnormal returns.

Keywords: stock market, calendar anomalies, abnormal returns, market efficiency, Indonesia.

JEL Classification: C32, C53, G39.

1. Introduction

Calendar anomalies are anomalies in stock return that related to calendar, known as phenomena founded in financial market; particularly in stock market. According to Brooks (2004), calendar anomalies could be loosely defined as the tendency of financial asset returns to portray systematic fashions at certain times of day, week, month or year. Several previous studies have been encountered an existences of calendar anomalies in many stock markets globally. These anomalies are of particular interest due to their presence contravenes the market weak-form efficient hypothesis, because asset prices are not random, but those asset prices predictable based on some calendar effects.

There are various types of calendar anomalies documented by previous researches. Returns are systematically lower or higher depending on the time of the day, the week day, the week of the month and the MoY (Elton and Gruber 1995). In certain months of the year, the stock returns are found to be highly abnormal as a result of month-of-year (MoY) effect, namely January, and in some trading days within a month as a result of the turn-of-month ToM effect. Lastly, in certain specific days of week, the stock returns are found to be highly abnormal as a result of the day-of-week (DoW) effect, namely Friday.

The studies on calendar anomalies have been intensively emphasized on the developed stock markets such as in the stock markets of the US (Gibbons and Hess 1981), Japan (Kato and Schalheim 1985), Canada (Tinic *et al.* 1987), Greece (Floros 2008), and Russia (Compton *et al*. 2013). Similar studies have also conducted on the emerging markets such as in Nigeria and Zimbabwe (Ayadi *et al.* 1998), Ghana (Ayadi *et al*. 1998), Jordan (Maghayereh 2003), eastern Europe (Ajayi *et al.* 2004), China (Gao and Kling 2005), Thailand (Chan *et al*. 1996; and Tangjitprom 2011), India (Raj and Kumari 2006), Bangladesh (Bepari and Mollik 2009; and Rahman and Amin 2011); Malaysia (Muhammad and Rahman 2010), and Pakistan (Khan *et al.* 2014). In addition, there have been some previous studies conducted across seven developed stock markets, comprising Australia, Japan, Canada, the UK, Japan, French and Singapore (Condoyanni *et al.* 1987) and across four Asian stock market, consisting of Malaysia, India, Singapore and Thailand (Chan *et al.* 1996).

Meanwhile, the studies on the Indonesian stock market have been limited comparing to the vast growing of the market in the region. Studies on the calendar anomalies on the Indonesian stock markets have been conducted by Kamaludin (2004), Cahyaningdyah (2005), Sumiyana (2008), and Iskamto (2015). These studies empirically investigated the DoW effect for the period 1993-2003 (Kamaluddin 2004), the week-four effect and the January effect for the period 2001-2003 (Cahyaningdyah 2005), the DoW and Monday effect for the period from January to December 2006 (Sumiyana 2008), and the weekly and monthly effects for the period 2010-2014

(Iskamto 2015), respectively. These studies documented mixed evidences, some found the existences of the calendar anomalies and some other found the otherwise.

Unlike the previous studies on the calendar anomalies in Indonesia stock market, which only investigated several calendar anomalies and focused on shorter period of the study, this present study re-examined more comprehensive types of calendar anomalies and utilized a longer period of study. Specifically, this study has several advantages compared to the earlier studies on this issue in the Indonesian stock market. Firstly, this study tested three kinds of calendar anomalies, namely the MoY effect, the ToM effect, the weekend effect and the January effect. Secondly, this study utilized longer study period from 2001-2014 (15 years), comprising 3,369 observations. To the best of our knowledge, this study is among the first studies to re-examine the calendar anomalies in Indonesia by adopting the longest study period.

By using the daily stock returns and applying the parametric statistics by multiple regression analysis, the findings of this study are hoped to shed some lights for investors to design trading strategies to gain abnormal return on the basis of such anomalies.

The rest of the study is organized in the following sequences: the next section highlights the previous studies on the calendar anomalies both in the advanced and emerging markets. The research method and data, on which the analysis is conducted, are presented in the Section 3. Section 4 discusses the findings and implications of the paper. Finally, Section 5 concludes the paper.

2. Literature review

MoY effect occurs when returns on common stock market is different across the MoY. This is the condition while abnormally high monthly return existed in the stock market, particularly in January. This effect is known as the January effect or ToY effect. Previous studies done on the stock market of the US have found that there were positive returns of the common stocks occurred in January, while the significant negative returns to common stocks existed in December (Rozeff and Kinney 1976). Haugen and Jorion (1996) affirmed that the January effect in the US stock market would last for 30 years ahead. Thus, the January effect is of common phenomenon in the largest stock market in the world. Nevertheless, the phenomenon is not only found in the US, but also around the globe. Many previous empirical studies documented the existences of calendar anomalies across the world's stock markets, both in the advanced and emerging stock markets, such as in Japan (Kato and Schalheim 1985), Canada (Tinic *et al.* 1987), Malaysia and Singapore (Chan *et al.* 1996), Ghana (Ayadi *et al*. 1998), Indonesia (Kamaludin 2004, Cahyaningdyah 2005, and Sumiyana 2008), China (Gao and Kling 2005) and Malaysia (Muhammad and Rahman 2010).

Unlike the above-reviewed studies that documented the existences of the calendar anomalies, the following study found no calendar anomalies in their stock market. For instance, there were some countries where the January effect were not indicated; such as Thailand (Chan *et al*. 1996), Nigeria and Zimbabwe (Ayadi *et al.* 1998), Jordan (Maghayereh 2003), India (Raj and Kumari 2006), Bangladesh (Bepari and Mollik 2009), Greece (Floros 2008), and Indonesia (Iskamto 2015).

Claessens *et al*. (1995) investigated the seasonal effects for several emerging stock markets and recorded that there were only several stock markets evidenced for January effect, such as in the Korean, Mexican and Turkish stock markets. Nevertheless, numerous stock markets in other countries shown the abnormal returns months other than January (for instance, April in Brazil, October in Chile and Argentina, and December in Thailand and Pakistan, etc).

There were numerous studies conducted, clarified these calendar anomalies and offered several logical hypotheses. One of the well-known hypotheses was tax-loss selling, which stated that the loss in December to reap benefits of tax within the year has been realized by investors (Branch 1977, Tangjitprom 2011). This, in turn, could produce the selling stress for the stocks and cause their returns declining in December and would reverse back in January, thus producing abnormal returns in January. In their study, Givoly and Ovalia (1983) confirmed that the main explanation for the abnormal returns in January for stock market of the US was tax selling hypothesis. Additionally, Reinganum and Shapiro (1987 discovered a strong relationship between tax effect and January effect in the UK stock market because of the absence of January effect in the year of 1965, when the capital gain of the taxes was charged.

Furthermore, another proposed justification for the January effect is the window dressing hypothesis, which explains that institutional investors would attempt to avoid loss of stock prior to the end of every quarter, particularly during the end quarter of the year to show good performance of their portfolio investment (Lakonishok *et al.* 1991, Tangjitprom 2011). Ng and Wang (2004) further supported the hypothesis that institutional investors

would sell the loss of stock within the last each quarter and purchase again in the following quarter that caused January effect or the ToY effect.

The ToM effect or the monthly effect arises when the stock return indicates differences in returns within some periods in a certain month. Returns have a tendency to be higher surrounding the ToM compared to the other days. One of the elucidations for this anomaly is the risk-based hypothesis, where the risks might differ throughout the months and be higher during the ToM period. According to Ogden (1990), the liquidity hypothesis could explain this phenomenon if dividends, interest, and salaries that are accumulated generally at the end of the month leads to rise the purchasing pressure during the period. Another reason is probably because of some flows of informational form, for example, announcement of positive earnings might cluster around the commencement of the month.

In similar vein, Ariel (1987) found that stock return would be on the average positive at the beginning or at first half of the month, whereas the returns for the rest period of the month tended to be zero. Ariel (1987) also revealed that these differences were not caused by the outlier data, yet it was due to the minor shift in the distribution mean. Thus, the effect in last trading day of the following month was very great, known as the turn-of month period. Furthermore, Boudreaux (1995) examined the monthly effect among the leading world's stock markets and documented that many European stock markets showed greater return at the commencement of the month as opposed to the remaining months. The stock returns of Norway, Denmark, and Germany rose significantly within the commencement of the month. On the contrary, the stock returns of French, Spain, and Switzerland showed to have non-existence of monthly effect. Amusingly, unlike those European stock markets, the stock markets of Singapore and Malaysia recorded that their returns within the commencement of the month were slightly significant than the remaining months.

With regard to the DoW effect, it happens once the stock return show the dissimilar return within certain days in a week. The majority of the earlier studies on the DoW effect found lower returns on Monday (often negative) and positive returns on Friday, *i.e.,* weeks inclined to open weak and end strong. French (1980) highlighted this as the weekend effect, where the returns on Friday were documented to be positive, while the returns on Monday were abnormal and negative. Furthermore, he asserted that this effect derived from the reality that firm normally would release bad news on the weekend to get rid of panic stock selling.

Some other explanations proposed for these calendar effects are the pattern of information flows, which is related to macroeconomic forces or firm specific determinants. Firms, for example, might release bad or "shocking" news more often on Friday, after the session closed to permit assimilation of information by investors or there could be a fashion in the release of financial analysts' recommendations for purchasing and selling stocks (Damodaran 1989, Steeley 2001). According to Damodaran (1989), announcement of news on Friday worsened the returns than during the weekdays. Generally, the favorable news published after the closing day of the market, and in turn, the effect transmitted over to the following Monday. In addition, De Bondt and Thaler (1987) studied the overreactions biases and showed that the loser stock would create greater return as compared to the winner stock in the following period. They asserted that this might be partly due to the January effect. The reversal of loser's return is a result from tax-loss selling, which investors intended to release the loser's stock to gain the profit from taxes, yet the reversal of winner accumulated higher returns from the capital gain tax lock-in effect in which the investors delayed to reap capital gain from taxes by getting rid of selling winners within year ended. In their earlier study, De Bondt and Thaler (1985) explored the investor overreaction and found that there was a predictable price reversal for long-term winner and loser stocks.

Finally, the studies on calendar anomalies on the Indonesian stock market have found mixed empirical evidences. For examples, Kamaludin (2004) found the DoW effect during the 1993 to 2003 period, and found that the lowest and highest returns existed on Monday and Friday, respectively. Cahyaningdyah (2005) and Sumiyana (2008) found evidence of day of the week effect on Monday (Monday effect) and the highest return on Friday (weekend effect). On the other hand, Iskamto (2015) failed to find the existence of weekly and monthly seasonality in the Indonesian stock market.

Referring to the above literature review, majority of the earlier researches on calendar anomalies have emphasized on the advanced stock markets, and limited researches have investigated the emerging markets, especially on the Indonesian stock market. Previous studies on the calendar anomalies in the Indonesian stock market have only investigated several calendar anomalies and focused on shorter period of the study, and none of them investigated more comprehensive types of calendar anomalies and utilized a longer period of study. Thus, this study tries to fill the existing gap in the literatures by empirically exploring three kinds of calendar anomalies, namely the MoY effect, the ToM effect, the weekend effect and the January effect, and utilizing longer

study period from 2001-2014 (15 years), comprising 3,369 observations. To the best of our knowledge, this presence study is among the first attempts to re-examine more comprehensive types of calendar anomalies in Indonesia, which adopting the longest study period.

3. Data and empirical framework

This study utilizes data from the Indonesian stock market, which is the Jakarta Stock Price Index or Jakarta Composite Index (JCI). This index is an index of market value-weighted stock calculated of every trading stock in stock market. The historical daily data from the period 2001 to 2014, comprising 3,369 observations were empirically analyzed. These data are gathered from the website of Indonesian Stock Exchange (www.idx.co.id)
In this study, the stock returns are measured by the log-difference of the stock indices, following the study by Tangjitprom (2011):

$$R_t = \ln \frac{P_t}{P_{t-1}} \quad (1)$$

where R_t is the continuous compounded returns of day t, P_t is the index of day t.

Yet, before the three well-known calendar anomalies of stock return; the MoY effect, the ToM effect, and the weekend effect were tested, unit root test based on the Augmented Dickey-Fuller (ADF) analysis were conducted earlier in order to ensure that the stock return in the stationary condition. Because using non-stationary or unit roots data in time-series regression analysis would produce the spurious result (Granger and Newbold 1974), thus the data to be analyzed need to be in the stationary form. The next step is to conduct the classical assumption test to ensure that the Ordinary Least Square (OLS) regression model is BLUE (Best Linear Unbiased Estimator). These classical assumption tests include the tests of normality, multicollinearity, heteroscedasticity, and autocorrelation (Gujarati and Porter 2009). A non-parametric test of Kolmogorov-Smirnov (K-S) is used to test the normality. If the value of Kolmogorov-Smirnov test is greater than the selected significant level, then the data is found to be normally distributed (Gujarati and Porter 2009). As for the multicollinearity test, the Tolerance Value (TV) and Variance Inflation Factor (VIF) are used. If the TV is greater than 0.1 or the VIF is smaller than 10, thus the data are free from the multicollinearity problem. The Durbin-Watson (D-W) test is adopted to check for the autocorrelation, where if the D-W value is around 2, then the data is said to be free from the autocorrelation problem. Finally, the Glejser test is used to examine for the heteroscedasticity of the data.

Firstly, the study then explores the MoY effect with the following formula, suggested by Tangjitprom (2011):

$$R_t = \sum_{i=1}^{12} \beta_i D_{it} + \varepsilon_t \quad (2)$$

where R_t is defined as daily return of day t, D_1 to D_{12} is defined as dummy variable; representing for January to December as monthly data; and ε_t is the error term. In sequence, to study each specific monthly effect, the monthly dummy variable of the month would be eliminated from the model.

Following Gultekin and Gultekin (1983), thus, the model (3.2) could be rewritten as below:

$$R_t = \sum_{i=2}^{12} \beta_i D_{it} + \varepsilon_t \quad (3)$$

where β_0 is defined as the returns of dropped month from the model, it is also known as the basic month. β_1 is represented as a distinction return for each month, described by dummy variable and basic month.

Therefore, the hypothesis testing could be tested in order to examine whether the estimated coefficient β_1 is different from zero.

Secondly, the ToM period which would be examined in this study was based on five days around the turn-of-month, included the last trading day of the month and the first four-trading day in the next months. In so doing, the regression model proposed by Tangjitprom (2011) was adopted in this study the existence of the ToM period, as follows:

$$R_t = \beta_0 + \beta_1 D_{TOM,t} + \varepsilon_t \quad (4)$$

where D_{TOM} is defined as dummy variable of turn-of month period; β_0 is defined as the non-ToM return; and β_1 is defined as the distinct return between the turn-of month period and non-ToM period.

The following hypothesis testing could be tested in order to examine whether the estimated coefficient, β_1 is different from zero. Next, the DoW effect would be examined by the model, as follows:

$$R_t = \sum_{i=1}^{5} \beta_i D_{it} + \varepsilon_t \quad (5)$$

where D_1 to D_5 is called as dummy variables represented Monday to Friday. In sequence, to study each specific weekly effect, the daily dummy variable of that day would be eliminated from the model.

Based on Agrawal and Tandon (1994), the model (3.5) could be rewritten as follows:

$$R_t = \beta_0 + \sum_{i=2}^{5} \beta_i D_{it} + \varepsilon_t \quad (6)$$

where β_0 is defined as daily return dropped out from the model, known as basis day β_1 is defined as the distinct return between the days, indicated by dummy variable and basis day.

The hypothesis testing could be tested in order to examine whether the estimated coefficient β_1 is different from zero.

4. Empirical results and discussion

The ADF test is a test to examine whether return series of stock has a unit root. Table 1 showed the null hypothesis that reads, the stock return series (JCI) has a rejected unit root. It indicates that stock return series is stationary, and thus this data could be used for further regression test.

Table 1 – The results of augmented Dickey-Fuller Unit Root test

MODEL	Augmented Dickey-Fuller (ADF) test statistic (R_t)
No Intercept and Trend	-51.899***
With Intercept, Only	-52.017***
Both intercept and trend	-52.013***

Notes: *** indicates significance at 1% level.

In the next step, the classical assumptions underlying the OLS method was examined to ensure that regression model used in the study is BLUE (Best Linear Unbiased Estimator). The study found that all the classical assumption tests provided the findings that the data analyzed in this study were normally distributed, non-multicollinearity, non-autocorrelation and homoscedastic. [1] These indicated that all the classical assumptions were fulfilled in the study, thus the data could be utilized for further analysis in the paper.

Having ensured that the stock returns were stationary and met all the classical assumptions for the OLS regression, in the following sections, the study provided the empirical findings on the three well-known calendar anomalies of stock return, *i.e.*, (i) the MoY effect; (ii) the ToM effect; and (iii) the weekend effect.

4.1. Findings from the MoY Effect

Table 2 reported the MoY effect of the Indonesian stock markets during the period 2001 to 2014. Based on Table 2, the study found that the returns were high in January and December, and the highest returns were recorded in December. These evidences were supported by the previous research by Tangjitprom (2001) in Thailand. Specifically, the findings of this study demonstrated that the daily returns in December were 0.245%. This was approximately 6 times higher than usually of daily returns of 0.042%.

[1] Due to space limitation, the findings of classical assumption tests were not reported here. However, the findings are available with author upon request.

Table 2 - Average daily returns, 2001-2014 (in %)

Return	Month (Period: 2001-2014)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily Return	0.054	0.081	0.055	0.182	0.066	0.044	0.172	- 0.550	0.078	0.005	0.080	0.245
Average	0.042											

Since the returns in December were significantly greater than the rest of months, thus the study provided the results from both the January effect and the December effect in Table 3. The results from Table 3 portrayed that the differences in returns between each month and returns on December was not all statistically significant. However, the December's return was statistically significant. Therefore, during the month of December, the returns were recorded to be abnormally greater than the rest of months.

Table 3 – The results of abnormal return test in December, 2001-2014 (in %)

Return	Constant	Month (Period: 2001-2014)										
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Return Difference from Dec	0.235	-0.161	-0.166	-0.139	-0.008	-0.170	-0.188	-0.075	-0.394	-0.162	-0.297	-0.169
t-statistics	2.665***	-1.315	-1.331	-1.139	-.068	-1.388	-1.546	-0.622	-3.160***	-1.323	-2.450**	-1.374

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

Subsequently, the test of January effect was provided in Table 4. From Table 4, we found that the returns in January were relatively greater, but these month's returns were not the highest returns than the rest of months. Besides, the returns in January were also found to be statistically insignificant. Therefore, the January effect cannot be confirmed to be existed in the Indonesian stock market.

Table 4 – The Results of January Effect Test

Return (%)	Constant	Month (Period: 2001-2014)										
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Return Difference from Jan	0.075	-0.005	0.022	0.152	-0.009	-0.028	0.085	-0.233	-0.002	-0.137	-0.008	0.161
t-statistics	0.883	-0.040	0.180	1.271	-0.078	-0.232	0.719	-1,911*	-0.014	-1.152	-0.071	1.315

Notes: * indicates significance at the 10% level.

Next, it is interesting to further verify the patterns of stock returns in the JCI during the turn-of-year effect, which was in December as the last trading week (after December 24) and in January as the first trading week (prior to 9), as suggested by Tangjitprom (2001). This is done purposely to investigate whether the above highest abnormal returns documented in December and the relatively higher returns documented in January was due to the turn-of-year effect. The findings of this tests were provided in Table 5.

Table 5 - The Results of ToY Effect Test (December, January, and for the Entire ToY Period)

Period	Return Difference from non-ToY Period (%)	t-statistics
	The ToY Effect period in December and January	
Constant	0.067	2.673***
December 25-30	0.103	0.579
January 2-8	0.491	2.123**
The Whole ToY Period		
Constant	0.068	2.710***
Turn-of-year	0.192	1.421

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

Table 5 showed that the average daily returns during the 24th – 30th December was 0.103%, and the average return during the 2nd – 8th January was 0.491%, which was higher than the average daily returns for other months. Overall, the whole turn-of-year period of daily returns of 0.191% was recorded, which was higher than the common daily returns in any other months. However, the whole turn-of-year period was found to be statistically insignificance. These findings implied that the highest returns in December and the relatively higher

returns in January were not resulted by the turn-of-year effect, although the returns during 25th December 25 to 8th January were abnormally high.

4.2. Findings from the Turn-of Month Effect

Table 6 showed the findings from the ToM effect. From Table 6, we found that he returns during the ToM period was 0.00104% and the returns of the non ToM period were 0.00049%. Within the ToM period, the returns were statistically significant higher than the returns of non-of-month period. The existence of the ToM effect supports the alternative hypothesis that the existence of calendar anomalies was confirmed in the Indonesian stock market.

Table 6 – The Results of ToM Effect Test

Period	Return Difference from non-ToM Period (%)	t-statistics
Constant	0.00049	1.726*
Turn-of-month	0.00104	1.817*

Notes: * indicates significance at the 1% level.

4.3. Findings from the DoW Effect

Finally, the study examined the weekend effect with the aim at probing whether the returns on Friday and Monday were different from the other weekdays. The Monday returns were tested to determine whether these returns were negative and lower than the returns of any other days of the week. The results of this test were reported in Table 7. Based on Table 7, the study recorded that the average Monday returns was -0.069, and this return was found to be lower than returns of any other weekdays. The average Friday returns was 0.174 and this return was statistically significant higher than returns of any other weekdays. These returns' pattern was consistent with the previous findings that the average return on Friday was abnormally high, while the average return on Monday was abnormally low. These findings implied that the weekend effect was existed the stock market of Indonesia. Therefore, these findings supported the alternative hypothesis that the existence of calendar anomalies is confirmed in Indonesia.

Table 7 - The Results of Abnormally High Return Test on Monday, and Friday

Month	Abnormally High Return on Monday		Abnormally High Return on Friday	
	Return Difference from Monday (%)	t-statistics	Return Difference from Friday (%)	t-statistics
Constant	-0.069	-1.395	0.174	3.327***
Monday	-	-	-0.236	-4.300***
Tuesday	0.120	1.803*	-0.090	-1.313
Wednesday	0.267	3.678***	0.028	0.008
Thursday	0.128	1.741*	-0.113	-0.031
Friday	0.190	2.851***	-	-
Observations	3,393		3,393	

Notes: *, **, and *** represent significant levels at the 10%, 5%, and 1%, respectively.

Conclusions

The purpose of the study is to re-examine the presence of calendar anomalies in stock market of Indonesia during the period 2001 to 2014. The study empirically explored the existences of the three well-known calendar anomalies, *i.e.,* the MoY effect or the January effect, the ToM effect, and the DoW effect. Empirical evidences showed that the ToY effect was inexistence in the stock market of Indonesia, even though the average abnormal return during December and January were relatively higher as compared to any other months. Then, the ToM effect was documented to exist in Indonesia, implying that the abnormal returns in the stock market of Indonesia was concentrated on some days within the last trading day, also on few trading days at the beginning of the next month. Finally, the study found that the weekend effect was also existed in the Indonesian stock market, denoting that the returns on Friday were abnormally high, while the returns on Monday were abnormally low.

In a nutshell, the study concluded that the calendar anomalies have existed in the Indonesian stock market during the period 2001 to 2014. These findings shed some lights for the investor in the Indonesian market to grasp the opportunity to make profit due to the existences of calendar anomalies in the market. However, the

investor should also consider the transaction cost, if they want to exploit the opportunities of the weekend effect and the ToM effect. This could be very helpful to decide the investment timing for the investors. Thus, this allows the investors to develop the proper trading strategies to gain those abnormal profits on the basis of such anomalies.

The findings of the study are based on the methodology outlined above. For more reliable and robust findings, further studies should cover broader stock market worldwide with a comparative treatment. It is also suggested for further researches to investigate the existence of calendar anomalies across industrial sectors of the stock market, including the recent emerging of the Islamic stock markets. Additionally, further researches should utilize longer period of the study so that the finding could be generalized for different stock markets with similar characteristics.

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The Role of Human Capital in Providing Innovation Security of the Region

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Abstract:

Innovation security is one of the most important imperatives of sustainable development of the region in the long term. The primary task of providing innovation security in the region is to build and maintain its human capital, which is an embodiment of knowledge, competencies and motivations, concentrated in a particular area that are inseparable from their possessors. Article considers the major vital interests and threats to the region in the context of the development of its human resources component of the regional innovation system. The catalyst and inhibitor factors of building the capacity of the regional innovation system, affecting the overall competitiveness of the region are highlighted. The development of human resources component of the regional innovation system of the westernmost subject of the Russian Federation, an exclave on the Baltic Sea – the Kaliningrad region, is evaluated in the logic of innovation security approach. The role of human capital in the provision of innovation security of Kaliningrad region is shown.

Keywords: innovation security, human capital, regional innovation system, kaliningrad region.

JEL Classification: D83, D85, F52, O33.

1. Introduction

Displacement of the researchers' interest from studying the economic-geographical position of the region towards its properties as a source of competitive advantage has occurred against the background of the empirical registration of a number of demographical phenomena conceptualized as 'edge cities' (Garreau 1991), 'cities – states' (Peirce 1993), 'mega-regions' (Florida 2008) and others, and the development of spatial (formerly social, human) capital theories (Becker 1964, Shultz 1971, Hall 1999, Ferragina 2013, Camagni and Capello 2013). From this perspective, the capital of the region is considered as a set of local assets (natural, human, organizational, cognitive, network) that make up its competitive potential. The idea of territorial cohesion made the central point of the new approach to regional development, which is the territorial dimension of sustainability and provides a basis for the collective development of the region in three areas: territorial efficiency, territorial quality, territorial identity (Torre and Wallet 2014). In each of the areas a significant attention is paid to man, as a source of competitive advantages of the territory (the carrier of knowledge, a part of the social capital, etc.), as a subject, that sets a vector of development of the territory, as the user of the infrastructure in a particular area. It should be noted that the dependence of the geography and social development factor has been noticed by the French sociologist of the XIX century Frederic Le Play, who wrote that the place determines the conditions of labour, and labour, in turn, determines the organization of the family and society as a whole (Le Play 1879).

The study of the social component of the region in its representation as a territorial socio-economic structure led to the formation of a special scientific approach to the competitiveness of the region, allowing to take into account the impact of social, cultural, cognitive proximities on the course of regional development processes (Mikhaylov 2016). From this perspective, the strategic competitive advantages of the region lie in tacit knowledge, which cannot be partially or completely alienated from its creator, codified and systematized. This knowledge is expressed in skills, abilities, experience, skilled personnel, technical practices, formalized norms of behaviour, culture, etc. The knowledge classification suggests that there is a pure tacit knowledge that cannot be codified, articulated or explicated, and the tacit explicit knowledge, which at the moment is implicit, but can be explicated in the future (Brokel and Binder 2007). The primary feature of tacit knowledge is its causal ambiguity generated by the inability of formal expression. The dual nature of this kind of knowledge is characterized by implicitness (i.e. tacitness), complexity, stability, integrity of transmission (Szulanski 1996). The diffusion of tacit knowledge reveals another special feature of its type – 'stickiness', characterized by increased complexity of its transmission. Sharing accumulated tacit knowledge between actors in the region is undertaken through collective learning process, visualized by David Kolb as a learning loop (Kolb 1976). Efficiency of learning depends on many factors: the difference in the technological processes of regional firms (knowledge base, agility in technological change, the nature of technologies), dependence on external sources of knowledge or information, such as other firms, suppliers and others, various depths in the level of technological development (Lall 2001). However, the primary role is played by the human capital that is accumulated in the region, which can be defined as a totality of innate abilities and acquired knowledge, skills and motivations localized on the common territory (Becker 1964).

2. Innovation security approach to the assessment of the human capital of the region

Innovation security approach to the assessment of the region's development and its individual sub-systems is relatively new. Initially only the scientific and technical security of the region was considered (Tatarkin *et al*. 2000, Naboichenko *et al*. 2003). Later, the innovation security gained an individual attention, however, it continued to be considered as part of other kinds of security, primarily, the economic (Bagaryakov 2012, Bagaryakov and Nikulina 2012, Bagaryakov *et al*. 2014). Current article proposes a broad approach to innovation security as an independent type of national security that considers the effects of the entire complex of relations and sub-systems of the regional system. The essence of the approach is that in order to ensure long-term sustainable development and maintain the region's competitiveness based on innovation it is necessary to build an effective system of innovation security. Great importance is the social sphere (Kuklin *et al.* 2013). Of particular relevance are the issues of regional innovation security in the context of globalization (Sapir 2007, Afonasova and Bogomolova 2013). Providing innovation security is directly related to the effectiveness of innovation policy implemented by the public authorities at different hierarchical levels (Barchuk and Maslennikova 2013, Kormishkin and Sausheva 2013, Golova 2014, Mikhaylova and Mikhaylov 2015b). Special attention deserves the applied research on innovation security of the regions of Russia (Burmistrova 2011, Sukhovey 2014, Kuznetsova 2015, Mikhaylova and Mikhaylov 2015a) and the methodology of its estimation (Kulagin 2012).

There can be distinguished two types of innovation security – external and internal. For internal innovation security the following three levels of implementation are defined: the federal, regional and municipal. In line with the system approach, the innovation security is a system that is both a reflection of the state of the regional innovation system (RIS), its characteristics and the environment in which it operates. Providing innovation security at the regional level affects all subsystems of the RIS. The region can act both as a space and / or the object of the federal innovation policy, and be engaged in ensuring its innovation security, defending its regional interests at all levels of development and implementation of innovation policy. In addition, due to the differences of the interests of individual regions both within the country and abroad, the region can be a source of threats to the innovation security of other regions.

The role of human capital providing innovation security of the region can be assessed through a comprehensive analysis of the human resources (HR) component of the RIS, including an assessment of its potential, the vital interests and security risks, the competitiveness factors. There are three components considered as part of the HR component of the RIS: research, business, education. The major interests of the HR security component of the RIS include: the adequacy of labour resources of certain specializations that correspond to the long-term development strategy and structural features of the region's economy; the attractiveness of the region for the high-class specialists in those areas of innovation, which are important for the economy of the region and are the areas of its expertise; high level of education among the population and its involvement in the process of continuing education; effective regional system of education that meets the strategic and operational challenges facing the region; preservation of regional identity in the background of promoting cultural diversity.

The main threats to the innovation security of the HR component of the RIS assigned (Mikhaylova and Mikhaylov 2015b): the influx of manpower, whose competence, education, specialization does not correspond to the specialization and the innovative profile of the region's economy; systematic outflow of young qualified specialists; low level of education in the region, lack of access to educational services; inefficient system of education and training for the region; low innovation culture; closed society, the lack of desire for cooperation and exchange of experiences and knowledge; cultural, ideological disunity and differences in mentality, traditions, leading to the destabilization of the social situation in the region.

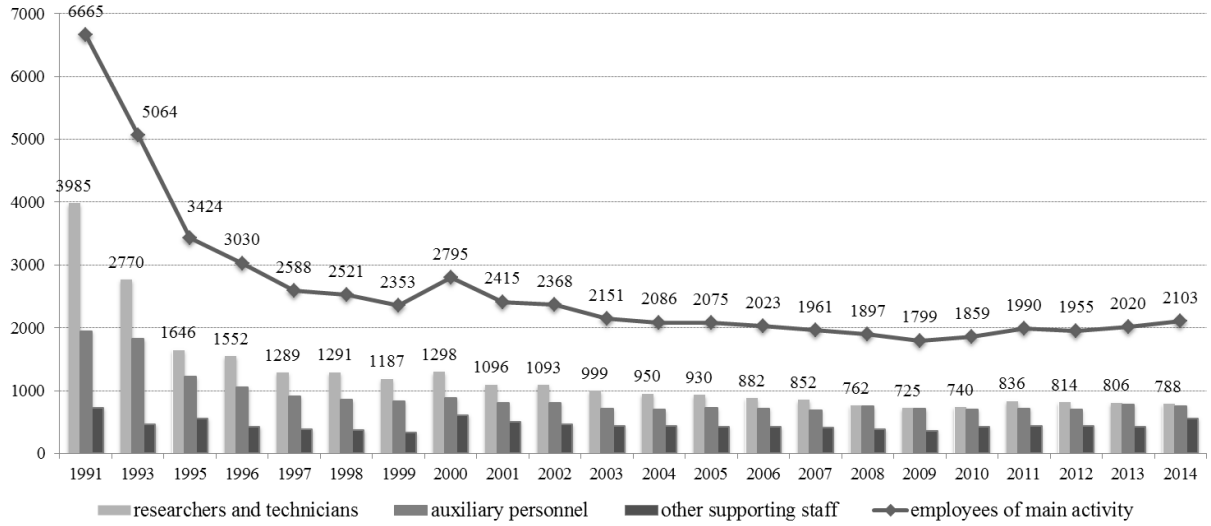
Among the factors of competitiveness that have a positive influence on the formation and development of the HR component of the innovation system of the region are identified: a relatively high average per capita income of the population; an innovative culture formed; growing economy demand for qualified specialists of corresponding and related specialties; favourable social climate; developed health and education systems; favourable ecological conditions; the absence of regional military-political conflicts; active state incentive programs to retain young talents in the region; implementation of social innovation in the region, enhancing the quality of life.

Negative factors include: the relatively low average per capita income of the population; low productivity; the widespread use of low-skilled labour; the influx of cheap labour; lack of innovation culture, the prevalence of traditional approaches and solutions; the economic downturn; social, cultural, religious tensions; poor quality of medical and educational services; severe environmental conditions; military tension in the region.

3. Evaluation of the Human Resource component of the regional innovation system of the Kaliningrad region

3.1 Research component

The importance to the knowledge-based economy represents the quantity and quality of human resources in the research sector. From 1991 to 2014 the population dynamics of the scientific staff of the Kaliningrad region was negative (Figure 1).



Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region, 2009-2015.

Figure 1 - The dynamics of HR potential of research sector of the Kaliningrad region, pers.

In 24 years the number of personnel engaged in research and development (R&D) decreased by 68.5% to 2103 people. Especially strong reduction was in the number of researchers and technicians directly involved in the process of creating new products, methods and systems – by 80.2% up to 788 people. Note that this is slightly above the level of the year 1966, when there was a process of active recovery of the research scope of the Kaliningrad region in the post-war period. While in 1958 the region's scientific organisations employed 127 people, by 1966 this number reached to 617. Another 482 research fellows conducted research at educational institutions of the region (Kaliningradstat 1968).

Along with researchers, in 1991 – 2014 decreased the number of auxiliary personnel and other supporting staff – by 61.2% and 23.4% to 756 and 559 people respectively. The consequence of the development of the negative trends in the region in the post-Soviet period was unbalanced structure of scientific staff: by 2014 the number of researchers and support staff nearly matched, that on the background of a significant proportion of researchers being over 40 years, leads to a significant reduction in HR potential of RIS with the inevitable loss of competitiveness in the long term.

A five-fold reduction in the number of researchers and technicians has led to a change in their structure by educational level (Fig. 2). In the period from 1991 to 2014, sharply decreased the proportion of employees with secondary vocational education – from 23 to 3% (from 907 to 23 people), which is structurally reflected in the increase in the general level of education of research staff. However, from the perspective of the inventive competences this factor can be seen as a negative phenomenon, since it means a loss of a large part of applied, mainly technical experts, with the potential to generate incremental innovations, potentially demanded by the economy of the region.

Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region. 2009-2015.

Figure 2 - The structure of research personnel (researchers and technicians) of Kaliningrad region by level of education, %

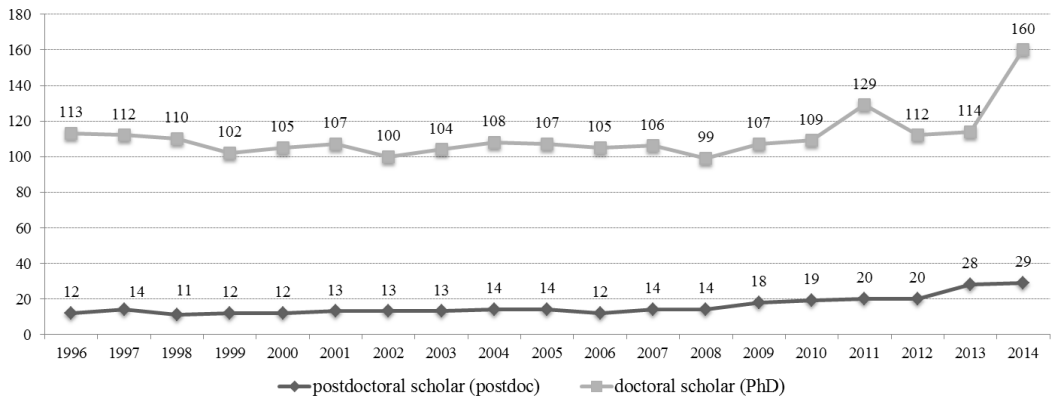
Results of the analysis of the dynamics and structure of the research personnel in the region by the field of science demonstrate the reduction in the number of researchers engaged in technical and agricultural studies (Table. 1).

Table 1 - Dynamics of the number of researchers of the Kaliningrad region by field of science

Indicator	2007	2008	2010	2011	2012	2013	2014	Growth rate 2014 to 2007, %
Number of researchers and technicians	720	629	624	670	673	675	680	-6
by field of science:								
Natural	305	280	303	306	298	333	337	10
Technical	384	318	291	305	313	283	277	-28
Medical	0	0	2	15	9	6	1	
Agricultural	23	23	17	15	18	16	11	-52
Social	4	3	8	17	19	35	50	13 times
Humanitarian	4	5	3	12	16	2	4	0

Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region. 2009-2015.

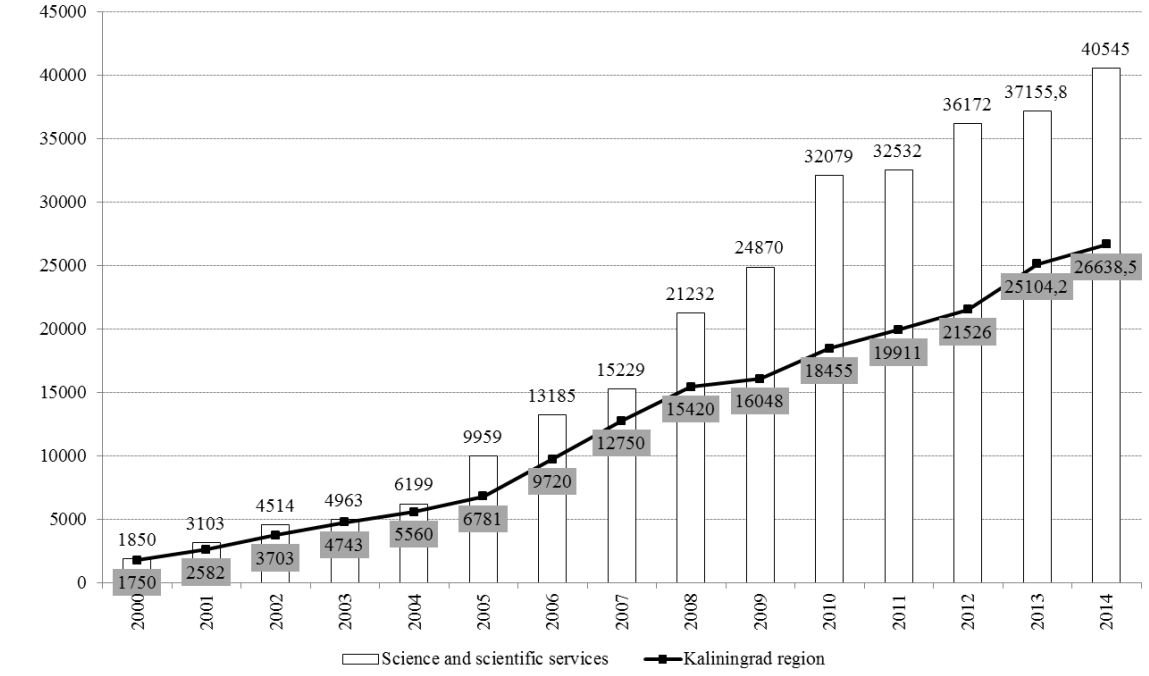
In the past few years (2013 – 2014) there was an increase in the number of researchers in the natural and social sciences. In the same period there was a general increase in the number of personnel with PhD performing research and development (Figure 3). One of the factors is the policy aimed at promoting the influx of scientific personnel from other regions.



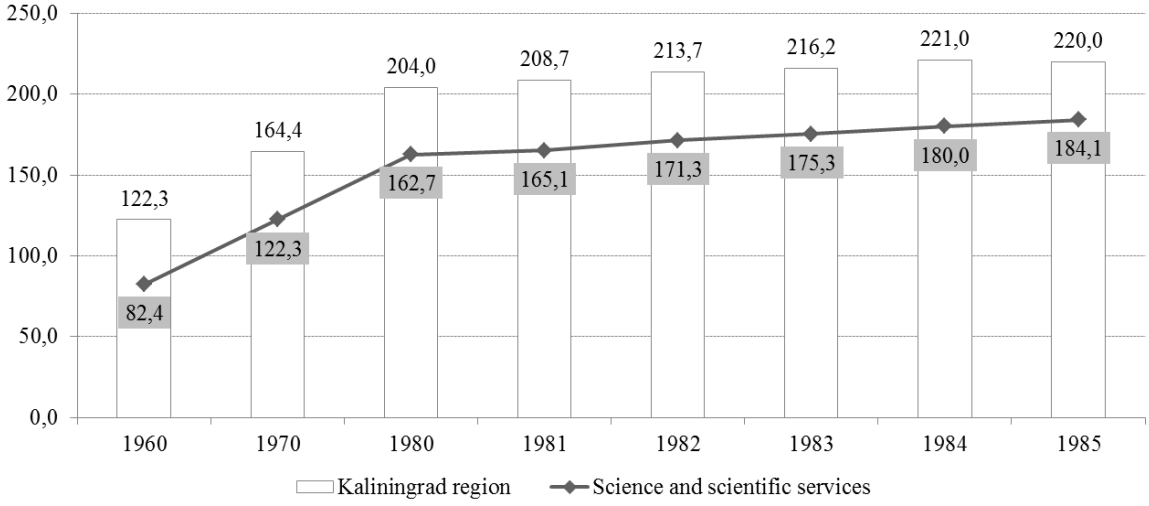
Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region, 2009-2015.

Figure 3 - Dynamics of the number academic staff with PhD engaged in R&D, people.

A significant factor in attracting and retaining the region's leading and promising researchers in their respective scientific fields is the level of wages in the sphere of science and scientific services and its relation to the average wage in the region. As in the Soviet era, currently the average monthly wages of scientists and researchers is above average for the Kaliningrad region (Figure. 4).



A) 2000 – 2014



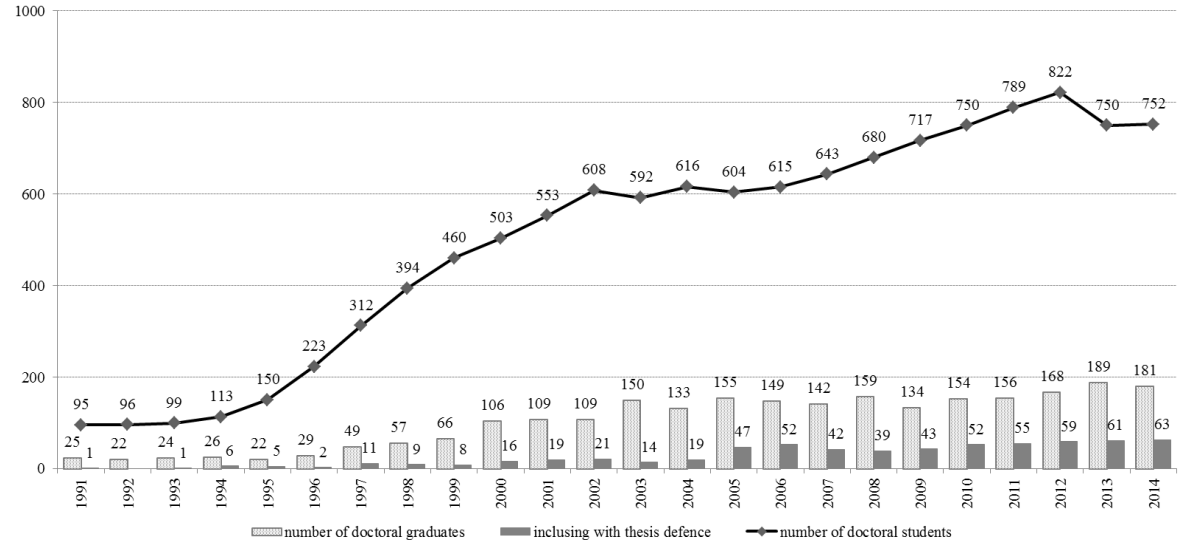
b) 1960 – 1985

Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region, 2009-2015; Kaliningradstat 1986.

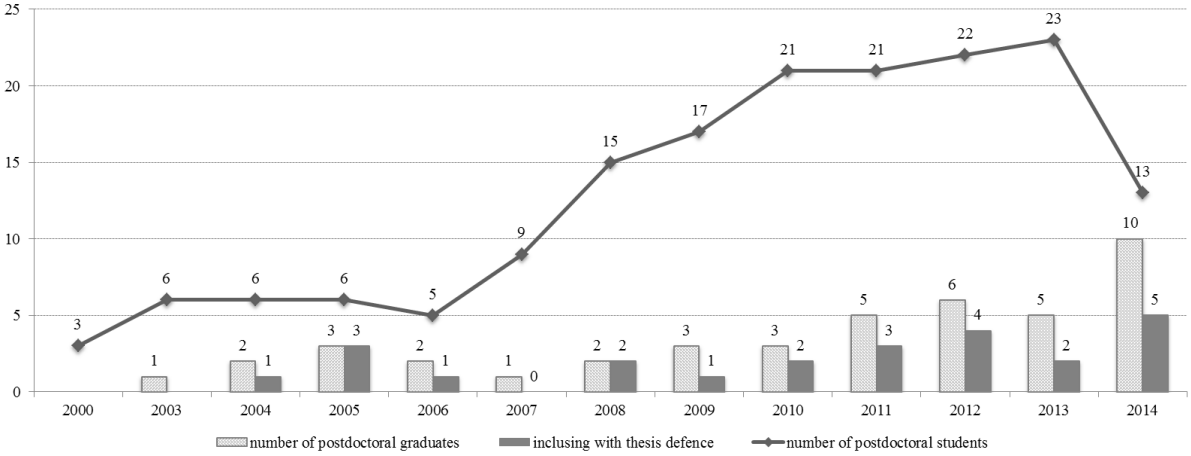
Figure 4 - Dynamics of average monthly wages of employees performing R&D compared to the regional average wage, rub.

However, while in the second half of the twentieth century, the scope of scientific services ranked second after water transport in the level of salaries in the Kaliningrad region, by 2014 – only fifth, behind financial sector, chemical industry, mining and fishing, fish farming (Kaliningradstat 1986; Rosstat 2015). Against the backdrop of one of the lowest in the Northwest Federal District gaps in the level of salaries in science with the average for the region (6th place out of 9), this reduces the economic incentives to retain young staff in the academic sector of the Kaliningrad region, increasing the attractiveness of migration to another regions (incl. abroad) or favouring the employment in business sector.

A significant advantage of the region's innovation system is, however, the existing system of reproduction of scientific personnel. The Kaliningrad region is a leader in the north-western region of Russia on the share of doctoral graduates (PhD and postdoc). Since 1991, actively grows the number of post-graduate students and their subsequent graduation (Figure. 5A).



A) doctoral studies



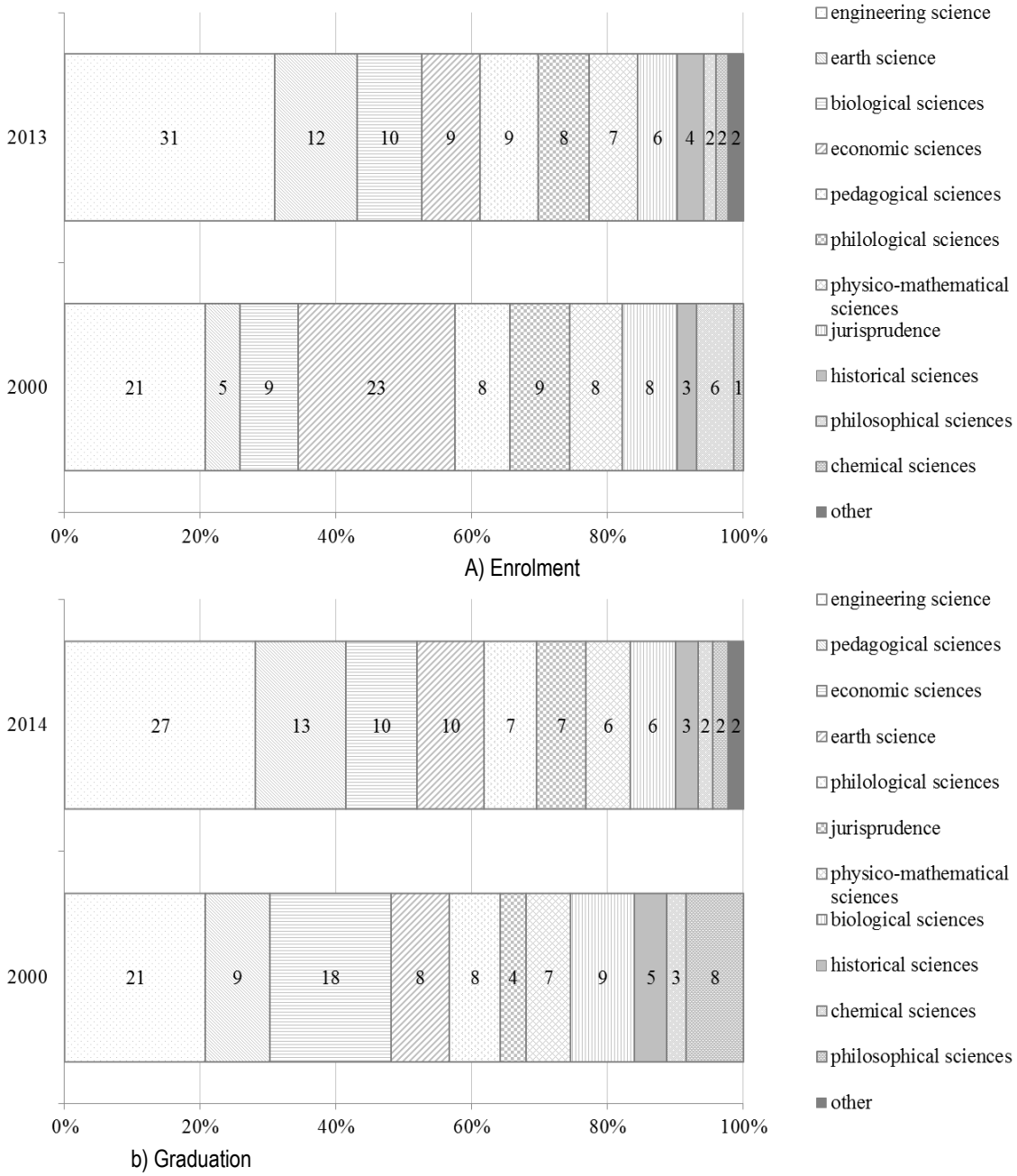
b) postdoctoral studies

Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region, 2009-2015

Figrue 5 - The potential for reproduction of human resources in R&D of the Kaliningrad region, people.

In 24 years, the increase in the number of doctoral students was 8 times, and graduates – 7 times. Also, increases the proportion of thesis defence: while until the 2000s, on average, it was about 12.4%, then since 2000 – 26.5%. In 2014 the share of those defended their doctoral thesis was 34.8%. Positive dynamics is also typical for postdoctoral studies (Figure 5B). For the 2000 – 2014, 24 postdoctoral theses have been defended in the region.

Currently, only two organizations in the region offer doctoral and postdoctoral studies – Immanuel Kant Baltic Federal University and the Kaliningrad State Technical University. The main contingent of doctoral students (over 65%) are trained in five scientific fields: engineering, earth, biological, economic and educational (Figure 6A) following the selection of 29 areas of specialisation. In terms of graduation in the lead are technical, educational, economic, and earth sciences (Figure 6B). Overall, more than 2,000 staff of the highest category was trained in the region since 2000 with an emphasis on technical, economic and pedagogical specializations.



Source: calculations are based on: Science and Innovation in the Kaliningrad Region: a statistical collection. Kaliningrad: Territorial body of Federal State Statistics Service in of the Kaliningrad region, 2009-2015

Figure 6 - Distribution of doctoral students of the Kaliningrad region by the fields of science, %

3.2. Business component

Along with the HR potential of the research sector a significant contribution to the total HR potential of RIS makes the business sector. In the economy of Kaliningrad region are employed 477.8 thousand people (as of the end of 2014), 31% of them have higher education. This is higher than in most regions of the North-western Federal District (excluding the city of St. Petersburg, with 41.1%), but lower than the national average – 32.2%. In the employment structure of the region the main share is made by the five types of economic activities: wholesale and retail trade, repair of motor vehicles, motorcycles, household goods and personal items (18.1%); manufacturing (15.9%); transport and communications (9.5%); operations with real estate, renting and business activities (9.0%); construction (8.5%). In terms of manufacturing industries, the highest concentration of manpower is in the food industry, other manufacturing industries (including furniture) and the production of vehicles and equipment.

The number of employees in organizations engaged in implementation of technological innovations can be applied to characterize the number of qualified professionals involved in the innovation process. For the Kaliningrad region, the value of this indicator is unstable. Minimum occurred in the crisis year of 2010 – 1584 people. By 2012, the number of employees increased to 8617 people, of which 8.7% are concentrated in two high-tech activities: the production of medical devices, measuring instruments, control, management and testing, optical instruments; manufacture of electronic components, instruments for radio, television and communication. Despite the positive trend, the proportion of employees of organizations engaged in technological innovation in the total employment of the region is still less than 2%.

Comparison of the North-West Federal District regions by the number of high-end jobs with respect to the average number of employees shows a substantial backlog of the Kaliningrad region in the level of average wages of employees of regional organizations and enterprises. Table 2 presents data on the effectiveness of labour resources by the types of economic activities in the region in 2013 – 2014.

Table 2 - The level of labour productivity in the Kaliningrad region

Type of economic activity	Average annual number of employed		Number of high-performance workplaces				Productivity *
	thous.pers.		thous. pcs.		pcs. per thous. employees		thous. rub/pers
	2013	2014	2013	2014	2013	2014	2013
TOTAL	476.5	477.8	108.7	111.5	228	233	583
Agriculture, hunting and forestry	33.7	30.7	2.2	2.3	65	75	358
Fishing, fish farming	4.3	4.0	1.7	1.2	397	300	754
Mining	4.4	3.7	1.7	1.6	390	432	2712
Manufacturing	84.6	76.2	19.6	20.1	232	264	753
Production and distribution of electricity, gas and water	12.2	11.9	4.5	5	370	420	744
Construction	39.9	40.7	6.6	5.8	165	143	418
Wholesale and retail trade; repair of motor vehicles, motorcycles. household goods and personal items	81.0	86.3	8	8.9	99	103	481
Hotels and restaurants	10.7	11.4	1	1.1	93	96	177
Transport and communications. including	44.3	45.4	11.8	12.4	266	273	497
Transport	39.3	n.a.	9.9	10.3	252	n.a.	484
Communications	5.1	n.a.	1.9	2.1	375	n.a.	597
Financial activities	7.5	7.3	6.4	5.9	859	808	117
Real estate renting and business activities. Including	38.1	42.9	9.7	10.4	254	242	1190
Research and development	1.7	n.a.	1.5	1.6	879	n.a.	848
Public administration and defense; compulsory social security	37.0	36.9	17.3	17.2	468	466	646
Education	31.8	31.9	5	6.1	157	191	316
Health care and social services	28.2	29.2	11.8	12.2	419	418	492
Other community social and personal services. Including	19.0	19.2	1.4	1.4	74	73	235
Activity in recreation and entertainment, culture, sport	8.4	n.a.	0.9	0.7	108	n.a.	302

Note: Productivity is the amount of gross value added created per 1 employee

Source: on the basis of data from the database Rosstat, 2015. The number of high-end jobs by economic activity in the context of the Russian Federation. The efficiency of the Russian economy. Rosstat. URL: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/efficiency/# (reference date: 07.02.2016)

The data in Table 2 shows that there is a weak relationship between the number of high-performance jobs and the generated gross value added calculated per employee (the correlation coefficient is 0.182). While the share of high-performance jobs by a wide margin is led by 'smart' industries: research and development (879 pcs. per thousand pers.) and financial activities (808 pcs. per thousand pers.), by the labour productivity indicators the leader is mining industry (2712 thousand rub. per pers.), which has only 432 high-performance jobs per 1000 employees. Meanwhile, financial sector generates the lowest gross value added – 117 thousand roubles per

person. An innovative economic model should be characterized by a correlation between the number of high-end jobs and the level of generated gross value added, as the production of innovative products, which should make the greatest contribution to the GRP, suggests the involvement of highly qualified specialists with respectively high requirements of pay.

Inconsistency of wage and duty requirements set for the qualification of employees, as well as the imbalance between the need of regional enterprises for personnel and the number and the quality of the actual labour force available create conditions for the outflow of skilled personnel to other regions, which is one of the threats to innovation security. Currently, Kaliningrad region acts as donor region of labour force, as well as a number of other regions of the north-west (Table 3). The number of people employed who leave to other subjects of the Russian Federation for work purpose is several times higher than those arriving, meanwhile there is increased tendency to increase the outflow of labour.

Table 3 - Interregional labour migration in the subjects of the North-western Federal District of the Russian Federation (annual average, thousand people)

Subjects of the NWFD	Number of people employed leaving to other regions of Russia						Number of people employed arriving from other regions of the Russia					
	2005	2010	2011	2012	2013	2014	2005	2010	2011	2012	2013	2014
Republic of Karelia	0.3	3	1.1	1.8	3.9	4.2	0.5	0.9	0.9	0.8	1.4	1.1
Republic of Komi	2.7	5.4	3.9	5.9	5.9	6.5	1.6	7.5	8	13.7	14.0	16.5
Arhangelsk region	…	1.4	4.7	8.1	4.6	5.2	2.7	4.2	2.6	7.1	5.1	3.9
Nenets Autonomous Okrug	…	…	…	0.1	0.0	0.0	…	0.7	0.4	1.1	3.9	2.4
Vologda region	1.3	3.4	2.4	12.8	5.7	3.0	…	2.7	2.6	4.2	4.2	1.4
Kaliningrad region	0.3	0.8	0.9	4.2	3.6	6.1	…	0.8	0.8	0.6	0.5	0.9
Leningrad region	72.8	83.9	45.7	135.4	143.8	134.5	7.6	12.9	15	28	16.8	14.9
Murmansk region	0.7	1	1.3	1.8	1.3	1.1	2.3	1.8	3.5	3.8	5.8	6.3
Novgorod region	6.3	8.7	10.5	13.3	13.8	13.7	1.7	0.9	1	1.7	2.4	4.2
Pskov region	2.5	7.6	10.7	12.8	10.9	11.4	0.3	0.2	0.4	0.2	2.1	1.0
Saint Petersburg	2.7	1.6	1.2	10.2	5.9	2.4	83.6	115.3	81.1	180.4	189.9	181.8

Source: on the basis of data from the database Rosstat, 2015

Against this background, great importance has the quality of the labour force arriving to the region both from other regions of Russia and abroad. The main source of additional labour for the Kaliningrad region are citizens of foreign countries. At the end of 2014 a total of 8057 foreign nationals had a valid permit to work in the region, of which approx. 50% were workers employed in construction, installation and repair works. Another 23.5% are drivers and operators of mobile equipment, staff in the metal-working and machine-building industry and skilled workers of other professions. Thus, the need for skilled personnel of working specialties is obvious. The share of highly skilled experts – heads of agencies, organizations and enterprises and their divisions, experts in the field of natural sciences and engineering, was 6.6%, which ranks third in the Northwest Federal District. The influx of unskilled workers in the region is limited and ranges around 4% that is a positive factor from the standpoint of providing innovative security.

3.3. Education component

The education sector should take the primary position in filling the needs of the region's economy in the labour force, taking into account the strategic perspectives of its development. Each year, the state and municipal educational institutions of higher education of the Kaliningrad region issue about 5 thousand bachelors, diploma and master's degrees, accounting for nearly 5% of the total graduates of the Northwest Federal District (Table 4). The region occupies a leading position on the share of student contingent in higher education in the total population among both the subjects of the North-western Federal District of the Russian Federation, and the countries of the Baltic Sea region. The concentration of students in 2014 was 311 people per 10 thousand people of population, which is also higher than in the Soviet period history of the region: in the 1970-1986 – 186 students per 10 thousand populations.

Table 4 - Bachelor, specialist, master graduates by state and municipal educational institutions of higher education

Subjects of the North-western Federal District of the Russian Federation	2005	2010	2011	2012	2013	2014
Republic of Karelia	3.8	3.9	3.7	3.7	3.1	3.2
Republic of Komi	4.6	5.3	5.1	4.9	4.6	5.0
Arhangelsk region	6.7	7.8	7.6	6.6	5.6	4.9
Vologda region	7.1	8.2	8.2	7.2	6.7	6.2
Kaliningrad region	*4.2*	*5.5*	*5.8*	*5.5*	*5.0*	*4.9*
Leningrad region	1.6	2	2.1	1.7	2.0	2.2
Murmansk region	4.1	4.4	4.1	3.7	3.8	3.3
Novgorod region	4.1	3.4	3.8	3.3	2.8	2.8
Pskov region	2.8	3.1	3.3	3.2	3.8	2.8
Saint Petersburg	64.5	81.1	78.8	78.8	71.6	68.3

Source: on the basis of data from the database Rosstat, 2015

According to the Monitoring of the effectiveness of the educational institutions of higher education in 2016[1] a total of 43.8% of all students of the Kaliningrad region are enrolled in social sciences, 26.9% – engineering science and technology, and per 7.6% falls on the humanities and the mathematics and natural sciences each. It should be noted that the issues of education quality and the demand for graduates of regional universities by local businesses are undoubtedly important for a comprehensive assessment of the region's innovation security, and should be a focus of an independent in-depth study.

Conclusion

After the collapse of the USSR the innovation system of the Kaliningrad region has experienced significant structural changes, including its human resources component. Dramatically reduced the number of research staff, their composition has changed. Due to the transition to a market economy model and the collapse of economic relations established in the Soviet period, there have been major changes in the region's economy. As a result of the economic restructuring, a range of activities have minimized or reduced their significance (*e.g.* pulp and paper industry, ferrous metallurgy, light industry, etc.). This resulted in a decline in employment in these areas and the drop in the demand for corresponding skills.

At the moment, an innovation system of the Kaliningrad region is in its infancy. New institutions are being created, new actors emerge, new cooperative links and networks of cooperation are being formed, and new research directions are developing. In accordance with the requirements of the time, the objectives and priorities of the region have changed. The innovative model of development came to the forefront, which implies the presence of a high level of accumulated human capital. In this context, the key problems of the region associated with an increase in the efficiency of the HR component of its innovation system have aggravated, which is expressed in a low level of per capita income of the population, the presence of institutional and tariff barriers that restrict labour mobility, the lack of involvement of the population in continuous education and the narrow coverage of the current and future staffing needs by the regional educational system.

Some steps to address these problems in order to increase the innovation security in the region have already been taken. In the Kaliningrad region formed favourable conditions for the accumulation of knowledge and competences required for the economy of the region through the attraction of qualified specialists from abroad, and increasing the efficiency of internal education sector. With a substantial support from the state, in the region was founded and is actively developing one of the ten federal universities of Russia, included in the top-100 Russian universities. By the share of students as well as by the number of people employed with higher education, the Kaliningrad region is ahead of most of the NUTS2 regions of the Baltic Sea region and the subjects of the North-West Federal District of Russia. The region has an effective system of reproduction of

[1] Monitoring of the effectiveness of the educational institutions of higher education in 2016: Kaliningrad region. URL: http://indicators.miccedu.ru/monitoring/_vpo/material.php?type=2&id=11200 (reference date: 2.07.2016)

academic staff, which enables to develop new breakthrough research areas such as life sciences, neuroscience, biochemistry, genetics and molecular biology, and others.

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The Time-Varying Correlation Between Macroeconomic Uncertainty, Inflation and Output Growth: Evidence from AR*(p)*-EGARCH Model for Sri Lanka

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Abstract:

This study utilizes an AR(p)-EGARCH model to examine the causal links and volatility transmissions between inflation uncertainty, output growth uncertainty and macroeconomic performance measured by inflation and output growth in Sri Lanka for the period 1993-2014. The empirical results show that higher inflation does cause welfare loss, both directly and indirectly, through the inflation uncertainty channel. Thus, there is an overwhelming support for Friedman-Ball hypothesis that higher inflation is accelerating inflation uncertainty. Secondly, inflation is negatively affecting output growth (and its uncertainty) while inflation uncertainty is increasing output growth. Finally, output growth generates output uncertainty while there is no evidence of the mutual effects of nominal and real uncertainties on one another. Our estimated results suggest that policy makers should make use of monetary policy for achieving multiple policy objectives such as reducing inflation and its volatility while restoring sustained and stable economic growth.

Keywords: inflation uncertainty, output uncertainty, inflation, output growth, AR*(p)*-EGARCH, Sri Lanka.

JEL Classification: C22, C32, C51, C52, E0, E10, E30.

1. Introduction

The central objective of macroeconomic policy makers is to attain economic growth and to keep inflation at a low level. The reason is that high and volatile inflation is harmful to economic growth due to its significant welfare costs. Thus, the issue of whether inflation and its uncertainty have significant positive or negative effects on real economic activity, has been the matter of extensive debate among economists and policy makers because of its relevant policy purpose. The issue gets further significance in developing countries where high and volatile inflation frequently prevails. It is important for policy designers to understand the causal linkages and volatility transmissions between inflation and its uncertainty in order to design concrete macroeconomic policies for targeting inflation while considering sustained economic growth.

Inflation uncertainty is both the result and cause of higher inflation. Theoretically, the issue got significance with emergence of Friedman's (1977) claim that rising inflation leads to higher inflation uncertainty. Ball (1992) strengthened the Friedman's idea by arguing that higher inflation not only cause inflation uncertainty but also poses significant negative welfare costs on real economic growth as it distorts the effectiveness of price mechanism and economic efficiency and results a decline in economic growth. Conversely, the positive effect of inflation uncertainty on level inflation was proposed by Cukierman and Meltzer (1986) while the negative effect is illustrated by Holland (1995). There is also ambiguous debate on the dynamic interactions between macroeconomic uncertainty and economic growth. There is also heated theoretical and empirical debate on the trade-offs between inflation and economic growth. Theories and related empirical studies on the relationship between inflation and economic growth have exhibited either no relationship such as Sidrauski (1967), negative relationship, such as Barro (1995), Fischer (1993) and positive relationship such as Tobin (1965) and Mallik and Chowdhury (2001). Further, both output uncertainty and inflation uncertainty may affect output growth and also have considerable direct and indirect effect on one another. Theoretically, there is a lack of consensus and empirically, the issue of liaison between macroeconomic uncertainty and inflation and output growth is still under the coverage of empirical research as there exists different views on the interaction between macroeconomic uncertainty and performance, particularly in developing countries.

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Like the other emerging and developing countries, economic growth and price stability have been the twin leading objectives of monetary policy framework of Central Bank of Sri Lanka (CBS). Monetary policy authority has employed and even currently utilizing different policy measures (e.g. credit, monetary aggregate and interest rate channels etc.) from the very early till recent in various political regimes to attain these twin targets. The argument is that generally, monetary policy makers in Sri Lanka consider inflation as harmful to real economic activity and aims price stability an essential goal to restore sustained economic growth. As the empirical studies are still indecisive about whether the macroeconomic stability promotes output growth or output losses in the short run due to policy contractions. Following such line of reasoning, the main aim of this study is to empirically investigate the controversial and dynamic issue of the causal links and volatility transmissions between inflation, its uncertainty, output growth and real uncertainty for Sri Lanka[3]. Being located in a poor and relatively less developed region of the world and also as a developing country, the sample area is an ideal region for the increasing macroeconomic fluctuations and higher inflation. Historically, the country is inherited economic problems such as macroeconomic and political instability, over population, poverty and unemployment. This empirical analysis is made through utilizing the AR*(p)*-EGARCH type model to assess whether higher inflation is having any consequences on future inflation and economic growth and whether, output uncertainty and inflation uncertainty affect inflation and economic growth.

Our empirical findings show that higher inflation does cause negative welfare costs through direct and indirect channels. The estimated results also propose that inflation rate induces its uncertainty and reduces output uncertainty. Output growth is leading towards real uncertainty while there is negative effect of higher inflation on real economic activities and inflation uncertainty is positively affecting output growth. Thus, a robust evidence in support for the casual dynamics and volatility transmissions between macroeconomic uncertainty and inflation and economic growth would deliver a solid ground for the development of macroeconomic models to empirically test such multidimensional relationships, specifically in less developing countries.

The rest of the paper is organized as follows: section 2 briefly presents an overview of the existing theoretical and empirical literature on the causal links and volatility spillovers of macroeconomic uncertainty on macroeconomic performance; section 3 outlines empirical approach and estimation strategy while the data and data sources are presented are in the next section. The empirical results and discussions are documented in section 5, followed by final concluding remarks and policy recommendations.

2. Review of related literature

There is a huge theoretical literature on this issue since after 1970s as illustrated by Friedman (1977), Bernanke (1983), Black (1987), Pindyck (1991), Ball (1992), Blackburn and Pelloni (2004) etc. still, there is no consent on the dynamic causal links and volatility transmissions of macroeconomic uncertainty on inflation and output growth. The coverage of empirical literature in the area is also very dynamic but still debateable and there is no consensus on the existence of major hypotheses elucidating the trade-offs between macroeconomic uncertainty and macroeconomic performance. Some earlier studies including Baillie, Chung and Tieslau (1996), Carporale and Mckiernan (1997), Grier and Perry (1996, 1998, 2000), Fountas (2001), Berument, Metin-Ozcan and Neyapti (2001), Hwang (2001, 2007), Fountas, Karanasos and Kim (2002), Bhar and Hamori (2003), Grier *et al.* (2004), Conrad and Karanasos (2005) ,Bredin and Fountas (2009), Fountas (2010) and some relatively new studies incldluing Fountas and Karanasos (2007), Caporale, Onorante and Paesani (2012) and Nasr and Ajmi (2014) have thoroughly tested the validity of these theories. They have investigated the volatility transmission and casual links between inflation and inflation uncertainty in developed and developing countries and mostly, resulted confronting findings. Remarkably, the empirical evidence is still scant and mainly describes G7 data. Specially, Daal, Naka, Sanchez (2005) and Thornton (2007, 2008) evidenced that nominal uncertainty is caused by higher inflation in Latin American countries. Likewise, Özdemir and Fisunoğlu (2008) supported the existence of famous Friedman hypothesis for Jordan, Philippine and Turkey. The study found weak evidence to embrace the Cukieman-Meltzer's hypothesis. In sharp contrast, Jiranyakul and Opiela (2010) explored the Friedman-Ball and Cukierman-Meltzer's hypotheses through GARCH type models in five major ASEAN countries and supported the former view in most of the countries.

On the other hand, the empirical studies on the relationship between real uncertainty and output growth mostly consists on the cross-sectional and pooled data with mixed results. For instance, Caporale and McKiernan

[3] This study is confined only to Sri Lanka as there is some literature (*e.g.* Javed *et al*. (2012), Chowdhry (2014) and Paul (2012) on other three major South Asian economies like Pakistan, India and Bangladesh while for the rest of three countries (Nepal, Bhutan and Maldives), the required monthly data is not available.

(1996, 1998) evinced for a positive causal effects of growth uncertainty on output growth (Black's hypothesis) for USA and UK respectively, while, Speight and Cm (1999) and Fountas *et al*. (2002) found no evidence on the relationship between output growth uncertainty and economic growth. In sharp contrast, Grier and Perry (2000) and Grier *et al*. (2004) hold positive impact of real volatility on real growth in US economy. There is very limited literature on the opposite type of causality-from economic growth to output growth uncertainty. In addition, despite the pool of literature on the relationship between inflation and economic growth, still there is some dispute on the robustness of the causal relationships between inflation and economic growth. For instance, unlike the no casual effect of inflation and economic growth in 70 countries by Kearney and Chowdhury (1997) for the period 1960-1989, Mallik and Chowdhury (2001) found a significant positive impact of inflation on economic growth in four South Asian countries including Sri Lanka. In short, there is a mixed evidence of inflation-growth interactions as surveyed by several studies (see for example, Haslag 1997, Bruno and Easterly 1998, Gylfason and Herbertsson 2001, Klump 2003).

Most of the empirical literature is analysing the issue of interactions between inflation, its uncertainty and output growth in developed countries[4]. For example, Bhar and Hamori (2004) examined the casual links between inflation and inflation uncertainty in G7 countries including USA, UK, Japan, Italy, Germany, France and Canada through the GARCH family model for the period 1961Q1 to 1999Q4 and supported the Friedman's hypothesis that higher inflation promotes inflation uncertainty, even in low inflation countries. Similarly, Kontonikas (2004) explored the effect of inflation on inflation uncertainty in UK for the period 1972-2002 and concluded that there is a positive favourable relationship between inflation and its volatility in the study area. In another study, Berument and Dincer (2005) also confirmed the existence of Friedman's hypothesis for all the G-7 countries. The opposite effect was found for Japan, Canada, France, UK and the US. Also, in France, Canada, the UK and the US, rising uncertainty has lowered inflation, excluding Japan where the effect is positive.

As far as the literature is concerned in emerging and developing countries, there is also mixed evidence on the dynamic relationship and volatility transmissions between macroeconomic uncertainty and performance. For example, Nas and Perry (2000) explored the link between inflation and inflation uncertainty in Turkey by utilizing monthly data from 1960.1 to 1998.3. The study showed that inflation uncertainty is created by higher inflation while the reverse effect was observed on the basis of time period. In addition, there are some studies who attempted to uncover the links between inflation, inflation uncertainty and output growth in the neighbouring South Asian countries, specifically Pakistan, India and Bangladesh. Among the earlier studies, Mallik &and Chowdhury (2001) examined the long run movements between inflation and economic growth in four South Asian countries including Pakistan, India, Bangladesh and Sri Lanka through the traditional time series framework of co-integration and error correction model and concluded that there is a long run relationship between inflation and economic growth. The study also pointed out that inflation is positively affecting economic growth in the study area such that all of these economies lies at a knife edge situation where inflation takes much effect from changes in output than the reverse effect. The prominent study is by Rizvi and Naqvi (2009), Rizvi *et al.* (2014). In the former study, they analysed inflation and inflation uncertainty in Pakistan through quarterly data of CPI for the time period 1976:01 to 2008:02 with EGARCH frameworks and evidenced that inflation is leading towards inflation uncertainty in Pakistan. In the latter study, they used the asymmetric GARCH models to explore the relationship between inflation and inflation uncertainty in ten Asian countries including Pakistan and India through quarterly data for time period 1987-2008. The study found that in both Pakistan and India, Friedman's hypothesis of positive effect of higher inflation on inflation uncertainty hold while for most of the Asian countries, a bi-directional causality between inflation and its uncertainty was observed. Baharumshah and Soon (2014) scrutinized the causal links between inflation, nominal uncertainty and economic growth for Malaysia and favored the Friedman-Ball hypothesis and Bernanke's idea. The study also evidenced the direct and indirect impact of inflation and its uncertainty on economic growth. The three existing studies investigating the issue in Pakistan, India and Bangladesh are the studies by Javed *et al.* (2012), Chowdhury (2014) and Paul (2012) and all supported the Friedman's hypothesis. Astonishingly, there is no relevant study on this issue in Sri Lanka but in a very recent study, Madurapperuma (2016) examined the long-run relationship between inflation and economic growth through the traditional time series framework and resulted that there is a significant and negative relationship between inflation and economic growth. The study supported the model of utility function in consumption and real money balances.

[4] See Fountas (2001, 2010), Grier *et al*. (2004); Fountas, Karanasos and Kim (2006), Fountas and Karanasos (2007), Bhar and Mallik (2010, 2012).

From the given literature, it is concluded that most of the empirical studies have utilized GARCH family models to inspect the casual dynamics between inflation and inflation uncertainty with the major support for Friedman's doctrine while some of these studies have also analysed the join interaction among inflation, output growth and their related uncertainties, specifically in developed countries. On one side, there is mixed or conflicted evidence on the effect of inflation uncertainty on level inflation due to country economic environment, time period and estimation strategy and on the other hand, there are very few studies who investigate the issue in a concrete manner by judging the casual links and volatility transmission between inflation, output growth, nominal uncertainty and real uncertainty. Therefore, due to the limitations and disagreement of the existing studies on the trade-offs between macroeconomic uncertainty and performance and specifically, the divisive findings of the existing empirical studies necessitate the further exploration of the nexus with an efficient empirical strategy. Notably, to the best of my information, there has been no specific study on this issue in Sri Lanka whose central monetary authority has historically attempted to restore macroeconomic stability and economic certainty. Consequently, this study will be the first attempt to diagnose the causal links and volatility dynamics between macroeconomic uncertainties and macroeconomic performance in the study area.

3. An AR(*p*) - EGARCH model of inflation and output growth

Most of the existing empirical economic studies investigate the effects of uncertainties by modelling the relevant variables as an autoregressive conditional heteroscedasticity (ARCH) and generalized autoregressive conditional heteroscedasticity (GARCH) family models. Initially, ARCH models were familiarized by Engle (1982) and generalized as GARCH by Bollerslev (1986) and Taylor (1986)[5]. These strategies are prevalently used to account volatility in macroeconomic and financial time series. These models follow an Autoregressive (AR) process along with ARCH and GARCH framework. GARCH-type models have several features in measuring the causal links among macroeconomic uncertainties and macroeconomic performance. These models measure the risk involved in the relevant time series and offer estimates of the variance of unpredictable innovations in the concerned variables to represent the volatility. They also measure the significance of the movement in the conditional variances of variables in varying time periods. The empirical strategy for this study is outlined in the following two components.

3.1. Empirical model

Following the empirical study by Mohd, Baharumshah and Fountas (2012) and assuming y_t as output growth rate while π_t as inflation rate, the conditional mean equations for both output growth rate and inflation rate are illustrated below.

$$y_t = \phi_y + \sum_{i=1}^{m} \phi_{y_i} y_{t-i} + \varepsilon_{yt} \qquad \varepsilon_{yt} \sim N(0, h_{yt}) \qquad (3.1)$$

$$\pi_t = \phi_\pi + \sum_{j=1}^{n} \phi_{\pi j} \pi_{t-j} + \varepsilon_{\pi t} \qquad \varepsilon_{\pi t} \sim N(0, h_{\pi t}) \qquad (3.2)$$

Both of the above equations signify an autoregressive behaviour and ε_{yt} and $\varepsilon_{\pi t}$ are showing the error terms for output growth and inflation rate respectively which are conditionally normal with mean zero and variances h_{yt} and $h_{\pi t}$ respectively.

After identifying the mean equations for both output growth and inflation rates, the EGARCH approach is used to investigate the empirical dynamics of the macroeconomic uncertainty and inflation and output growth rates. It is worth to mention that GARCH is more parsimonious than ARCH model due to the fact that it captures the effect of infinite number of past squared residuals on current volatility. It is also less likely to violate the non-negativity constraints artificially imposed on ARCH parameters (Bollerslev 1986). But the GARCH model is precluded due to its symmetric response of uncertainty to positive and negative shocks because a positive inflation shock is more likely to rise inflation volatility via monetary policy tool, as compared to negative inflation shock of equal size (Brunner and Hess (1993) and Joyce (1995). Consequently, it creates worries on the symmetric estimates of traditional GARCH models. All this motivate to utilize asymmetric GARCH such as Exponential Generalized Autoregressive Conditional Hetroskedastic (EGARCH) model, of Nelson (1991) in order

[5] See for example, Bollerslev *et al.* (1992, 1994); Grier and Perry (2000) and Fountas *et al* (2006) for surveys.

to overcome the non-negativity constraints on the parameters by modeling the logarithm of the conditional variance. Thus, the conditional variance equation is expressed as:

$$ln(h_t) = \omega + \sum_{j=1}^{q} \alpha_j \left| \frac{\varepsilon_t - j}{\sqrt{h_{t-j}}} \right| + \sum_{j=1}^{q} \lambda_j \frac{\varepsilon_t - j}{\sqrt{h_{t-j}}} + \sum_{i=1}^{p} \beta_i ln(h_{t-i}), \qquad |\beta| < 1 \qquad (3.3)$$

where ω, α, λ and β are the variance parameters to be estimated.

The non-zero value of λ specifies the asymmetric effect and the positive value of λ shows that high inflation is leading towards high inflation uncertainty and vice versa. The variance specification is used to capture the effects of good news and bad news to model inflation and its volatility and same to output volatility. Thus, the EGARCH model is relieving the non-negativity constraint by taking the log of the conditional variance. It also allows positive and negative shocks to have different impact on macroeconomic uncertainty.

3.2. Granger causality strategy

After presenting the mean and conditional variance equations for both inflation and output growth rates in the form of AR*(p)*-EGARCH approach, the next step is to outline the Granger causality procedure to robustly examine the casual nexus and volatility transmission between our series of interest. For this purpose, the conditional variances of both output growth and inflation rates are derived from their conditional mean equations and the existence of Granger Causality between inflation, output growth and macroeconomic uncertainty is tested. The Granger causality procedure is used to fix whether one variable is useful in forecasting the other variable (Granger 1969). Following the Granger-causality strategy assumed by Kevin and Grier (1998) to capture the lagged effects between the variables of interest and to minimize the number of estimated parameters, the causality between inflation and inflation uncertainty is analysed as:

$$\pi_t = \psi_\pi + \sum_{i=1}^{k} \gamma_{\pi_i} \pi_{t-i} + \sum_{i=1}^{k} \theta h_{\pi t-i} + \varepsilon_{\pi t} \qquad (3.4a)$$

$$h_{\pi t} = \psi_\pi + \sum_{i=1}^{k} \theta h_{\pi t-i} + \sum_{i=1}^{k} \gamma_{\pi_i} \pi_{t-i} + \varepsilon_{\pi t} \qquad (3.4b)$$

where "*k*" symbolizes the lag length and h_t is the uncertainty term.

The null hypothesis is that inflation uncertainty (inflation) does not granger cause inflation (inflation uncertainty). While for output equation, we proceed as:

$$y_t = \mu_y + \sum_{i=1}^{k} \beta_{y_i} y_{t-i} + \sum_{i=1}^{k} \alpha h_{yt-i} + \varepsilon_{yt} \qquad (3.5a)$$

$$h_{yt} = \mu_y + \sum_{i=1}^{k} \alpha h_{yt-i} + \sum_{i=1}^{k} \beta_{y_i} y_{t-i} + \varepsilon_{yt} \qquad (3.5b)$$

4. Data and data sources

The sample period for this study is from 1993 to 2014 and the frequency of the data is monthly, hence, this study uses the unadjusted data for both output growth rate (proxied by industrial production index (IPI) and inflation rate (measured as the percentage change in consumer price index(CPI) taken from the International Financial Statistics (IFS) of IMF. It is worth to mention that the sample period is based on the availability of monthly data. Both of series are taken as the log first difference of industrial production index and consumer price index respectively to guarantee the stationarity of both series as illustrated as:

$$y_t = ln(Y_t/Y_{t-1}) * 100 \text{ and } \pi_t = ln\left(CPI_t/CPI_{t-1}\right) * 100,$$

where, y_t is the output growth rate and π_t is the inflation rate.

5. Empirical results and discussions

This study takes Sri Lankan economy as a fascinating example to study the causal links and volatility dynamics of macroeconomic uncertainty and macroeconomic performance. Evidently, Sri Lanka as a developing country, historically suffering from higher inflation and real output volatility. First, the data characteristics and preliminarily diagnostic tests for the existence of ARCH effects in both of the series are reported in Table 1. It is observed that the mean of output growth rate is high as compared to that of inflation rate, illustrating higher inflation as compared to lower growth while the standard deviation is high for output growth, indicating more variability of economic growth. Thus, it is derived that the country is facing higher inflation along with higher output growth uncertainty. In addition, the table also shows the long-tailed distribution for both of the series as revealed by the large skewness and kurtosis. Additionally, the Jarque-Bera statistics reveal that both of the series are normally distributed. But, overall, the given descriptive statistics on skewness and excess value of kurtosis indicate non-normal distribution for our series of interest as observed in other financial variables. Most importantly, the reported ARCH-LM statistics provide evidence for the existence of ARCH effects in inflation rate as presented by ARCH (8) and ARCH (12) respectively. The significant value of ARCH test provides overwhelming evidence of the presence of ARCH effects.

Table 1 - Descriptive Statistics and preliminary diagnostic tests

	Mean	Med	Max	Min	Std. Dev	Skew	Kurt	Jarque Bera	ARCH (8)	ARCH (12)
π_t	0.7023	0.5543	5.0524	-3.5418	1.5094	0.1495	3.3484	2.3100 (0.3150)	5.664*** (0.0000)	4.0685*** (0.0000)
y_t	0.4772	0.5293	10.0450	-8.3917	2.9026	0.0876	3.6222	2.4546 (0.2930)	1.6805 (0.1096)	1.4264 (0.1638)

Notes: ARCH (m) is the m^{th} order test for auto regressive conditional heteroscedasticity. Figures in parentheses show the probability values.

In addition, before to report the estimated results of mean and variance equations of AR*(p)*-EGARCH models, it is vital to test the non-stationarity of our series of interest. Importantly, non-stationarity is the natural feature of macroeconomic variables due to technological, legislative and political changes. Thus, in order to test the non-stationarity of our series, this study utilizes the widely used Augmented Dicky Fuller (ADF) test (Dickey and Fuller, 1979, 1981) and Phillips and Perron (1988) test (PP test) to get robust parameter estimates and statistical inferences. As illustrated by the estimated results of ADF test at Table 2, it is clear that the null hypothesis of unit root is rejected at 1% level of significance for both of the variables.

Therefore, the concerned series are integrated of order zero. These results are further confirmed by the inspecting the existence of unit root in both of the series through PP test. Therefore, it is concluded that both output growth rate and inflation rate are stationary at level and there is no need to take their differences for estimation purpose.

Table 2 - Unit root and stationarity tests results

	ADF		PP	
	Constant	Constant & trend	Constant	Constant & trend
π_t	-11.5409***(0)	-11.5377***(0)	-11.0431***	-11.1271***
y_t	-15.7762***(0)	-15.7119***(0)	-19.0316***	-18.9603***

Notes: Augmentation terms used in the unit root regressions are provided in parenthesis. *, ** and *** denote rejection of the null hypothesis of unit root at 10%, 5%, and 1% significance levels, respectively.

5.1 Estimates of AR(p) EGARCH models

After checking the initial diagnostics tests for the application of GARCH family models such as auto correlation and ARCH effect in our series of interest as output growth rate and inflation rate, we next proceed to auto regressive GARCH specifications. In the first step of estimation process, the decision about the optimal lag order in conditional mean equations for both of the series is based on a number of statistical criteria. The lag order for the AR part in both output growth and inflation equations is determined by the information criteria such as minimum Akaike information criteria (AIC), Schwarz information criteria (SBC) and the existence of white noise error. The presence of auto correlation in the residuals of auto-regressive model is tested by Breusch-Godfrey test and Ljung-Box Q-statistics. Based on given model selection criteria and residual diagnostic tests in the form of Ljung-Box Q-statistic and Ljung-Box squared of Q statistic, this study has chosen AR(3) for the mean equation

of output growth rate and AR(9) for conditional mean equation for inflation rate. Due to the existence of the lagged dependent as endogenous variable in our model, this study calls for the application of maximum likelihood (ML) estimates which are asymptotically efficient (Davidson and MacKinnon 1993).

Further, this study has specified the EGARCH (1,1) model as adequate to measure the causal links and volatility transmission dynamics of inflation, output growth and their uncertainties. The estimated EGARCH model parameters are documented in Table 3, whereas panel A reports the estimated results of mean output growth and inflation equations, while the variance equations for both of the series are outlined at panel B of this table. The estimated results of mean equations show that the lagged output values are highly negatively significant while lagged inflation rate is having a mix response of positive and negative lagged effect to current inflation, signifying inflation inertia. Thus, the mean equation supports the inflation inertia and significant lagged output growth effect on current output growth. As far as the conditional variance equation is concerned, it is observed that the lagged value of GARCH term (β) is highly positively significant for both output growth and inflation equations at 1% level of significance. This indicates that there is significant volatility effect for both output growth and inflation rates. Interestingly, it also holds significant in case of ARCH effects for both of the series, indicating that conditional variance of output growth and inflation rate is positively and significantly affected by the lagged standardized shocks. In addition, the sum of ARCH and GARCH terms ($\alpha+\beta$) is greater than one, indicating that current information remains highly important for forecasting the conditional variances of output growth and inflation rates. Finally, both of the conditional equations fail to support the asymmetric behaviour in both of the equations as represented by non-zero but insignificant values of λ. Consequently, there is a positive significant ARCH and GARCH effects in the conditional variance equations of both output growth and inflation rates.

Table 3 - The estimated results of AR(p)-EGARCH Model

Panel A. Estimation of the mean equations for output growth and inflation rates			
Mean output growth equation		Mean inflation equation	
AR(p)	AR(3)	AR(p)	AR(9)
Constant	0.8664*** (0.1654)	Constant	0.6319*** (0.0978)
y_{t-1}	-0.4892*** (0.1007)	π_{t-1}	0.3453*** (0.0603)
y_{t-2}	-0.2587*** (0.0927)	π_{t-2}	-0.1872*** (0.0708)
y_{t-3}	-0.2243*** (0.0798)	π_{t-3}	-0.1324* (0.0730)
		π_{t-4}	0.1792*** (0.0642)
		π_{t-5}	-0.0210 (0.0652)
		π_{t-6}	0.1266* (0.0695)
		π_{t-7}	-0.0166 (0.0629)
		π_{t-8}	0.0241 (0.0707)
		π_{t-9}	-0.2851*** (0.0579)
Panel B. Estimates of the variance equations for output growth and inflation rates			
Variance equation for output growth		Variance equation for inflation rate	
ω	-0.2622** (0.1141)	ω	-0.1372*** (0.0473)
$\propto$	0.4560*** (0.1725)	$\propto$	0.1755*** (0.0644)
λ	0.1014 (0.0743)	λ	0.0226 (0.0582)
β	0.9426*** (0.0418)	β	0.9662*** (0.0303)
Panel C. Residuals diagnostics of output equation			
Output growth equation		Inflation equation	
Q_1	0.0746 [0.785]	Q_1	0.1957 [0.658]
Q_4	1.7753 [0.777]	Q_4	2.4034 [0.662]
Q_8	6.8252 [0.556]	Q_8	2.8221 [0.945]
${Q_1}^2$	0.1089 [0.0741]	${Q_1}^2$	0.3078 [0.579]
${Q_4}^2$	5.9533 [0.203]	${Q_4}^2$	3.8628 [0.425]
${Q_8}^2$	7.8505 [0.448]	${Q_8}^2$	10.611 [0.225]
$ARCH\ (8)$	0.9230 [0.5001]	$ARCH\ (8)$	1.2712 [0.2592]
$ARCH\ (12)$	0.7582 [0.6916]	$ARCH\ (12)$	0.6663 [0.7828]
AIC	4.6835	*AIC*	3.2202
SIC	4.8532	*SIC*	3.4151
LL	-315.1619	*LL*	-394.9635
Jurque-Bera test	0.2943 [0.8631]	Jurque-Bera test	1.6841 [0.4308]

Notes: Figures in parentheses are the Standard error values. Q_p and $Q_p{}^2$ are the ρ^{th} –order Ljung-Box test statistics for correlation in standardized residuals and squared standardized residuals, respectively. AIC, SC and LL shows the Akaike information criterion, Schwarz criterion and maximum log-likelihood criterion respectively. $ARCH\ (m)$ is the m^{th} –order auto regressive conditional heteroscedasticity. Jarque-Bera is the normality test.

After estimating the AR*(p)* - EGARCH models for both output and inflation, we execute some residual diagnostic checks to evaluate whether the estimated model capture the joint distribution of the residuals reasonably well. That is to test whether our estimated model is fitted well and the estimated results are robust. The residual diagnostic tests for the conditional mean and variance model are performed at panel C of Table 3. Comfortably, the diagnostic tests show that there is no serial auto-correlation and serial dependence as shown by the Ljung-Box test Q-statistics for correlation in standardized residuals and squared standardized residuals respectively. The ARCH effect is used to test the heteroscedasticity in the model. The ARCH test is incapable to reject the null of no ARCH effects which indicates that there is no further ARCH effects in the series. All in all, the estimated results for standardized residuals and squared standardized residuals as pointed out by three different lag orders such as 1, 4 and 8 hold satisfied for both output growth and inflation rates, while the ARCH tests can not reject the null of no ARCH effects at lag 8 and lag 12 respectively. Lastly, the normality assumption also hold for the estimated series in both equations. Thus, we feel comfortable with the given estimation strategy and empirical findings.

5.2 Estimated results of Granger causality between inflation, inflation uncertainty, output growth and output growth uncertainty

While adopting the two-step GARCH methodology in order to avoid the limitations of the simultaneous estimation approach[6], we derive the conditional variances for our series of interest and then perform the Granger causality experiment to explore the causal links and relationships of inflation, output growth and their uncertainties. The Granger causality tests are carried out at different lags levels such as 4, 8 and 12 to test whether our results are vigorous at different lag lengths. Table 4 offers the estimated results of Granger causality tests among inflation, output growth and their concerned uncertainties. Importantly, the signs of the sum of lagged coefficients of the causing variables is presented to show the direction of causality.

Table 4 - Granger causality tests among inflation, output growth, inflation uncertainty and output growth uncertainty

Direction of causality	Lag-4	Lag-8	Lag-12
$\pi_t \rightarrow h_{\pi t}$	50.8538 (0.0000) [+]	45.0699 (0.0000) [+]	55.0729 (0.0000) [+]
$h_{\pi t} \rightarrow \pi_t$	2.5338 (0.6386)	5.4886 (0.7043)	13.5482 (0.3305)
$\pi_t \rightarrow h_{yt}$	9.6554 (0.0466) [-]	10.4135 (0.2372)	8.3587 (0.7565)
$h_{yt} \rightarrow \pi_t$	2.8812 (0.5779)	3.2468 (0.9179)	4.0920 (0.9817)
$h_{\pi t} \rightarrow y_t$	3.8758 (0.4231)	10.8201 (0.2121)	29.5472 (0.0033) [+]
$h_{yt} \rightarrow y_t$	4.5905 (0.3319)	6.1019 (0.6358)	6.4850 (0.8897)
$y_t \rightarrow h_{yt}$	45.8764 (0.0000) [+]	42.0414 (0.0000) [+]	34.1444 (0.0006) [+]
$y_t \rightarrow h_{\pi t}$	2.9464 (0.5668)	4.3262 (0.8266)	9.1483 (0.6902)
$\pi_t \rightarrow y_t$	2.4143 (0.6600)	6.2706 (0.6169)	19.5817 (0.0754) [-]
$y_t \rightarrow \pi_t$	1.5065 (0.8255)	6.9520 (0.5418)	8.4187 (0.7516)
$h_{yt} \rightarrow h_{\pi t}$	3.6980 (0.4484)	2.8534 (0.9432)	6.8827 (0.8653)
$h_{\pi t} \rightarrow h_{yt}$	3.5352 (0.4725)	5.4596 (0.7075)	6.5303 (0.8870)

Note: π_t and y_t denotes inflation and output growth respectively, $h_{\pi t}$ and h_{yt} stand for inflation uncertainty and output uncertainty, respectively while $\pi_t \rightarrow h_{\pi t}$ means inflation granger causes inflation uncertainty. The numbers in the first row give the different lag orders and given figures are χ^2 statistics, while the numbers in the parentheses are the p-values. The signs in square brackets show the signs of causality of the causing variables such that a + (-) indicates that the sum of the lagged coefficients of the causing variable is positive (negative).

The first four rows report the estimated results of Granger causality for the casual interactions among inflation, inflation uncertainty and output uncertainty. The estimated results firstly test the Friedman's idea that higher inflation is generating inflation uncertainty. Our estimated results intensely support the Friedman's hypothesis by all the given lags. The result is consistent with the existing empirical studies in the neighbouring

[6] The alternate approach is criticized due to its simultaneous estimation strategy by including conditional variances in the mean equations and by the failure to identify the pro-longed lagged effects of the causing variables.

emerging and developing countries such as Mohd, Baharumshah and Fountas (2012) for Malaysia, Indonesia, Phillpines and Thailand; Heidari, Katircioglu and Bashiri (2013) for Iran; Baharumshah and Soon (2014) for Malaysia; Rizvi *et al*. (2014) for ten Asian countries including Pakistan and India. The similar estimated results were also reported by the existing studies (*e.g*. Chowdhury, 2014; Javed and Khan, 2012) for Pakistan and India respectively. Next, we also check the reverse causation (causality of inflation uncertainty on inflation rate) which shows that there is no significant effect of inflation uncertainty on inflation in Sri Lankan economy. The estimated result is consistent with the estimated findings of Paul (2012) for the failure of supporting Cukierman-Meltzer's idea for Bangladesh by using quarterly data and EGARCH-M approach. This further designates that there is no confirmation of negative or positive effect of inflation uncertainty on level inflation as suggested by Holland (1995) and Cukierman and Meltzer (1986) respectively. Also, the estimated results of the causal relationship of inflation and output uncertainty explain that inflation rate is impeding output growth uncertainty in Sri Lanka at lags 4 only which contradicts the Friedman-Ball hypothesis and Okun's (1971) assumption that higher inflation induces inflation uncertainty and further generates output uncertainty as Okun (1971) postulated.

Thus, our results support the combination of Friedman and Taylor effect as observed by the negative effect of inflation on real uncertainty. Theoretically, the effect of inflation on real uncertainty is somewhat ambiguous, where Ungar and Zilberfarb (1993) propose the positive impact of inflation on output uncertainty (Taylor's idea). The fourth row checks the causal relationships between real uncertainty and inflation rate with no evidence of the existence of the causal relationship between growth uncertainty and higher inflation for Sri Lanka which does not support the hypotheses of positive impact by Devereux (1989) who extended the Barro-Gordon model by augmenting endogenous wage indexation. The positive effect of real uncertainty on inflation as suggested by Cukierman and Gerlach (2003) and that of negative impact by Taylor (1979) and Cukierman and Meltzer (1986) is also not evidenced by the estimated results.

In addition, the middle four rows of table 4 illustrate the Granger causality results for testing the relationships between economic growth, nominal uncertainty and real growth uncertainty. The estimated results for the causality running from inflation uncertainty to output growth positively hold for Sri Lanka. This supports the Dotsey and Sarte (2000) hypothesis that owing to nominal uncertainty, economic growth accelerates due to risk aversion behaviour and pre-cautionary savings. Their model is augmented by cash-in-advance approach such that pre-cautionary motive and risk aversion attitude of the economic agents encourage savings and hence economic growth is accelerated through investment. In sharp contrast, the irreversibility of investment such that foregoing current investment to future (Pindyck 1991) model is not supported by the estimated results. This is also in contrast to Friedman's (1977) claim that inflation uncertainty reduces real economic activity. Our results are in line with the recent study by Paul (2012) for the neighbouring country (Bangladesh) that uncertainty of inflation boosts economic growth. Further, the estimated results provide no support of negative relationship between output uncertainty and output growth as pointed out by Ramey and Ramey (1995). It also fails to support the Black (1987) idea of positive impact of output growth uncertainty on growth. Importantly, the estimated results also highlight the causal links between output growth and output uncertainty. Remarkably, there is a robust support for positive relationship between economic growth and real uncertainty. It provides an evidence for the existence of Fountas and Karanasos (2006) conjecture that output growth is stimulating growth uncertainty. Lastly, there is no support for the causal links between output growth and inflation uncertainty in the study area. Thus the estimated studies fails to support the positive effect of higher real growth on nominal uncertainty as postulated by the conjecture of Phillips and Friedman that in former case, higher economic growth stimulates inflation while in the latter case the higher inflation will affect inflation uncertainty positively.

The last four rows display the estimated results for the causal links between inflation, economic growth and their related uncertainties. The estimated results reveal that inflation impedes output growth as illustrated at lag 12 which rejects the findings of the empirical study by Mallik and Chowdhury (2001) for four south Asian countries including Sri Lanka. The argument is that their study can be criticized on the grounds that their estimated results are based on traditional time series analysis and have not considered the existence of structural breaks and role of other macroeconomic variables affecting economic growth. Our estimated results are also consistent with existing scant empirical studies for Sri Lanka (Gunasinghe 2007 and Madurapperuma 2016). Both of the studies have proved the negative effect of inflation on country economic growth through the co-integration and error-correction strategies. In addition, there is no observed evidence that economic growth has any positive or negative effect on inflation while there also no relationship between output uncertainty and inflation uncertainty. Thus, this study fails to support Fuhrer's (1997) theory of negative impact of real uncertainty on nominal uncertainty and the positive effects of output uncertainty on inflation uncertainty as illustrated by Devereux (1989). Lastly, the estimated results ratify that nominal uncertainty is not instigating real uncertainty in

the study area. Accordingly, it is derived that only inflation rate induces its uncertainty while impeding output uncertainty and output growth is leading towards real uncertainty while there is negative effect of higher inflation on real economic activities.

Conclusion and policy recommendations

High and sustained economic growth along with low and stable inflation is the central objective of macroeconomic policy but there is perceived trade-off between lowering inflation and attaining economic growth. Also, there is lack of consensus and clear cut empirical evidence on the effect of higher inflation on inflation uncertainty and its inverse. Importantly, the situation is also same on the effect of real uncertainty on output growth and inflation. This study has, therefore, empirically inspected the causal links between inflation, output growth and their related uncertainties in an ideal economy, experiencing high macroeconomic instability and economic uncertainty. The study also attempt to empirically determine whether uncertainty of both inflation and output growth rate is symmetric or asymmetric. Explicitly, the study tries to test the various related hypotheses developed by Friedman (1977), Ball (1992), Cukierman and Meltzer (1986), Pindyck (1991), Holland (1995) and Dotsey and Sarte (2000) by the testing of various parameters for Sri Lankan economy.

Using AR(*p*) - EGARCH methodology to measure conditional variances for both inflation and output growth, the empirical results have several important conclusions for the study area as well as for the other neighbouring developing countries. Firstly, the widely-used Friedman's doctrine of positive impact of inflationary shocks on inflation uncertainty is strongly evidenced. Also, inflation is a negative determinant of economic growth as observed by the estimated results directly and indirectly (through the channel of nominal uncertainty as proposed by Friedman (1977) Thus, the estimated findings explore the view that higher inflation has real effects and demands for the goal of lower and stable inflation for the central monetary authority of the country. Secondly, output growth is a positive determinant of real uncertainty. This result is robust but theoretically, there is indecisive literature on the effects of real growth on its uncertainty. Still, our estimated results have important policy implications for the construction and designing of macroeconomic and macro econometric models for ensuring economic growth. The results also impart the view that policy makers should aim to attain stable and robust economic growth. Specifically, it evaluates the analysis of business cycles variability and economic growth and argues that unlike to the separate studies of the both (as evidenced in the earlier business cycles literature), the macroeconomic modelling makers should include both output growth and real variability in their macroeconomic modelling frameworks. Consequently, the claim that output growth is reducing real uncertainty does not appear to find support here. Thirdly, higher inflation is rising output growth uncertainty and inflation uncertainty is encouraging output growth. These results imply that higher inflation has not only its direct effect on inflation uncertainty but also on real growth and its stability.

The empirical findings of this study are vital to macroeconomic policy makers, macroeconomists, financial analysts, academicians and central bank officials in understanding the casual dynamics and volatility transmission between inflation, its uncertainty, output growth and real uncertainty. This study imparts guideline for them to take appropriate policy measures to maintain price stability along with output growth stimulation. This study eliminates the doubts existed in the empirical studies on the cause and effect of inflation and its uncertainty. It also specifies whether inflation has any significant effect on output growth and whether economic growth uncertainty has consequences for level growth and inflation. While filling the knowledge, this study has important theoretical implications for the policy makers to expectations formations and macroeconomic uncertainty process. In this study, the empirical strong evidence that inflation raises future inflation uncertainty necessitates the need for better monetary stabilization and demand for targeting inflation by independent authority of central bank. More importantly, the current macroeconomic environment of the Sri Lankan economy (where inflation is rising continuously), appeal for more dynamic stabilization policy implication for central banks to deal with high inflation along with safety to economic growth. The causal links between inflation, output growth and their uncertainties also augment the policy makers to explore the desirable policy frame work. The study also tests the validity of various hypotheses and point out the existing phenomenon in the study area. This study suggests the use of monetary policy for achieving multiple policy objectives such as reducing inflation and its volatility after considering economic growth. However, the study calls for empirical work needed on uncertainty of interest rate and exchange rate in order to better understand the causal direct and indirect interactions of inflation and output growth and their uncertainties. Further research may also require to examine the possible structural breaks and non-linearities of these variables and to augment the findings with other GARCH family models.

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Population Dynamics: Geographical Differences in Countries of the Baltic Sea Region

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Abstract:

Prior to the 1990s, the population of all states of the Baltic region increased in spite of the countries' natural, social, economic and political differences. Since then, the cross-country particularities have become significant due to the increased differences of both natural and, in particular, migratory population movements. Using the graphical-analytical methods and typology analysis techniques, the authors analyze demographics of the nine countries of the region and identify their demographic types by features of the specific components of their population dynamics.

The article presents the main reasons for the qualitative differences. It is noted that the concept of the Second demographic transition cannot be applied at least to a part of the Baltic region, and the attention should be paid to the interdependence of economic and demographic processes.

Keywords: baltic sea region, population dynamics, population reproduction, migration, second demographic transition.

JEL Classification: F22, F52, F66, J61.

1. Introduction

In the second half of the twentieth century, there were dramatic changes in population dynamics in the Baltic region countries[1]. In some states, such as the Nordic countries, the initially relatively high growth rate declined. In others, *e.g.* the Baltic States, the population began to decline since the beginning of the 1990s. In Russia, after the drop the number of inhabitants began to rise again in the 1993 – 2009. Germany saw a slight reduction in the 1970s and 1990s. In Poland, the population was shrinking in 2010 and in 2012 – 2015.

With all the differences of dynamics, ranks of countries in terms of population have not changed over 65 years. As before, the Russian Federation has the first place, Germany coming second, and Poland third, followed by Sweden, Denmark and Finland. The smallest in terms of population size are Lithuania, Latvia and Estonia.

In the context of the Baltic region states, the article considers the components of population dynamics (natural and migratory movement), as well as the main causes of emerging qualitative interstate differences in the demographic situation.

2. Changes in the population size

In 1950 – 1990, the population grew in all countries of the Baltic region, with the exception of the 1970s, when the German population slightly decreased (Table 1). Poland, Russia and Lithuania showed growing population rates, while the Nordic countries and Germany were low on the list.

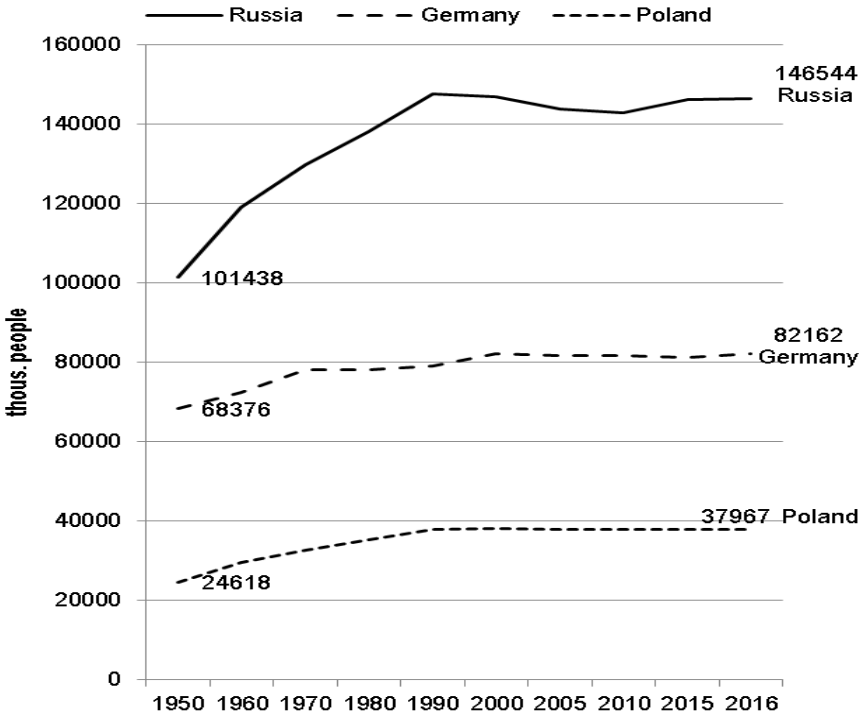
[1] The countries of the Baltic region include Russia, Germany (until 1990 existed in the form of two states – Federal Republic of Germany and East Germany – and West Berlin with its special status), Poland, the three Nordic countries – Sweden, Denmark and Finland and the three Baltic states, which until 1991 were part of the Soviet Union – Lithuania, Latvia and Estonia. All of these countries, and they alone, have access to the Baltic Sea, which has a significant impact on their development.

Table 1 - Population Dynamics of the Baltic region countries, 1950 – 2016

Country	Increase (decrease) of population for the period, %						
	1960/1950	1970/1960	1980/1970	1990/1980	2000/1990	2010/1990	2016/2010
Russia	17.4	9.2	6.3	6.9	-0.5	-2.8	2.6
Germany	6.1	7.9	-0.1	1.2	3.9	-0.4	0.4
Poland	19.7	10.8	8.4	7.4	0.6	-0.6	-0.1
Sweden	6.9	7.1	3.7	2.7	3.9	5.4	5.5
Denmark	7.4	7.5	4.4	0.3	3.8	0.3	6.8
Finland	10.7	4.6	3.4	4.3	4.0	3.5	2.5
Lithuania	7.1	13.2	9.1	8.5	-4.9	-10.5	-8.1
Latvia	8.2	11.8	6.7	6.3	-10.7	-11.0	-7.2
Estonia	9.9	12.1	8.9	6.7	-10.8	-4.9	-1.3

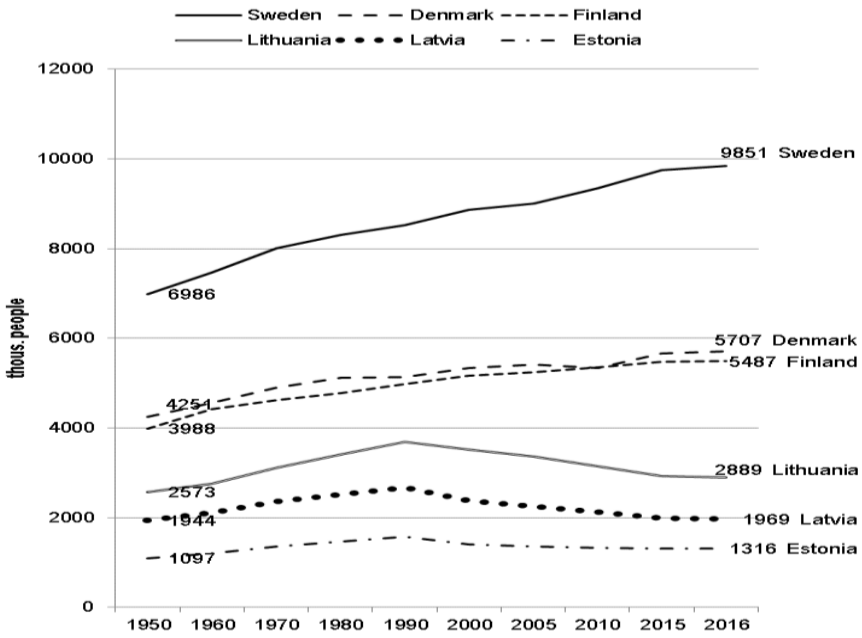
Source: calculations based on the official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat," accessed June 14, 2016, http://ec.europa.eu/eurostat.

The turning point for the former socialist countries was the beginning of the 1990s when the fundamental political and socio-economic changes started to affect. From that moment on, the population of the Baltic countries has been in decline. In Poland, due to the high proportion of young population, the reduction began twenty years later. In Russia, the population has been on the rise again since 2009. In 2002 – 2016, the highest growth rates were typical for Denmark and Sweden, while Russia, Finland and Germany were showing less rapid increase. A slight decrease in the number of inhabitants was observed in Poland; Estonia saw a more significant drop, and Lithuania and Latvia suffered most. Graphically, the change in population of the Baltic region countries is reflected in Figures 1 and 2.



Source: calculations based on the official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat", accessed June 14, 2016, http://ec.europa.eu/eurostat.

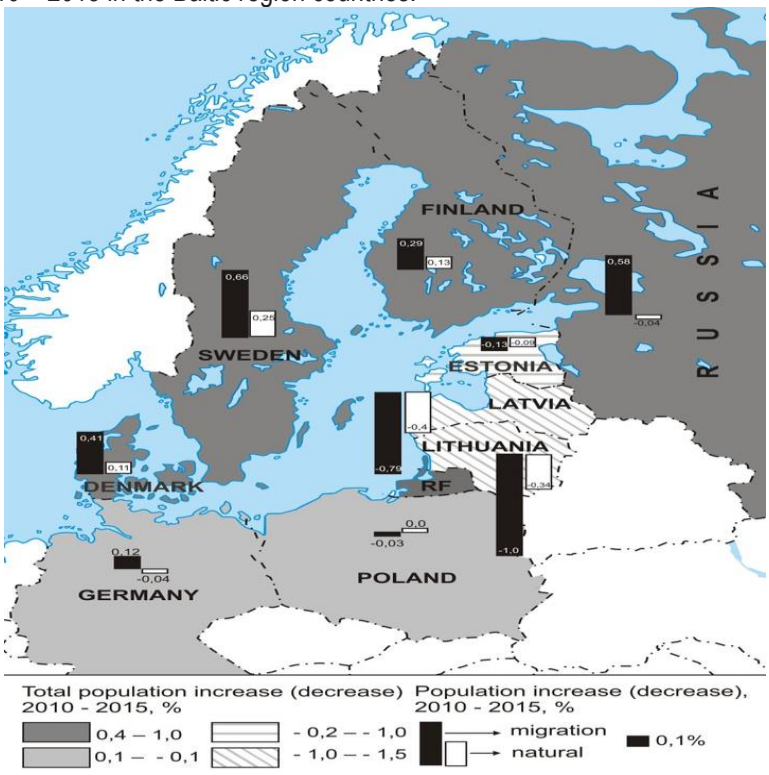
Figure 1 - The population dynamics of Russia, Germany, and Poland, 1950 – 2016 (at the beginning of the year)



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 2 - Population dynamics of Sweden, Denmark, Finland, Lithuania, Latvia, and Estonia, 1950 – 2016 (at the beginning of the year)

Figure 3 shows the ratio of the role of natural and migratory movements in the dynamics of its population size for the years 2010 – 2015 in the Baltic region countries.



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 3 - Average annual coefficients of the total, natural, and migratory population growth in the Baltic region countries, 2010 – 2015

Evidently, the main role in a fairly high rate of population growth in the Nordic countries (0.4% per year in Finland, 0.5% in Denmark, and 0.9% in Sweden) has a positive migration balance, although there is a small natural increase too. However, the excess of the birth rate over death rate in these countries is not due to the numbers of newborn children sufficient for enhanced reproduction of the population, but to increasing life expectancy.

In the Baltic States, on the contrary, the population decline is equally accounted for by migration outflow of the population (it plays a major role), and natural population decline. The average annual rate of population decline in Latvia amounted to 1.3%; 1.2% in Lithuania and 0.2% in Estonia.

In Russia, the annual population increase by 0.5% is mainly due to migration gain against the background of a low natural population decline. However, in 2013 – 2015 a small natural population growth was observed caused by the increase in life expectancy as well as an increase in the number of births stimulated by the *maternity capital* – a measure that proved quite effective in boosting birth rates.

Germany and Poland did not see any significant changes in population in the years 2010 – 2015. A slow growth in Germany (less than 0.2% per year) resulted from an excess of low migration increase over an even less natural loss of population. The average annual decline in population in Poland amounted to just 0.02%; the reason was a slight migration outflow of the population with almost zero natural growth.

3. Reproduction of the population

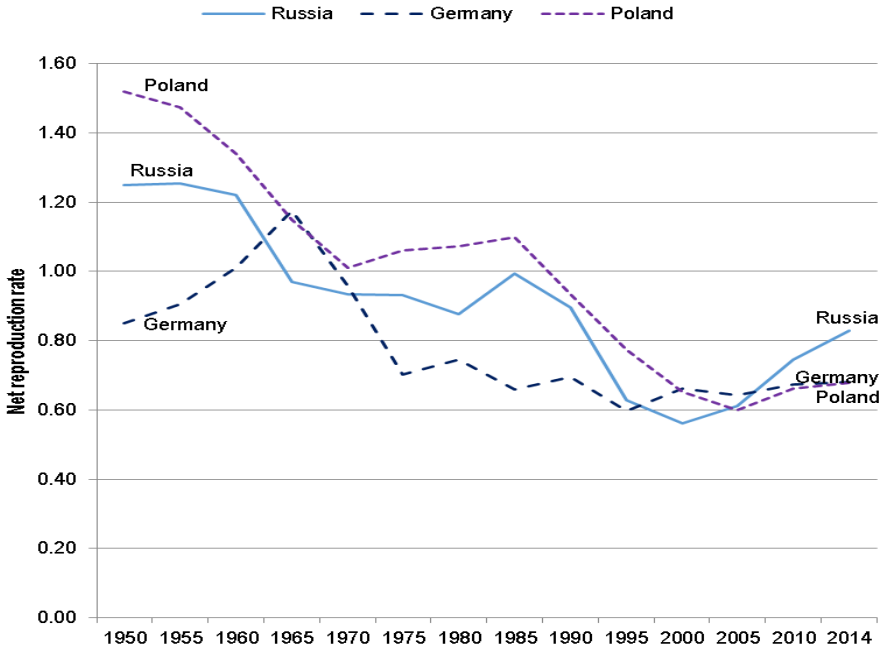
Despite the fact that some countries of the Baltic Sea region have shown positive birth rate dynamics, the general population number has been going down for a long period. However, in the 1950s, most countries of the Baltic Sea region (except Germany, Latvia and Estonia) had expanded reproduction of the population (*i.e.* above the replacement level) (Figure 3 – 5).

In Poland, where in the 1950s the traditions of Catholicism were still strong, the net reproduction rate was highest in the Baltic Sea region and exceeded 1.5 (Note 2)[2] (Figure 4). However, in 1985 – 1990, the type of reproduction changed from the above to below replacement

By 2014, the net reproduction rate dropped to 0.68. In Germany, in the 1960s, only basic population replacement was registered. In 1965, there was a slight increase in the population reproduction rate. However, after a few years, the net reproduction rate dropped again to less than 1. In 2014, this indicator went down to just 0.68 in both Poland and Germany.

In the Russian Federation, the expanded reproduction of the population changed to below replacement level in the first half of 1960s. In 1985, with the beginning of the anti-alcohol campaign, the birth rate in the country went up, and the reproduction of the population reached the replacement level. However, the deterioration of the socio-economic situation in the years of “perestroika” led to narrowed reproduction of the population already in 1990. Then, after the collapse of the Soviet Union and due to the difficulties of transition from the command to market economy, the birth rate began to decline sharply. In 1999, the net reproduction rate reached its minimum – 0.54. Then, after the economic crisis and the transition period from one type of economy to the other was over, living standards of the population improved significantly. It resulted in an increase in the reproduction. An efficient measure was introduced on January 1, 2007 – the government introduced a family support measure in the form of the so-called maternity capital. Just to compare, in 2006, the net reproduction rate in Russia was 0.62 and 2014 rose to 0.83. Higher population reproduction rates are only observed in those countries of the Baltic Sea region that have a strong social policy, such as Sweden and Finland.

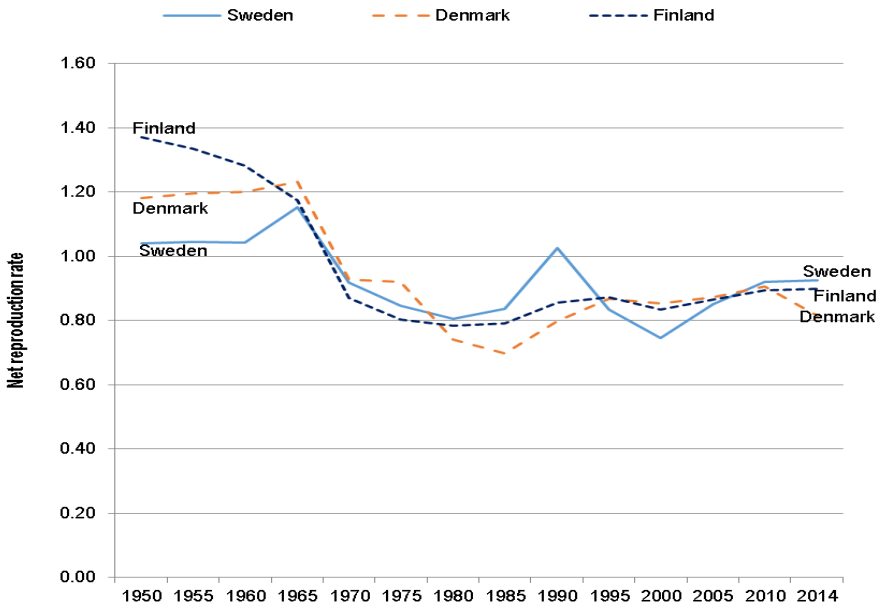
[2] The net-coefficient (or the net rate as it is often called in Russian demographic handbooks) of population reproduction indicates how many daughters born to an average of one mother live to the age of the mother. When net factor equals 1, the parent generation is replaced by the same number of daughters, and the reproduction of the population is basic or simple. If the net rate is greater than 1, the reproduction of the population is expanded, less than 1 - narrowed.



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 4 - Net-rate dynamics of the population reproduction in Russia, Germany and Poland, 1950 – 2014

In the three Nordic countries (Figure 5), the transition from the expanded reproduction to the narrowed one occurred during the second half of the 1960s. Only in 1990 – 1992, in Sweden the net rate raised over 1 (1.01 – 1.03). In 2014, the highest rate in the entire Baltic Sea region was in Sweden (0.93) followed by Finland (0.90) and Denmark (0.81).

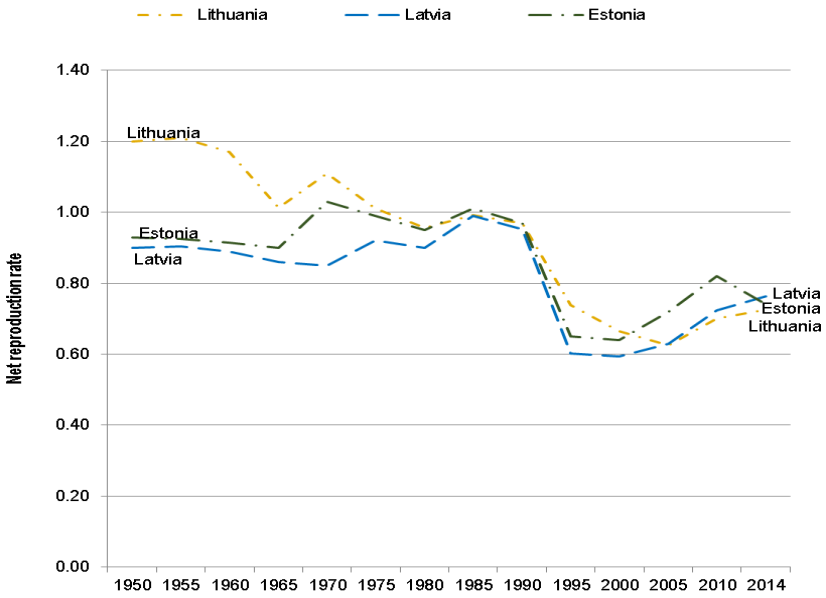


Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 5 - Net-reproduction dynamics in Sweden; Denmark and Finland. 1950 – 2014

In 1950, the Baltic republics of the USSR varied significantly in the level of reproduction of the population. In Lithuania, the reproduction of the population was expended, in Latvia and Estonia – narrowed (Figure 6). In the 1980s, the figure got closer, with the reproduction of the population approaching the replacement level. However, in the 1990s, the reproduction of the population got slower; the same trend was registered in the Russian

Federation for similar reasons. In 2014, the net reproduction rate in the Baltic countries was 0.73 – 0.76 (lower than that of Germany and Poland).

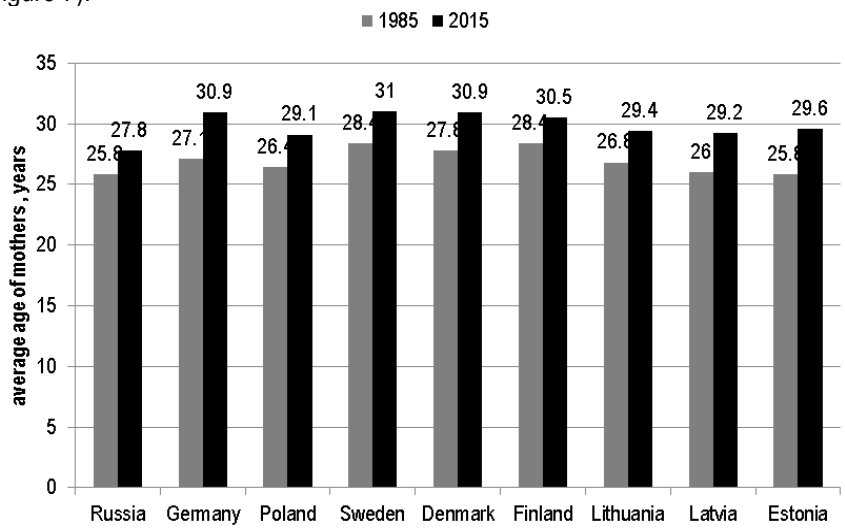


Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 6 - Net-rate reproduction dynamics in Lithuania, Latvia, and Estonia, 1950 – 2014

Thus, for a long period of time, none of the countries of the Baltic Sea region has had the "parent" generation fully replaced by the "children" generation. In the Baltic countries, Russia, and Germany this has led to the natural loss of population, *i.e.* apparent depopulation. In the Nordic countries and Poland, depopulation has not been so obvious due to the demographic potential accumulated in the previous years, and/or the rejuvenating effect of migration. In these countries, the natural population growth is still maintained, but the situation will inevitably change in the future.

One of the most important factors affecting the reproduction rate is the 'aging' of fertility. In 1985 – 2014, the average age of women having their first child went 2 – 5 years up in all countries of the region: from two years up in Russia (where this indicator was the lowest) to 4.8 years in Latvia and Estonia. The highest fertility age (30.5 – 31.0 years) is registered in Germany and the Nordic countries. The three Baltic States take the middle position (29.2 – 29.6 years), followed by Poland (29.1) and Russia with first time mothers being 1.3 years younger than in Poland (Figure 7).



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat

Figure 7 - The average age of mothers at birth in the Baltic region countries, 1985 and 2014

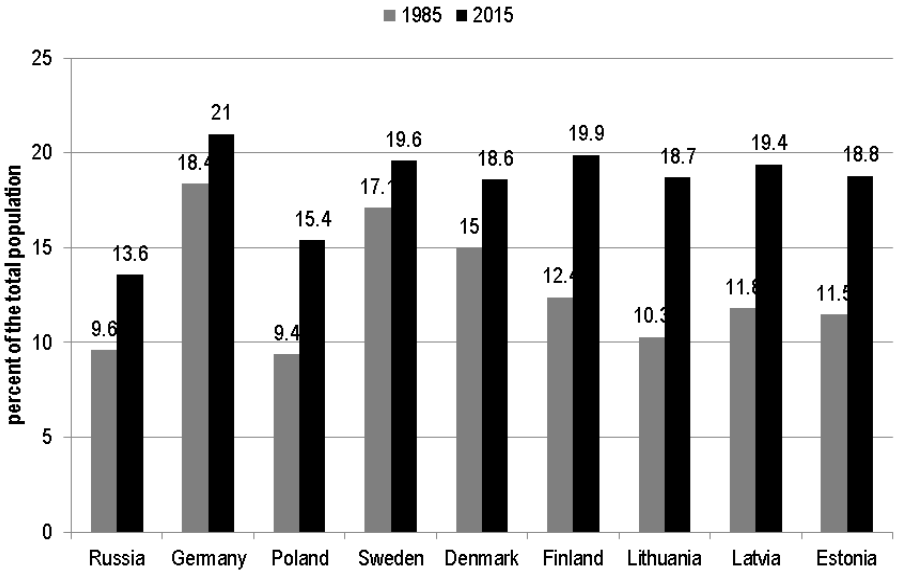
4. Life expectancy and the aging of population

In developed countries of the region, low birth rates and increasing life expectancy (reaching 78 – 80 years for men and 83 – 84 years for women) (see Table 2) leads to an intense aging of the population, *i.e.* the share of elderly people in the total population is constantly increasing (Figure 8).

Table 2 - Life expectancy at birth, years

Country	Year	men	women
Russia	2014	65.3	76.5
Germany	2014	78.7	83.6
Poland	2013	73.0*	81.2*
Sweden	2013	80.2	83.8
Denmark	2014	78.7	82.8
Finland	2013	78.0	84.1
Lithuania	2014	69.2	80.1
Latvia	2014	69.1	79.4
Estonia	2014	72.4	81.9

Source: calculations based on official data of "Rosstat" accessed June 10, 2016, http://www.gks.ru, "Eurostat," accessed June 14, 2016, http://ec.europa.eu/eurostat and "UNECE," accessed June 10, 2016, http://w3.unece.org/PXWeb/ru/TimeSeries?IndicatorCode=37&CountryCode=616



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 8 - The share of people older than 65 years in the general population structure in the countries of the Baltic Sea region (percentage 1985 and 2015)

The 'youngest' countries of the Baltic Sea region are Russia and Poland. The aging of the population in them follows the bottom-up model due to the declining birth rate. Life expectancy in Poland and Russia is much lower than in the Nordic countries and Germany. In the Baltic countries, low birth rate is a major contributing factor to the growing proportion of the elderly. Another significant factor is a high migration outflow of the population, since the majority of people leaving the country are young. In 1985, Germany and Sweden had a high proportion of people over 65 years. The population in these countries is aging both due to a lower birth rate and the death age pushing higher.

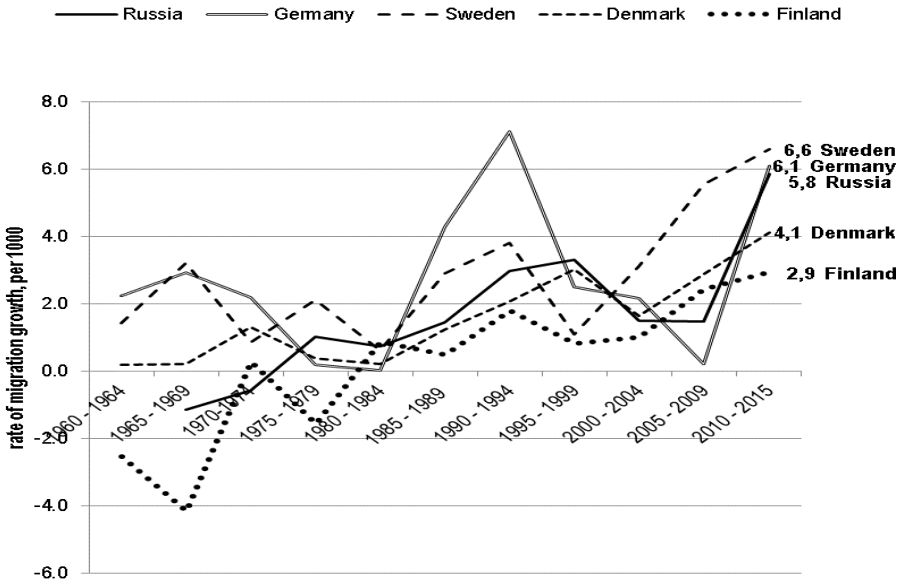
Table 3 - The age structure of the population

Country	Age groups		
	0-14	15-64	65 and over
Russia	16.7	69.8	13.5
Germany	13.2	65.8	21
Poland	15	69.6	15.4
Sweden	17.3	63.1	19.6
Denmark	17	64.4	18.6
Finland	16.4	63.7	19.9
Lithuania	14.8	66.5	18.7
Latvia	15	65.6	19.4
Estonia	16	65.2	18.8

Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat," accessed June 14, 2016, http://ec.europa.eu/eurostat.

4. The role of migration

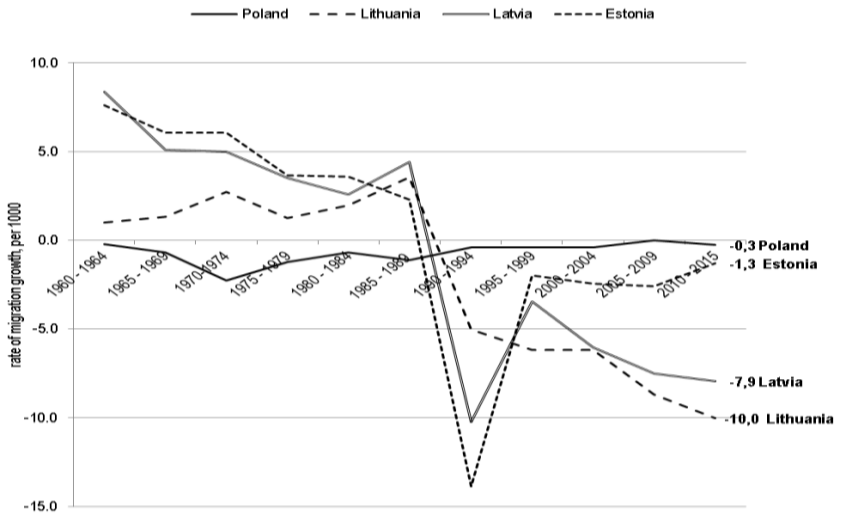
When it comes to migration and its role in population dynamics, two groups of countries stand out in the Baltic Sea region. Russia, Germany and some Nordic countries have the highest migration growth rate (Sweden, Germany and Russia), followed by Denmark and Finland (Figure. 9). Figure 9 shows a clear upward trend in all these countries.



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 9 - Dynamics of the average annual rate of migration growth in the Baltic region countries with a positive balance of migration during the first half of the 1980s until 2015

There has been an outflow of population in the three Baltic States and Poland. (Figure 10). Poland had an outflow of the population during the socialist period of its history: after 1990, its population decreased with more Poles going to Germany as temporary labor migrants. In the Baltics, a significant outflow of the population was observed in the 1990s. After the demise of the USSR, there was a particularly high outflow of ethnic Russians returning to Russia. This trend was particularly apparent in Estonia and Latvia, where the share of ethnic Russians was particularly high. After the accession of the Baltic countries to the EU (2005), there was a significant influx of migrants to many European countries, particularly from Latvia and Lithuania (see Göler 2014). The rate of outflow was much lower in Estonia.



Source: calculations based on official data of "Rosstat," accessed June 10, 2016, http://www.gks.ru and "Eurostat" accessed June 14, 2016, http://ec.europa.eu/eurostat.

Figure 10 - Dynamics of average annual rate of migration growth in the Baltic region countries with a negative balance of migration during the first half of the 1990s until 2015 (thousand people)

5. On the concept of the Second Demographic Transition

The demographic changes that took place in Western Europe in the 1970s (a sharp decline in the rates of population reproduction, the transition towards a sustainable regime of narrowed reproduction) does not fit into the well-known concept of demographic transition. Scholars attempt to explain (but not predict) this pattern with the concept of the Second Demographic Transition, which emerged in the mid-1980s. However, unlike the concept of the "first" demographic transition, it is not universally applicable, as it limited to economically advanced countries that have reached a sufficiently high standard of living (see Lesthaeghe and Van de Kaa 1986; Van de Kaa 1999; 2002).

The features of the Second Demographic Transition show in the industrialized countries that have achieved a certain level of economic development as a result of scientific and technological revolution of the mid-twentieth century. The transition is based, on the one hand, on the changes in the demographic behavior of the countries' population ensuring a high standard of living, and, according to some scholars, following the trend of the "prevalence of [material] needs". The result of these changes is a steadily narrowed (below replacement level) reproduction of the population, depopulation, and, as a consequence, the reproduction of labor force below replacement level. On the other hand, this concept involves a significant influx of migrants in the country attracted by better conditions of life in their host countries and by available jobs that appear as a result of the reproduction of labor force below replacement level. Therefore, at least there should be countries from which the migrants required by the economy can be attracted.

The earlier history of the issue aside, it should be noted that since the early 1990s Eastern European countries of the former socialist camp have become one such source for the more economically developed countries of Western Europe. This is where we are faced with a serious violation of the Second Demographic Transition concept. The migration outflow of the population comes from industrialized countries with reproduction of the population and labor force below replacement level. One factor is the gap in living standards in Western and Eastern Europe despite the fact that, with the accession of a considerable number of former socialist states to the European Union the opportunities of free movement of labor within the EU opened up to all new members.

Poland and the Baltic countries are a typical example of industrialized - even postindustrial - countries with steadily narrowed reproduction of the population and negative migration balance. This is not to say that the economy of these countries has no shortage of labour force. For example, according to Eurostat, in 2015 Estonia showed the level of vacancies only slightly lower than the EU average, and higher than Finland (Eurostat. 2016). In 2015, when the EU average unemployment rate was 9.4%, in Poland it only stood at 7.5%, with 6.2% in Estonia, and 9.1%. In Lithuania; Latvia alone ranked slightly above average with 9.9%.

It seems that the concept of the Second Demographic Transition is not working in relation to these countries. Interestingly, the post-socialist Russia with approximately the same level of economic development, and reproduction of the population being steadily below replacement level, has enjoyed a significant migration

influx. This takes us back to the concept of economic and demographic situation developed back in 1970s by professor Agafonov (1970). This conception considers a close relationship of economic and demographic processes, the former playing the defining the role (Agafonov 1970, 1982; Agafonov and Golubev 1973).

Further enhancement of the Agafonov's theory was the concept of geo-demographic environment in which demographic processes are linked with all the external socio-economic factors (Fedorov 1984, 2014, 2014). Therefore, the concept of geo-demographic situation seems more applicable to the study of migration. Especially since the migration related to the subject of demography in its expanded interpretation has very little relation to the demographic processes in the classical sense, for migration processes are not socio-biological (such as birth or death) but socio - economic by nature.

Conclusion

The analysis of demographic processes in the countries of the Baltic region enables identification of several groups of countries differing not only in their specific population dynamics, but also in the level and specificity of the socio-economic development impacting on the geographical differences of demographic and migratory behavior of the population and, consequently, on indicators characterizing the demographic processes and structures. Current research results suggest four groupings:

1. *Denmark, Sweden, and Finland:* population growth is ensured by both the excess of births over deaths and the influx of migrants.
2. *Germany*: a positive balance of migration fully or partially compensates for the natural loss of population, which marked the first half of the 1970s.
3. *Lithuania, Latvia, Estonia and Poland* constitute a separate subtype: the population is reduced as a result of natural population decline (since the beginning of the 1990s) and migration outflows (from 1989 – 1990). In Poland, the birth rate exceeded the death rate (except for a brief period from 2002 to 2005. with a small natural decrease) that partially or fully compensates the loss of migration.
4. *Russia*: a positive balance of migration fully or partially compensates for the natural loss of the population that was evident from 1992 to 2012.

The main disadvantage of the demographic situation in all countries of the Baltic region is sharply narrowed reproduction of the population, and a long-going depopulation. Attempts to replace the missing labor by the influx of migrants (in countries with a positive balance of migration), although being economically advantageous, can lead to unpredictable political consequences, especially when it comes to the influx of immigrants from countries with very different civilizational features. Therefore, it seems appropriate to undertake an active demographic policy aimed at increasing the birth rate to a level that provides at least the simple (*i.e.* basic) reproduction of the population. The outflow of the population (usually of young age) from countries with a high negative net migration (the Baltic states) makes it even more difficult to increase the birth rate and cannot be evaluated positively either from the standpoint of economic development of the respective countries or in terms of reproduction of the population.

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Forecast of Development of the Russian Machine-Building Complex in the Context of Unstable Economic Environment

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Abstract:

The article is devoted to identifying the peculiarities and justification of the priority areas of development of the machine-building complex of the Russian Federation. Based on the analysis of statistical data on the state of the productive capacity of the Russian machine-building complex, the author has developed the scenarios of the strategic production potential of the Russian machine-building industry for the period up to 2025: inertial, modernization, partner; the choice of a partner scenario of development as the target has been justified. It was found that the Russian economy has necessary conditions and opportunities to solve the issue of complex modernization and ensure the pace of the advanced development of domestic machine-building enterprises. It is justified that an effective state import substitution program, which corresponds to modern requirements and is capable of ensuring the integrity and diversity of the process of transformation, must become the foundation for the realization of these goals.

Keywords: machine building, production potential, predictive model, scenarios of development, strategy, multiplier effect.

JEL Classification: E51, L60, L69.

1. Introduction

The development of machine-building production in Russia in the medium and long term will be defined by the volume of investment in the renewal of the material and technical base of the enterprises and by the level of competitiveness of the produced goods in the domestic and foreign markets. Investment activity of buyers will be the main factor in creating the demand for engineering products. The logical consequence of the activation of innovative activity should be an improvement in the competitiveness of enterprises in both domestic and foreign markets.

The results of the analysis of the prospects of strategic development of the Russian machine-building industry (Karsuntseva 2014) suggest the presence of three alternative solutions to a systemic problem.

1. Inertial scenario, which involves maintaining the current trends in the development of machine-building complex of the country without any major changes. The implementation of the inertial scenario will cause a further increase in the share of imports in the domestic market and the decline in the share of Russian exports with the sequential degradation of the domestic machine-building industry.

The inertial scenario does not require any substantial action by the state. The role of the state can be minimized and be, for example, in continuation of policies to encourage certain areas of research and project activities, in maintaining an optimal level of tariffs on the import of equipment from abroad, in increase of the level of localization of production equipment, in subsidizing and other forms of support of domestic producers that do not contravene the conditions and requirements of the WTO.

In the case of the implementation of the inertial scenario, the current negative trends in the development of the machine-building complex will remain, which may lead to further undesirable consequences:

- production capacity of enterprises will decrease and stagnate (degrade) to a complete loss of the key technologies of the Russian machine-building industry;
- share of imported equipment in the Russian market could grow to 90% within 5-7 years, and complete replacement of domestic products is possible for certain types of machinery equipment (Galeeva 2015);
- reduction in the number of people employed in machine-building industry due to a sharp drop in production (Tatarskykh 2014).

The implementation of the inertial rate means an approaching industrial collapse, the loss of the domestic market, deterioration of production potential of the machine-building industry (Fatkhutdinov 2011). In this case, it will cause serious damage to the technological security of the Russian economy and sharp increase in the total costs in related industries (energy, metallurgy, mining sector, etc.) due to the increasing dependence on imports. The manifestation of the negative impact of foreign oligopolists on the Russian economy is also possible. In the

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macroeconomic scale, all this will lead to an increase in unemployment and social tension in society, a significant deterioration of the geopolitical position of the Russian Federation.

2. Modernization scenario that provides constant state support in the field of research and development of domestic producers and modernization of material and technical base of enterprises, in promoting the transfer of Western technology, in the implementation of measures to improve the investment attractiveness of the machine-building complex.

Intensification of processes of creation of joint ventures with leading foreign manufacturers upon terms of technology transfer and a high level of localization of production is expedient in the interests of the national economy, as it allows to quickly master the production of new products and compete on equal terms with foreign companies in both domestic and foreign markets (Tsenina *et al*. 2016). State participation in the implementation of this scenario involves the formation of conditions to ensure the investment attractiveness of the Russian economy for the foreign capital. However, the importance of public control over the activity of enterprises of strategic importance for national security is worth noting (Ershova 2010).

The modernization scenario is not considered further in the work as a target, as excessive amounts of investment at the design stage will lead to an outflow of funds and render impossible the normal implementation of the next stages of the life cycle of innovation – commercialization, diffusion and routinization.

3. Partner scenario is described by modern trends of formation and development of institutional and organizational alliances on the basis of close cooperation between public authorities and private businesses. It is an active use of possibilities of public-private partnership (PPP) (Deryabina 2010), which ensure the implementation of innovations throughout the entire period, from creating the project to its final phase (Starkey 2002). The positive results of the implementation of a partner scenario include: dynamics of growth in the number of innovative design-oriented businesses (Davenport and Beck 2002) in the machine-building complex; reducing the time to create and develop new products through strengthening the coordination of the research and development (Nilsson and Olve 2001); growth of co-financing from non-budgetary sources; increase in the likelihood of successful implementation of investment projects and rational choice of priority areas of research and development.

2. Methods

2.1. Factors of growth of competitiveness of the Russian machine-building complex

The partner scenario meets the goals of the state program of import substitution at the first stage of implementation with a further prospect of inertial development of the machine-building industry up to 2025, based on established scientific and technological potential. Thus, the second stage of the program implementation involves only general measures of state support: customs tariff regulation, measures to improve development institutions, etc. The partner option is considered in the work as the target scenario of development of the machine-building industry.

The formation of the partner option of the industry development assumes average annual rate of renewal of production facilities at the level of 7% at constant prices, which corresponds to the rate of renewal of the active part of fixed assets in 2005-2008 (Russian Industry 2005, 2008). At the same time, the rate of disposal of equipment is taken into account at 2.5%, which is higher than the annual average in the base period.

The main components of machine-building production growth in the conditions of modernization of the Russian economy are domestic demand and import substitution, as these factors define the main areas and create preconditions for the innovative development of the enterprises of the machine-building complex of the country. Domestic demand for machine-building production is determined by the key parameters of scientific and technological development of the real sector of the economy (Tatarskykh 2013). Import substitution as an important factor of achieving a balanced development of the machine-building industry forms the necessary level of competitiveness of the domestic production to establish the optimal structure of imports and exports in the domestic market, which ensures technological safety.

The process of formation of the competitive production potential of the Russian machine-building industry in the short term will be influenced by two groups of factors:

- development of innovative sectors of the economy that provides a positive trend in the growth of the competitiveness of products (Dudin *et al* 2014);
- reduction of the potential of scientific and technological groundwork, which results in a loss of competitive advantages (Zhabin *et al.* 2015) (Figure 1).

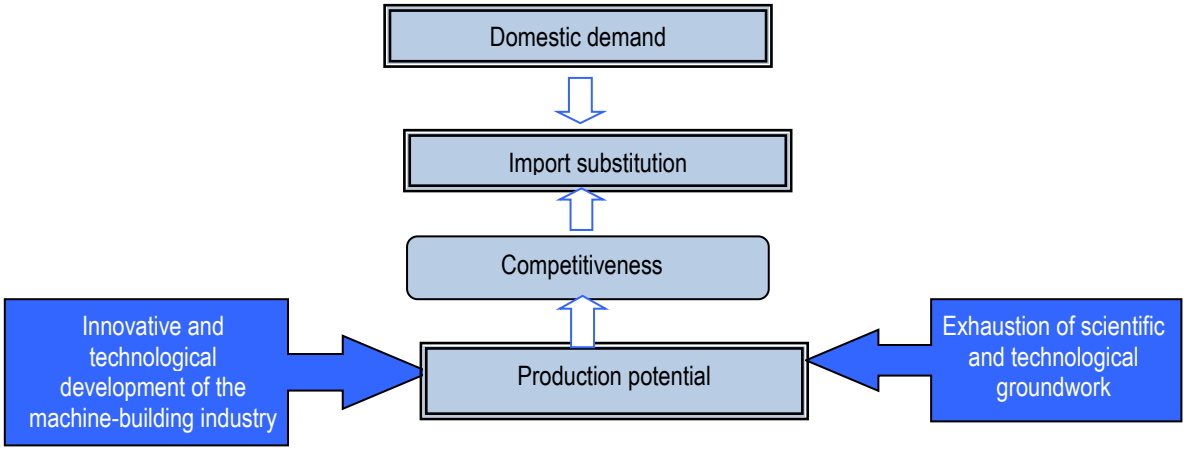

Figure 1 - Factors of import substitution of production of the machine-building complex of the Russian Federation

Exhaustion of scientific and technological groundwork is a limiting factor of the competitiveness growth (Prastacos *et al.* 2002) of the domestic machine-building industry. Restoration and development of the production potential require not only a considerable amount of financial investment in the renewal of the production facilities of the enterprises, but also the large time costs. Therefore, the delay in taking the necessary investment measures threatens the possibility of degradation of the complex (Karsuntseva 2013).

Enhancing the impact of the first factor on the production potential and competitiveness of enterprises will have a positive impact on reducing the impact of the second. Nevertheless, the restoration of the innovation component of productive capacity is a long and complicated process (Grabozdin 2014). Given a sufficiently high level of investment in the development of innovative activity in the short term, a weakening of the influence of negative factors in the medium term can be expected.

2.2. Development of a predictive model of development of machine-building production

Forecasting the domestic demand for machine-building equipment requires taking into account the impact of such innovative priority parameters as dynamics in the commissioning of new equipment in the active part of basic production assets of the enterprises of real sector of economy, as well as the dynamics of retirement. This means that the total domestic demand for equipment of the I - th group will be determined taking into account the intensity of the replacement of the old equipment by the new, purchased by companies within the framework of implementation of innovative projects (Pecherskaya *et al*. 2015). The valuation calculation of the annual demand of the domestic market can be represented as follows:

$$D = \sum_{i=1}^{n} A_{i0} \cdot \frac{(1 - C_{d.i}) \cdot C_{r.i}}{1 - C_{r.i}} \cdot K_{vi}, \quad (1)$$

where: A_{i0} is the cost of the active part of BPA of the *I*-th group by the beginning of the typical period, thous rub; $C_{r\,i}$ is the coefficient of renewal (commissioning) of the equipment of the *I*-th group; $C_{d\,i}$ is the coefficient of disposal of equipment of the *i*-th group; $C_{v\,i}$ is the coefficient of revaluation (valuation) of the fixed assets of the *i*-th group.

Thus, the pace of equipment upgrades is seen as the dominant innovative factor of forecasting of domestic demand in the coming period. The main limiters of the processes of commissioning of new equipment at industrial enterprises include limited funding, poor staff capacity, lack of reserve of capacity utilization, etc.

It is suggested to consider the formation of predictive coefficients of equipment renewal as a three-factor model, which depends on the amount of invested funds, the aggregate of technical and technological factors, production targets within the production plan:

$$C_r = f(I_t, F_i, V_j) \quad (2)$$

forecasting the rates of equipment disposal – as a two-dimensional model:

$$C_d = f(F_i, V_j) \quad (3)$$

Technology of formation of the predictive options can be presented in the form of some iterative sequence consisting of two stages. In the first stage, the coefficient of renewal of production equipment is chosen based on the retrospective analysis. For the innovation scenario, the annual average figures are selected that correspond to the period with the highest efficiency of the use and development of the productive capacity of the machine-building enterprises. At the same time, the performance of industrial potential is analyzed.

At the second stage, the cost of the new equipment and the total value of the investment costs, including the pre-production costs of enterprises (equipment installation, commissioning, etc.), are determined. If the value of the required amount of investment is above the potential funding, the repetition (iteration) of the forecasting procedures is made, with lowering the initial value of the renewal coefficient. Since the forecasting takes into account the average value of the coefficients or renewal and disposal, the procedure of their calculation takes the following form:

$$C_{ri} = \frac{\mathrm{P_i}}{\mathrm{P_i} + A_{i0}(1 - C_{di})}, \quad (4)$$

where: P_i is the cost of new production equipment of the i-th type; $C_{d\,i}$ is the coefficient of disposal of equipment of the i-th group; A_{i0} is the cost of the active part of BPA of the i-th group by the beginning of the typical period, thous rub.

In the late 90s of the XX century and early 2000s, the industry average of renewal of the active part of basic production assets in the machine-building industry has reached a critically low level and amounted to less than 1% with the industry average value of the coefficient of disposal of 1-3% (Rosstat). The logical consequence of this trend was the sharp decline in the share of new equipment in the structure of the production facilities of machine-building enterprises of the country.

Since 2005, there has been a positive trend in the renewal of production equipment, the highest industry average value of which was recorded in 2007-2008 and amounted to about 6%. The industry average value of the coefficient of disposal for the same period was 1.7% (Rosstat, Russian Industry 2005, 2008). Despite the positive dynamics of growth in recent years, it has not yet managed to overcome the negative effects of the crisis of investment activity of the early 90s of the last century. Today, the equipment of the 70-80s of the XX century makes up a significant proportion of production facilities of machine-building enterprises.

3. Results

In case of continued investment activity in the Russian machine-building industry at the rate of the late 2000s (about 6%) and the rate of disposal of equipment at no more than 1.7%, the share of advanced equipment in the medium term is expected to be 23.7% and will remain at the same level in the long term. The proportion of the equipment more than 20 years old in the structure of the active part of the country's basic production assets will be about 39% by the end of the medium-term period, followed by tendency of reducing the obsolete equipment to 28% by the end of the long-term period. Accordingly, in the implementation of the partner scenario, the worn-out equipment will always prevail in the structure of the active part of basic production assets, but its share will gradually decline. Using outdated equipment increases the manufacturing costs of the enterprise, has a negative impact on the technical parameters of products, and extends the time of its production, thereby reducing the basic parameters of the enterprise competitiveness in the market.

Modernization option of the machine-building industry development is possible at the volume of investment in the renewal of the production facilities with a coefficient of at least 10%. In the case of the coefficient of commissioning of 10% and the disposal rate of 3%, the average age of the equipment in the machine-building industry could reach 9-14 years by the end of the medium-term period. At the same time, the proportion of worn-out equipment more than 20 years old will be significantly reduced in the medium term (Table 1). The production and technical base of enterprises will form mainly due to the introduction of advanced equipment, the share of which could reach 40-44% by the end of the medium-term period. It is worth noting that the pace of equipment renewal at the level of 10% is not a record for the domestic industry, since it was a pace of renewal of the active part of fixed assets in the early 80s of the XX century, and this pace ensured the growth of production of some machine-building enterprises in 2006-2008. In this context, the forecasting pace of renovation of production facilities should be recognized as characteristic in the development of the modernization scenario of the development of the machine-building industry in the Russian Federation.

The pace of renewal of production equipment underlying the formation of forecasting scenarios of development will allow to significantly improve the structure, dynamics and prospects of development of the internal market by the end of the forecasting period (2025), and to reduce the share of imported equipment to a level that ensures technological and economic security of the country (Table 2).

In the case of implementation of the partnership scenario, a significant growth in industrial production in the medium term can also be expected, but the growth rate is unlikely to provide the full satisfaction of growing domestic demand for machinery and equipment.

Table 1 - Forecasting scenarios for development of the production potential in machine-building industry of Russian Federation, %

Test parameter	Typical period 2014, %	Inertial scenario		Modernization scenario		Partner scenario	
		2016-2020	2020-2025	2016-2020	2020-2025	2016-2020	2020-2025
Specific weight of advanced equipment in the structure of the active part of BPA	100	9.2	9.8	44.0	65.0	23.7	29.8
Growth of labor productivity	100	103.0	105.0	143.0	178.0	125.0	141.0
Growth of production capacity	100	102.0	103.0	145.0	195.0	112.0	135.0
Average age of the equipment, years	100	21.0	23.5	13.8	9.6	19.1	15.8
Share of machinery and equipment more than 5 years old	100	9.6	10.1	35.3	45.2	14.4	17.0
Share of machinery and equipment more than 20 years old	100	46.2	45.4	42.5	17.2	39.0	28.0
Average annual growth rate of the active part of fixed assets	100	100.5	100.0	108.0	105.0	105.0	106.0

Table 2 - Forecast of the structure and dynamics for Russian market of machine-building products in Russian Federation, %

Test parameter	Typical period 2014, %	Inertial scenario		Modernization scenario		Partner scenario	
		2016-2020	2020-2025	2016-2020	2020-2025	2016-2020	2020-2025
Rate of growth of production volumes	100	103	107	195	315	135	190
Rate of growth of the domestic market	100	165	185	287	330	195	236
Rate of export growth	100	101	102	125	168	110	133
Share of imports in total demand of domestic market	100	65	85	57	35	63	50

4. Discussion

According to forecasts, the growth of industrial production in Russia will be able to provide no more than 40% of the growth in domestic demand, *i.e.* the trend of increasing the share of imports in the Russian machine-building products market is expected to continue in the medium term. In the long term, the accumulated scientific and technological groundwork and the level of the reached competitiveness allow to achieve a significant growth in machine-building production, ensure the replacement of imports in the domestic market and significant export growth (Figure 2). Thus, it is about getting positive results and the effectiveness of the policy of import substitution (Salter and Torbett 2003), which determines the positive dynamics of the structure of the domestic market of machine-building products in favor of domestic producers in the long run.

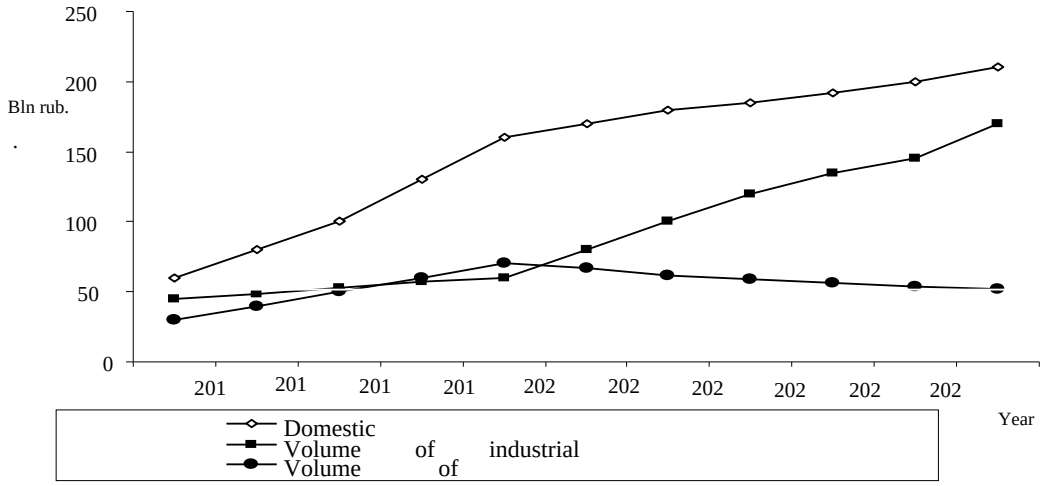

Figure 2 - Forecast of the potential of the machine-building products market of the Russian Federation

The process of activation of the technical re-equipment of industrial enterprises will be followed by a substantial increase in production efficiency. Influence of innovative factors will positively impact the growth of labor productivity and resource conservation, increase in the profitability of industrial activity, substantial strengthening of the competitive position of domestic producers in both the domestic and foreign markets (Lyasnikov *et al.* 2014).

The forecast of development of the machine-building production by individual economic activities in accordance with the target scenario in the medium- and long-term periods is presented in Table 3.

Table 3 - Forecast for development of machine-building production in the Russian Federation by types of products: the target scenario, %

Types of products	Typical period 2014, %.	Rates of growth of production volumes		Replacement of the growing domestic demand (import substitution)	
		2016-2020	2020-2025	2016-2020	2020-2025
Metallurgical equipment	100	130	205	26	80
Power generating equipment	100	143	234	33	90
Chemical and oil and gas equipment	100	160	294	30	86
Weight-handling equipment	100	115	210	29	90
Mining equipment	100	132	215	33	92

In the medium term, the most rapid development is expected in the most successful segments of the machine-building production – oil and gas and power machine-building industries. A large share of the growth in domestic demand for other types of machine-building production will be provided by foreign equipment.

In the long term, it is expected that the implementation of the target scenario will be followed by significant strengthening of the competitive position of domestic producers both in the domestic and foreign markets. The intense pace of import substitution can be observed in the markets of weight-handling and metallurgical equipment, where the share of imported equipment can be minimized at the end of a long-term period.

Conclusion

Innovation and technological renovation of production facilities of the machine-building industry should have a positive effect on the efficiency of economic activities of enterprises and their contribution to the formation of the general results of the socio-economic development of the country (Table 4).

The expansion of industrial activity will be followed by an increase in human resource potential, which has a positive impact on macroeconomic indicators such as employment and unemployment. However, it should be noted that the dynamics of the headcount of industrial production personnel will be somewhat lower than the rate of industrial production (Table 4). The increase in the personnel headcount will be ensured by the growth of production capacity and increase in the shift index, while the increase in production will primarily be determined by the productivity of labor. This factor will be crucial in shaping the performance of production activities of

enterprises throughout the forecast period, and its value will be determined by the pace of renovation of production equipment.

Table 4 - Assessment of the impact of raising the level of use of production potential of the machine-building industry on the dynamics of macroeconomic indicators of the Russian Federation: the target scenario, %

Indicator	Typical period 2014, %	Medium-term period (2016 - 2020)	Long-term period (2020 - 2025)
Rate of growth of gross value added	100	176	248
Rate of growth of the share of value added in production output	100	110	126
Rate of growth of the industrial personnel headcount	100	103	112
Rate of average wage growth	100	155	215

The main factor determining the formation of positive dynamics of macroeconomic indicators of Russia will be a multiplier effect obtained as a result of innovation and technological re-equipment of enterprises of the machine-building complex. The implementation of the integrated national program of import substitution in the machine-building industry will support cross-sectoral interaction, which would entail a substantial increase in investment and innovation activity in related industries. Sustainability of machine building and economy of the state as a whole will depend on the number of domestic manufacturers of machine-building products involved in the mechanism of innovation multiplier. This implies that an increase in the level of use and innovative development of the production potential has the dominant influence on the formation of the system of socio-economic factors in the development of the Russian economy, while the sustainability of economic growth is primarily determined by the level of innovation and investment activity of the enterprises of the real sector of the economy.

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Features of Migration Processes in Different World Industries in the Second Half of the XX Century

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Abstract:

The study of driving forces and particular changes in the territorial structure (or spatial organization) of the global industry is one of the traditional tasks for specialists in economic geography and economists. Its relevance is confirmed by the significantly accelerated processes dynamics in the context of globalization. The article shows that the structural approach in the study of changes in the spatial organization of the world industry must be combined with systemic and historical approaches. Therefore, the article presents the analysis of changes in the global industry for 50 years based on described selected research methodology. The authors reveal the forces, which have influenced the spatial organization of global industrial production, as well as characterizes structural changes and migration processes in the global industry taking place in the second half of the XX century. It is noted that the point of influence of the global industrial production has shifted to the Asian region.

Keywords: migration processes, industry, spatial dynamism.

JEL Classification: R12, F22, N50, N60.

1. Introduction

Globalization and innovative development led to profound changes in the sectoral structure of the global economy. The economy has been "servicized". Currently, the proportion of the distribution and services (tertiary sector) in global GDP is 62.4% (the proportion of secondary industry is 31.1%, agriculture - 6.5%, 2014) (The World Factbook). However, recall that despite the domination of the distribution and services in the creation of the global GDP and employment of population, the source of the progress of civilization and its measure is the improvement of forms and methods of material production, and primarily industrial production.

Deindustrialization, considered from the perspective of having the reduction of employment in the global industry, does not mean "irrelevance" of this sector to the economy (Rodionova 2014). Industrial development is crucial in achieving high performance and efficiency of the whole economic mechanism.

In this study, we were interested in the processes taking place in the global industry in the second half of the XX century (from 1950 to 2000). Enhancing the role of manufacturing industry in the sphere of material production in the concerned period was caused by a number of features of the postwar economic development of all countries in the world. It should also be noted that a number of industries from other sectors of the economy actually moved into the industry (including that from public catering sector - the production of semi-finished products. Now many foods are available in the retail network after industrial processing, etc.). Construction industry, as a new sub-industry, was also developing rapidly: construction increasingly has become just the assembly of finished parts of buildings and structures. Mechanization in all sectors of the economy largely contributed to the increase in industrial output.

New productions and advanced industries, such as nuclear industry, aerospace, electronics, bio-industry, etc. emerged in global economy. Initially, their development was carried out in the sector of military production, and only after a while their emerged production of consumer goods based on military technical background. Today the largest part of the R&D expenses accounts for most advanced industry sectors. Many new products (chemical fiber, synthetic rubber, detergents, medicines, vitamins, etc.) were commercialized. New and even old industries were engaged in manufacturing of fundamentally new types of products with the same purpose that was produced previously, though more efficient and advanced. Thus, manufacturing of synthetic detergents such

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as washing powder, cleaning preparations, bath gels and shampoos, etc. was entered into mass production. Technical improvement of traditional types of products was carried out commonly enhancing their production technology and quality. The impact of scientific and technological revolution has affected both the changing demand of production and consumer demand of the population that also determined the differences in the growth and development rates of individual plants and industries.

In the second half of the XX century, primarily under the influence of scientific and technological revolution, there were important shifts in both the sectoral structure of global industry and at the level of individual sectors of the manufacturing industry. Global industry system was formed based on the interaction of factors and the subordinated location of production facilities in many industries and various industrial territorial combinations in the territory of countries and regions. Changes occurred in various structures of global industrial production (global industry): industry-specific, organizational, and spatial structures.

2. Research methodology

The study of global industry has a number of important methodological features, whose essence consists in analysis of the nature of its industry-specific, organizational and other structures with the subsequent projection on the spatial structure of the given system (territories of countries and regions). Used specific scientific methodology of knowledge includes the politico-economical, economical and statistical analysis, feasibility study and other approaches. The unification of the diverse approaches into a coherent research methodology was based on geographical approach, which is characterized by the following features: territoriality, complexity, specificity, and globality.

Current study is based on theoretical and methodological works of domestic scientists in the field of economics and economic geography (Kondratiev 1993, Baransky 1990, Probst 1965, Maergoiz 1986, Saushkin 1973, Alaev 1983, Lappo 1997, Dmitrevsky 1990, Vitver 1963, Alisov and Khorev 2000, Khrushchev 1997, Zimin 1991, Volsky and Kolosova 1975, Schlichter 1995, Khorev 1981, Vitkovsky 1997, Maksakovsky 2008, Mironenko and Tverdokhlebov 1981 *et al.*), as well as foreign scientists (Smith 1962, Weber 1909, Christaller 1966, Lesh 1940, Hagerstrand 1953, Isard 1960 *et al.)* and other scientists involved in the study of international division of labor and having made a significant contribution to the development of economic theory considering use of space, distribution of productive forces, the study of the regional aspects of economic development, improvement of the spatial organization of the global economy and its industries. Many of the mentioned works are presented in the list of references used by the author and recommended to students for study. The study of global industry development and distribution problems is based on the application of general methodological concepts of systemic-structural approach. We used economic, statistical, historical, comparative-geographical, typological and cartographic research methods, as well as mathematical methods of statistical data processing. The used research methodology, which is based on macro approach, allowed considering global industry as a complex hierarchically organized polystructural system; world industrial production - as an element of the global economy as a whole; individual industries - as a part of global industrial production; industry of a country or region - as part of the global industry.

For consideration of development features of the global industry, study of objects such as a country and a region fully meets the basic objectives of the analysis. The third element (object) of research is the world as a whole. Macro approach means identifying the full range of reasons influencing the structural shifts of the global industry.

We have taken for granted the thesis that the global system of industry is formed based on the interaction of factors and the subordinated location of production facilities in many industries and various industrial territorial combinations in the territory of countries and regions.

To obtain a complete pattern, changes were detected in different structures of the global industry as a system in the industry-specific, organizational, social, and spatial structures. The structural approach means focusing attention on the feature of the world industrial system, which characterizes its relative stability (statics). However, the structural approach does not cover the totality of the qualities of the studied object. Therefore, it should be necessarily combined with systemic and historical approach. The system analysis method allows considering the integrity of the studied system, its internal and external communication links, interlinking complicated sectoral and territorial problems. The assessment of structural changes occurring in certain industries and industry in general, requires consideration of indicators corresponding to a sufficiently large time frame that excludes the impact of random indicators on the research results.

By comparison of the statistical data on production volumes of a particular product in the countries and regions of the world over time from 1950 to 2000, as well as considering the indices and coefficients of structural changes, a study was conducted to determine the nature of the territorial (regional) shifts in the distribution of individual productions and industries of the world. We have determined, whether they were ordinary or pivotal, and evaluated whether there was actual spatial redistribution of industrial production among regions and countries (Kashirin *et al.* 2016, Derunova *et al*. 2016, Rodionova 2014, Rodionova and Kokuytseva 2011).

The second half of the XX century was selected for the research. Many scholars identify this period as the second global integration cycle, when the global disintegration (1914-1945) was replaced by a new phase of the global economy consolidation. The actual "gain" of globalization in the XX century began just after 1970, while in the field of the capital investment - at the turn of the 1990-ies. At that, the beginning of 1950-ies is associated with the initial stage of the technological revolution, which provided comprehensive influence on virtually all spheres of the world community; whereas the 1970-ies are associated with the beginning of its second stage. The year of 1990 is also a milestone since it is the last year before the collapse of the Soviet Union and the entire socialist system. A new period of the global economy development started exactly after this year. This period was characterized by significant structural transformations in the economy of the former USSR republics and other countries, now called “transition” countries.

We are convinced that the condition of the research object in every moment should be considered not by itself, but only as a certain development stage of this object. Thus, we selected the time frame from 1950 to 2000.

The data on industrial production were analyzed in terms of natural indicators according to the volume or weight of manufactured products (depending on the industry under consideration). Statistical data for various countries were compared for 44 types of products manufactured by 19 leading industries. These data included the production output and product exchange for the “key” decades: 1950, 1960, 1970, 1980, 1990 and 2000, which are the most convenient for analysis since they are available in various international directories. Moreover, such ten-year periods allow considering adequately and clearly the achievements of scientific-and-technological advance in different countries and in the whole world.

The measure of structural changes in the world economic space can be assessed using different indicators, which are characterized by terms used in scientific literature, such as "displacement" ("transfer") of production, "redeployment", "industrial migration", and "geographical shift". Another used term is "international migration of production" (a conditional concept taken by analogy with the already accepted concepts of "labor migration", and "migration of capital") (Alisov 1987, Alisov and Khorev 2001, Rodionova 2014, Rodionova and Kokuytseva 2011).

Migrations or the movement of whole production and, specifically, equipment of industrial enterprises is in fact very rare. For example, it took place in the USSR in 40-ies, at the beginning of the Great Patriotic War, when industrial enterprises were evacuated from the European part of Russia to Ural and Siberia. Usually, when the industrial migrations still take place, for example, when moving production from one area to another or from one country to another, then as a rule, new enterprises are constructed in a new place. New productions, emerging in the countries and regions of the world, satisfy the consumer demand in products that previously were produced by closed enterprises in the developed countries or regions. Sometimes the construction of new enterprises is carried out by the same company or transnational corporation (TNC) that closes the old ones.

In the economic literature, the term “*structural changes”* usually means a change in the proportion between industries or within them (*i.e.* shifts in the sectoral structure). We have in mind a wider interpretation of this concept, describing *changes in all structures of the global industry*, including its *spatial aspect*.

Under *geographical shifts* or *migrations of industrial production* we understand changes in the distribution of industrial production, which are expressed in change in ratio of countries and world regions in global output of products during the period under study. When changes are detected in a small number of countries (regions), the shifts should be considered to be ordinary, if changes occur in a significant number of countries (especially having the largest characteristic value), then the shifts should be considered as pivotal.

It is advisable to distinguish "*direct*" and "*indirect*" migration. The "*direct migration*" will be taken into account only in the case, when the change in the proportion of a certain territorial unit (country, region) in the global output of products for a certain period of time was due to adequate change in the absolute volumes of these products output. If the change in proportions of territorial units is conditioned by just the difference in the growth rates of production of any type of product, then the migration is considered as "*indirect migration*". Migration processes in industrial production indirectly reflect trends in the cost of production of the same product

in different countries. This circumstance results in the changing of the role of the particular state or region in the international industrial division of labor.

Study of the structural changes in global industry was carried out at the level of seven geographical regions. They can be considered as already fully developed integration macro-regions or those being at the stage of development. These regions are: 1) North America (USA, Canada, Mexico); 2) Central and South America; 3) Western Europe; 4) Eastern Europe (including the countries of Central-Eastern Europe and all former Soviet republics); 5) Asia; 6) Africa; and 7) Australia and Oceania.

In our opinion, the choice of these regions as a tool in the analysis of geographical shifts in global industry is justified in terms of both their economic clout and their structure. Each of them includes industrialized and developing countries; there are "engines of development" (USA - in North America, Germany - in Western Europe, Brazil – in Central and South America, Russia – in East Europe, Japan and now China – in Asia, etc.). In these regions, there are also "outsiders", as there are differences in the level of socio-economic development of countries within the regions.

Inclusion of Eastern European countries (including countries of Central-Eastern Europe and all former Soviet republics) into a special region requires special explanation. Typologically, the Eastern European countries had many similarities, characterizing the peculiarities and regularities of their development in the second half of the XX century (geographical, ethnic, historical, political, etc.). After the Second World War in a short historical period, the countries of Eastern Europe transformed their economy and became industrial countries (or industrial-agrarian countries). Close integration communications were manifested in the foreign trade of all CMEA (Council for Mutual Economic Aid) countries. Currently, these states, including Russia and other CIS republics (the so-called "transition" countries) transform their economies in different ways and with varying degrees of success "from planned economy to market", trying to find their place in the international division of labor. In some international reference books, statistics for CIS countries is still marked as "former Soviet republics".

The selection of the region as a separate unit was also caused by the importance of comparing statistical data in dynamics, i.e. in the course of time, as during all postwar years up to the early 1990-ies it was a single economic region. They all belonged to the system of socialism and were part of the Council for Mutual Economic Assistance – CMEA. In our opinion, the allocation of the remaining regions does not require the special review.

To compare the intensity of changes occurring at the level of individual global industries in the second half of the XX century, and the extent of spatial redistribution of industrial potential at the macro-regional level, we selected several indicators. The change in the concentration ratio for 44 enterprises of the leading industries at the country and regional levels were defined based on the calculation and comparison of the ratio of the top three (five and ten) countries in the global production volume of a particular industry over time from 1950 to 2000.

To characterize the structural changes that result from uneven intensity in changes of indicators of the individual parts of totality, we compared changes in ratios of major regions in global manufacturing of a particular product. Besides, we calculated performance variations of absolute growths and growth rates of the individual ratios of the individual parts of the totality (quadratic coefficients of "absolute" (1) and "relative"(2) structural changes):

$$\sigma_{f_i - f_0} = \sqrt{\frac{\sum (f_i - f_0)^2}{n}} \quad (1),$$

$$\sigma_{\frac{f_i}{f_0}} = \sqrt{\sum \frac{(f_i - f_0)^2}{f_0}} \quad (2),$$

where: f_0 – is the region's proportion in the global industrial production of a particular industry in the basic year; f_i – is the region's proportion in the global industrial production in the current year; n – is the number of regions (in our case seven economic-geographical regions of the world).

The coefficient of "absolute" structural changes allowed quantifying average deviations in percents between the ratios of the individual parts of the compared totalities. This coefficient was calculated in two versions: a) relative to 1950; b) and relative to two adjacent dates (we compared data for the two neighboring decades, for example, the data of 1960, relative to 1950; 1970, 1960, etc.).

Indicators of "absolute" structural changes allowed measuring the intensity and rate of changes in each of the compared regions within the period from 1950 to 2000. The calculated indicators of "relative" structural changes characterized ratios or indexes of proportions of the regions (which indicated the rates of ongoing

changes), *i.e*. allowed revealing the proportionality of the changes, rather than the differences of the ratios of individual regions.

Groups of forces, which have influenced the spatial redistribution of the global industrial production. Select few generalizing factors that, in our opinion, contributed to the transformation of production and spatial structure of the global industry as a whole and of individual branches of industry. A kind of *centrifugal forces* can be classified as:

- full or significant depletion of mineral resources (or the deterioration of their quality) in economically developed countries that promoted exploration and mining in new remote areas of the same countries or in the territory of developing countries (conducted often under the control of and at the expense of investment of TNCs from economically developed countries);
- deterioration of technical and economic indicators of industrial production in economically developed countries (high wage of employees, high taxes, environmental restrictions, high cost of raw materials and energy, etc.);
- transition to a postindustrial type of development of the "core" countries of global economy (economically developed countries); the growing importance of the tertiary sector of the economy and the development of information industries, which require attraction in this sector a growing number of skilled labor force;
- adoption of legislative acts on environmental protection in the economically developed countries;
- the possibility of decomposition of many interrelated technological processes that allows reducing the total cost of manufacturing of a product unit as well as improving production efficiency;
- deepening process of specialization and the international division of labor in industry; the increasing specialization of countries and regions not only in the production of certain commodities, but also components, individual parts and assemblies;
- improvement of the global transport network (the possibility of transporting raw materials, intermediates, machinery and equipment parts and components, as well as finished products at the long distances with high quality delivery in the shortest possible time, etc.).

Another group of factors (forces) somewhat balances the action of the forces noted above, slowing down in some way the migration process of industrial production to new countries and regions of the world. They can be called *centripetal forces*, which in our opinion, include the following:

- high industry potential of developed countries, the availability and efficient operation of production capacities; increasing production efficiency through change of techno-economic indicators by implementing new and improved technologies (material and energy saving technologies, etc.);
- the broad possibility of using cheap imported raw materials as well as secondary raw materials in the production of a wide range of industrial products;
- the availability of a huge R&D capabilities, the development of new industries and high-tech productions; the use of the latest achievements of scientific and technological revolution, the widespread implementation of automation and computerization at all stages of the production process, improvement of the industrial production organization forms;
- receptive market outlets in the group of highly industrialized countries for products of majority of manufacturing industries, etc.

The cumulative effects of the considered centrifugal and centripetal forces resulted in a spatial global redistribution of industrial production among regions and countries.

Global deconcentration of world production. In the second half of the XX century the production volumes were growing in all of the considered industries (though growth rates were different). Note that the range of products was also increasing. Countries were increasingly specialized in the production of a particular product or its components. There has been a trend of wide distribution of production facilities into many countries all over the world. This resulted in decreased concentration ratio of global production in the group of leading countries at the regional and global level.

The conducted calculations revealed a change of the leading countries ratios, *i.e.* ratios of ternaries, quintuples and dozens of countries in the global production volume of different industries over 50 years (Table 1). In fact, in all industries (with very few exceptions) we noted a decrease in the concentration of production. It was particularly significant in black and nonferrous metallurgy, fuel industry, and in some branches of engineering, chemical and light industries. To some extent this is one of the evidences of the industrialization development on a global scale.

Thus, in 1950, almost the entire production of motor-cars, tape recorders and other appliances, the whole production of synthetic rubber, and secondary aluminum smelting were concentrated in the top ten countries of the world. Moreover, a high concentration ratio of production was also confirmed by very high proportion of the leading top five and top three countries. For example, the ratio of the three leading countries in 1950 was 96% in the extraction of natural gas, 93% in the production of motor-cars and synthetic rubber, etc. However, after 50 years there have been significant changes: by the year 2000 the proportion of the top three countries in the same industries decreased to 52, 46 and 43%, respectively (Table 1).

For certain industries (especially for those, where the concentration ratio has decreased just slightly) we noted the regularity of a different kind. In fact, many industries or enterprises changed the leaders. Thus, while in 1950 the top ten included basically just the industrialized countries, now, to a large extent, these are developing states (most often Asian). Or another direction of shifts - Asian and South American countries put considerable pressure on economically developed countries in Western Europe and North America in the group of leaders. Phenomena of such nature were observed in the group of machine-building industries (production of TV sets, refrigerators, tape recorders, washing machines, and computer equipment); in chemical industry (production of chemical fibers, synthetic resins and plastics, synthetic rubber); in the construction industry (production of cement etc.); in the light industry (production of cotton and woolen fabrics, etc., footwear) and even in the food industry (production of meat products, sugar, and animal butter). The processes, occurring in each of the considered industry, were identified while conducting analysis of collected statistics for all the analyzed industries in all considered countries.

Table 1 - The ratio of the leading countries in global extraction and production of particular industrial products (in natural indicators of production volumes), 1950 – 2015, %

Industrial products	Production concentration ratio								
	Ratio of top 3 countries			Ratio of top 5 countries			Ratio of top 10 countries		
	1950	2000	2015	1950	2000	2015	1950	2000	2015
Mining industry									
Oil	74	31	38	85	41	48	94	62	67
Natural gas	96	52	44	97	60	53	99	72	68
Iron ore	67	55	79	78	70	86	87	89	94
Bauxites	59	61	64	76	77	78	94	94	94
Copper ore	59	53	47	77	64	60	91	82	79
Manufacturing industry									
Iron ore	63	44	63	78	56	70	91	75	85
Steel	69	40	62	81	52	72	90	70	82
Alumina	81	51	74	90	66	82	99	84	89
Primary aluminum	81	40	66	88	58	74	97	75	84
Blister copper	62	41	46	78	55	60	93	74	79
Refined copper	68	43	58	83	56	68	94	74	75
Vehicles (all)	88	55	49	95	67	60	100	81	75
Motor-cars	92	46	53	98	55	66	100	83	85
Shipbuilding (vessels)	57	67	91	71	75	95	91	89	98
Nitrogen fertilizers	44	52	49	59	61	58	83	71	74
Phosphate fertilizers	52	56	67	64	68	75	83	78	85
Potash fertilizers	70	61	64	96	81	83	100	96	97
Chemical fibers	59	44	75	73	59	82	90	79	88
Cement	46	45	66	59	53	69	73	65	77
Paper and paperboard	65	48	53	73	60	65	87	76	77

It is important to pay attention to the following fact. We have analyzed changes in the concentration ratio in the period from 2000 to 2015 and identified an increasing pattern of this indicator. But, in our deep conviction, it does not characterize the decrease in the rate of proliferation of production capacities towards developing countries. This phenomenon is explained quite simply. This was actually due to the growth of the manufacturing ratio of most industrial products in China. It is exactly this country, which currently holds a leading position in many branches of the global industry.

Here are just some examples. Thus, the proportion of China in the iron and steel production by 2015 amounted to 50% of the world total (World Steel Association, 2016). At that, the proportion of top ten countries in

total accounts for 84%, while the proportion of the top three countries (China, Japan, and India) is 62%, whereas in 2000 this proportion amounted for just 40% (Table 1). In production of primary aluminum, the ratio of China is 55% of the world total (2015) (Mineral Commodity Summaries, 2016), while the proportion of other countries of the top ten accounts currently for just 40% of world production. At that, the total proportion of the top three countries (China, Russia, and Canada) is 66%, while in 2000 it was 41% (see Table 1). More significant progress has been achieved in cement production, as China's proportion increased to 57% of the world total (and consequently, the proportion of the top three leaders – China, India, and the USA – has increased to 66%) (Mineral Commodity Summaries 2016). In 2000, the proportion of the top three leaders amounted to just 45%, while China's proportion was 33% (Table 1). In other words, the overall manufacturing of industrial products in emerging countries has been growing, and many of them have turned into the group of leaders. Though, at that the growth rates of industrial production in China were much higher. At that, a similar pattern was observed in almost all branches of the global industry.

Data analysis shows that migration of industrial production into the Asian region was noted almost in all branches of industry. Here are some examples. The ratio of Asian countries in the global production of coke has grown during the period 1950-2000 from 3 to 58%; in steel production - from 4 to 42%; in motor-cars production - from almost 0% to 32%; in the production of TV sets - from 9 to 62%; in cement production - from 8 to 66%; in the production of nitrogen fertilizers - from 9 to 50%; in the production of synthetic rubber - from virtually zero to 35%; and in the production of various kinds of chemical fibers - from 8 to 62%, etc. Presented data confirm the fact of spatial redistribution of industrial potential and industrial production of the major regions of the world towards Asia. We can only add that according to the estimations made by the author, the proportion of Asian countries in global indicators has further increased, primarily due to the increase in China's proportion in global production. We can provide more examples. The proportion of China in steel production increased to 50% (and this is even more than the total proportions of all Asian countries in 2000), in the smelting of primary aluminum - up to 54% (while the total proportion of all Asian countries in 2000 was 20%). At that, China increased its output of primary aluminum in the period from 2000 to 2015 by 10 times (from 3 to 32 mln tons), while its proportion in the global production increased from 12 to 54%; steel output increased by 6 times (from 127 mln tons in 2000 to 805 mln tons in 2015). The proportion of China in manufacturing of all types of motor vehicles increased up to 27%, while in production of motor-cars – up to 30%, cement – up to 57%, etc. Respectively, the total proportion of Asian countries in global production was grown as well, in some industries – due to the proportion of Western Asian countries (Middle East region), but basically – at the expense of the East, South and Southeast Asian countries. In other words, these data confirm an actual migration of industrial production towards the Asian region.

3. Results

The estimated coefficients of the structural changes (absolute and relative) as compared to those corresponding to 1950, as well as calculated between the nearest decades (1950 to 2000) allowed identifying the industries and enterprises, in which migrations of production capacities were most significant. Thus, for example, the calculated quadratic coefficients of absolute geographical shifts ranged from 1.2% (in production of refined lead) to 15.0% (in production of motor-cars), when comparing data for adjacent decades; they ranged from 2.8% (in production of pulp) to 29.8% (in production of synthetic rubber), when comparing data for 2000 with indicators of 1950.

The analysis has shown that high values of the coefficient of the "absolute" geographical shifts (20% or more) were peculiar for both extractive and processing industries (semi-products manufacturing, basic and even high-tech industries). For example, in the mining industry – in the extraction of natural gas and iron ore the indicators amounted to 28 and 21%, respectively. Among semi-products manufacturing industries, the most significant shifts occurred in the coke (26%) and alumina (25%) production. The other manufacturing industries were characterized by the following shift indicators: production of synthetic rubber (30%), motor-cars (29%), TV sets (26%), and chemical fibers (24%). And just in one branch of industry (among 45 considered branches) – in the pulp production – this indicator was below 10%.

When comparing indicators of ratio change of the regions in world production with changes in production volumes (in natural indicators) in different regions of the world over time from 1950 to 2000, the pattern is even more impressive. Dramatic shifts in the location of production in many subsectors and sectors of the global industry are confirmed statistically. Thus, at the absolute growth of production volume, the ratio of Western Europe in world production of TV sets since 1950 fell from 42 to 16%, in North America - from 45 to 10%, while at the same time the proportion of Asian countries increased from 9 to 62%. This fact is confirmed also by a high

mean square coefficient of the "absolute" geographical changes (over 25%). A similar situation was revealed in changing the balance in many sub-sectors of the chemical industry. Thus, with the decline in the ratio of Western Europe and North America in the global production of chemical fibers more than twice (from 38 to 15% and from 41 to 16%, respectively), a manifold increase in the proportion of Asian countries was recorded from 8 to 62% along with simultaneous increase in the production volume.

4. Discussion

The obtained results allow drawing the following conclusions. Even at the "medium" (rather than the maximum) coefficients of the geographical shifts, noted changes were so significant that we can characterize geographical shifts in many industries as pivotal. For example, in ferrous metallurgy, steel production in Western Europe over 50 years has almost tripled, in North America it rose by 1.5 times, whereas in the Asian region production volume increased by almost 50 times. At that, the proportion of North America decreased from 48 to 16%, the proportion of the Western European region - from 27 to 19%, while the proportion of Asian countries in the same period increased from 4 to 42%. Note that such a high proportion of the latter region in 2000 was recorded as a result of the decline in production in Eastern European countries (proportion in global steel production in 1990 was 26%, while in 2000 it decreased to 16%), though this 10% does not actually change the overall "diagnosis".

In other words, "indirect" migration of production was recorded in almost all the analyzed industries. Production volumes grew in all regions of the world. However, there were sectors of the global industry - ferrous and nonferrous metallurgy (especially aluminum), where "direct" migration was noted in virtually all stages of the production cycle. Similar processes have been observed at some enterprises of light industry (textile, sewing, and footwear industry), in the chemical industry (for example, production of phosphate and nitrogen fertilizers, due to changes in the resource base, and in the production of chemical fibers).

Migrations of industrial production at the country and regional level occur in stages (stepwise) with a certain time lag. For example, in global ferrous metallurgy, migrations were observed initially in the iron ore industry and the production of coke, which further, only years later have led to migrations at the stages of iron smelting, steelmaking and rolling. In the aluminum industry, changes in the location of the global bauxite-mining industry that took place in the middle of the XX century, resulted in the migration of industrial production of alumina and primary aluminum, which occurred just in 1970-1980-ies. Thus, it is expedient to conduct the analysis of migration processes across the whole manufacturing chain (considering all the stages of the production cycle: from extraction and enrichment of raw materials to the final production). That is, it is expedient to consider jointly the processes occurring in mining and manufacturing industries.

It should be noted that changes in production volumes and the distribution of production facilities, occurring in some industries, cause (according to the multiplier effect) the structural and spatial shifts in other industries. This is clearly seen on the example of the electrical energy industry development as well as many basic industries. Changes in distribution of manufacturing industry entail changes in the distribution of mining industry and vice versa. The migration of industries and production facilities, causing migration of population, entails a change in the distribution of industries that produce, for example, articles of mass consumption, etc.

We have distinguished four groups of industries according to the characteristics of the ongoing migration processes:

- *Extractive industries, many of which are characterized by circular migrations.* We traced a kind of "migration" cycles of the points of influence in the minerals extraction from advanced nations to emerging countries and vice versa (Zimin 2003).
- *Individual manufacturing industries, which revealed "direct migration" of production capacities.* This is black and nonferrous metallurgy, production of construction materials, basic chemical industries, light industry, etc. In the territorial-sectoral structure of the leading countries there is kind of "washout" of traditional industries, which before were obligatory, as well as the decline in production volumes in economically developed countries. At the same time production volumes adequately increase in developing countries (mostly in the "semi-periphery" countries of the world economy). Integration groupings and transnational corporations play a special role in the implementation of this trend. The interstate relation system in these industries is increasingly replaced by a system of regional (for example, in the frameworks of EV, NAFTA, etc.) and global links (affiliates of transnational corporations). Production is usually transferred to countries with the resource base, abundant cheap labor, and less demanding environmental legislation.

▪ *Individual manufacturing industries, in which "indirect migration" of production capacity has been identified at the level of macro-regions.* For many kinds of mass productions of standardized products (assembly works) we revealed movement towards the global distribution system due to the expansion of market space in the context of globalization of world economy, technical and technological standardization in production and consumption, as well as the use of cheap labor. Similar kind of migrations were noted in the individual branches of engineering (manufacturing of motor-cars (assembly), TV sets, refrigerators, tape recorders, computers, washing machines, etc.); in the chemical industry (production of a large group of polymeric materials); in the light industry (production of fabrics, footwear), etc. At the level of macro-regions of the world, there were no considerable degradations in output in economically developed countries and regions, though, however, the production of the same goods rapidly increased in the developing countries (due to generating high profits by TNCs, first and foremost, using cheap labor). These facts were revealed in the cross-country analysis of the collected statistical data for all countries and all the analyzed industries. For mass production (*e.g.*, manufacture of consumer electronics, computers, etc.) we revealed a movement toward a global distribution system due to the expansion of market space in the context of globalization of world economy, technical and technological standardization in production and consumption.

▪ *Industries and individual manufacturing facilities actually not affected by migration processes.* These are the newest high-tech industries (biotechnology, pharmaceuticals, advanced electronics industry, space industry, etc.), whose distribution is attached to the R&D centers in highly economically developed countries (*i.e.,* the first stages of the “product life cycle") (Kokuitseva *et al*. 2013), as well as productions, manufacturing expensive (exclusive) products (for example, trendy clothing in light industry), or expensive environmentally friendly products (food industry), etc. The latest high-tech productions, as well as those that produce the "upper level" products of the production cycle continue remaining the specialization profile of economically developed countries (as well as the specialization in the creation and export of the latest technologies) (Kokuitseva *et al.* 2015).

Conclusion

In summary, we conclude the following. A feature of the contemporary system of the global industry is its high spatial agility. Analysis of large amounts of collected statistical data, calculations of indicators and indices of structural changes, and cartographic monitoring of industries at country and regional level allow us to conclude that in the second half of the XX century there were significant migrations of global industrial production in the various branches of mining and manufacturing. However, they had different nature: in some industries shifts, can be considered as pivotal, while in others they were ordinary. All industries included in the analysis have shown a regrouping of forces, the redistribution of global industrial production at both country and regional level.

At that, in the wake of the significant difference in the growth rate of industrial production in different regions of the world, they are more clearly differentiated into the advanced and the underperformed regions. The observed structural changes often correspond to the intensification of disparities in the distribution of industry on a global level rather than smoothing this level. Characterizing the spatial structure of global industrial production, it should be noted that the differences in terms of "North" – "South" (developed nations - developing countries) still remain. Though competition in global markets forces entrepreneurs of advanced nations to move "the lower and middle floors" of production to less developed countries (where labor is cheaper), especially if the workforce training level is sufficient for certain types of enterprises or industries. As already mentioned, shifts of production capacities to developing countries was noted in many industries.

Spatial redistribution of industrial production between countries and regions of the world occurs mainly due to the "semi-periphery" of the world economy. Industrial production moves to the countries of the "periphery" at a slower pace, whereas the countries of "deep periphery" (least developed, according to the UN terminology) are almost not included in international production.

The identification of the Asian priorities in the new situation of world industrial powers can be considered as the current general trend. We can say that there is a new balance of power. The point of influence of world industrial production, which previously was in Western Europe, in the second half of the XX century moved to North America, while currently it is directed to the Asian region.

Data analysis conducted by the authors on the development of the global industry in the period from 2000 to 2015, confirms once again previously identified trends and changes in the spatial organization of the world industrial production (Rodionova *et al.* 2009, Rodionova 2014, Rodionova *et al.* 2016).

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The Model of Risk Assessment in the Management of Company's Competitiveness

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Abstract:

The article concentrates on the topical problem of studying and considering the stochastic factors in the process of managing competitiveness of high-tech corporations. The paper puts forward an economic-mathematical model, which describes negative factors and their influence on the cost indicators of a knowledge intensive project implemented by a company, which tries to add to its competitiveness. The advantage of this model is its ability to take into consideration the specific features of a particular knowledge intensive project. The results of calculations completed under the model are given in the form of model analysis.

Keywords: competitiveness management of a company, risk identification, project life cycle, project costs, economic mathematical modeling.

JEL Classification: L23, O12, D81.

1. Introduction

It is a matter of fact that developing and manufacturing a product with new consumer properties often comes amid various risk factors (Thornton 2003, Yoe 2011). One of company's characteristics, when its competitiveness is to be assessed, is the company's ability to resist negative impact of uncertainty and risks (Chursin and Makarov 2015, Drucker 2007, Mensch 1975). As result it is necessary to identify and assess risks inherent in new projects of a company (Santo 1990, Hargadon 2007). The problem of identification and probabilistic estimate of risks in panning financial and economic activity of a company can be effectively addressed through the use of economic-mathematic modeling. The general approach in this case implies the assessment of potential losses derived from adverse impact of different risk factors with different probability of these factors manifestation.

2. Methods

Consider the process of risk management in the new projects implementation by the company in terms of knowledge intensive products. The project for the development of a new high-tech product is implemented in some stages, which are its life cycle (Kahneman and Tversky 1979; Bianco 2009). It is characteristic of projects implemented by a high-tech company, to have a predictive life cycle of its implementation that is fully described in the project plan (Farr 2011). As a rule, each stage of the project differs from every previous one. Each stage of the project corresponds to a certain set of actions and operations (Suhányi and Suhányiová 2014). Every project has its specific sequence of stages (Osadchy 2006). The possible sequence for a high-tech project is shown in Figure 1.

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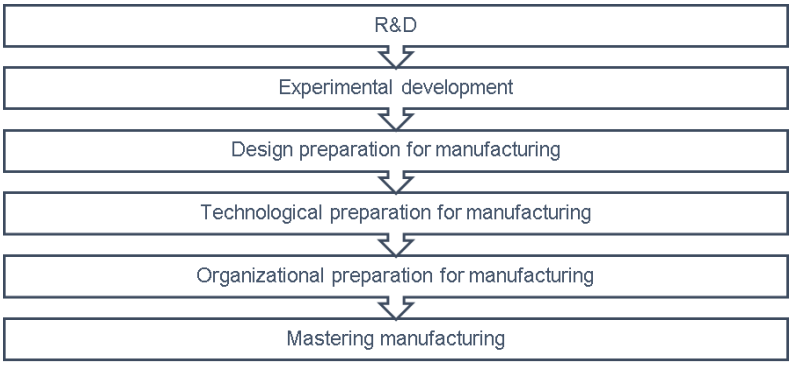

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Figure 1 - Predictive project life cycle (example)

The importance of sustainable management of a project can be illustrated by the fact that risks and uncertainty are more possible at the beginning of the project implementation while amending the project without adjusting its costs is more feasible at the early stages of its implementation. Therefore, the sustainability of project management has different importance at different stages of its implementation (O'Leary 2000).

Thus, the risk factors affect first of all the cost of the project implementation, *i.e*. they add to financial losses at different stages of the project (Nechaev and Antipin 2012, Nechaev and Prokopieva 2013). In that regard it is essential to forecast these losses and make all possible managerial decisions to avoid them and successfully implement the project. Further on we will describe the process of arising financial losses because of adverse risk factors. The process of project implementation can be described through a system of economic parameters, which are changing in the course of the project implementation: project costs, period of project implementation etc. Generally, the dynamics of parameters of a space project implementation can be described by a system of differential equations:

$$\begin{cases} p_1'(t) = \psi_1(t, p_1(t), p_2(t), \ldots, p_n(t)) \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ p_n'(t) = \psi_n(t, p_1(t), p_2(t), \ldots, p_n(t)) \end{cases} \quad (1)$$

Risks are characterized by two values - the probability of their arising ξ^1 and the severity of their consequences ξ^2. Thus,

$$R = R(\xi^1, \xi^2) \quad (2)$$

In economic-mathematical models the essence of these risk functions is to adjust the values of economic parameters of a company but the values of these parameters are stochastic. Next, relying on economic and mathematical modeling we will demonstrate the way the risks affect the cost parameters of the project. Here it should be noted that this approach can be generalized in case of other project parameters (*e.g.,* timing).

Let's designate knowledge intensive project as *P*. To implement the project *P* a set of activities should be carried out (operations, events etc.), $\{M_i\}$, i = 1, …, N where *N* is a number of activities in the framework of each stage:

$$M = \begin{pmatrix} M_1 \\ M_2 \\ \vdots \\ M_N \end{pmatrix} \quad (3)$$

A certain sum of money is planned to be spent on the implementation of each activity, which amounts to $S(M_i)$:

$$S = \begin{pmatrix} S(M_1) \\ S(M_2) \\ \vdots \\ S(M_N) \end{pmatrix} \quad (4)$$

The costs of each stage implementation can viewed as generalized estimator of financial spending on every stage. At the same time, we consider a number of the planned values of the costs of implemented stages.

$$S^0_{э_1}, S^0_{э_2}, ..., S^0_{э_K} \quad (5)$$

where Q - the quantity of the project stages and actual costs

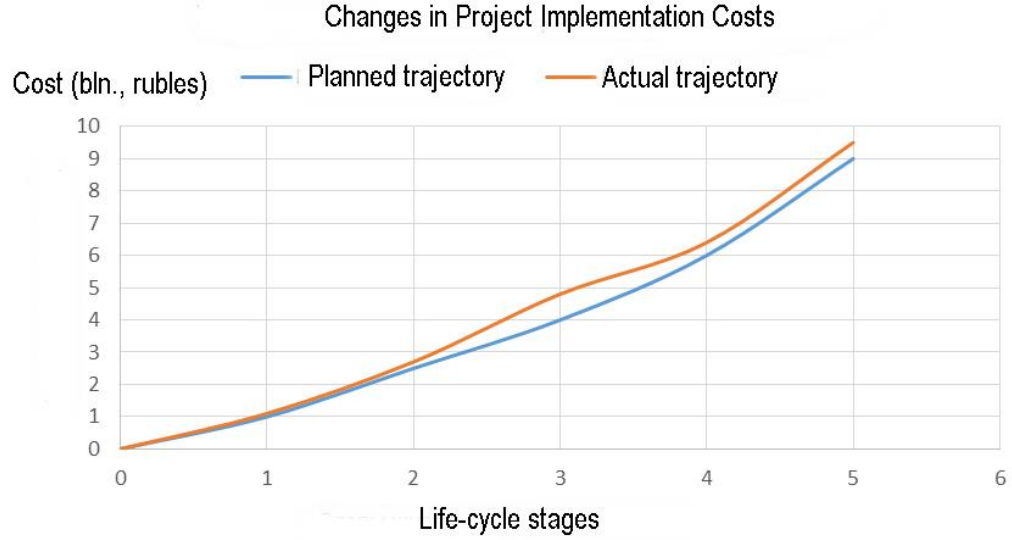
$$S^1_{э_1}, S^1_{э_2}, ..., S^1_{э_K} \quad (6)$$

.

Each stage corresponds to a set of events, implementation costs of which is described by the vector:

$$S_{э_i} = \begin{pmatrix} S_{э_1}(M_1) \\ S_{э_1}(M_2) \\ \vdots \\ S_{э_1}(M_Q) \end{pmatrix}. \quad ....(7)$$

We consider the planned and actual trajectory of change in the implementation costs in the framework of overall monitoring of knowledge-based project implementation costs (Figure 2).



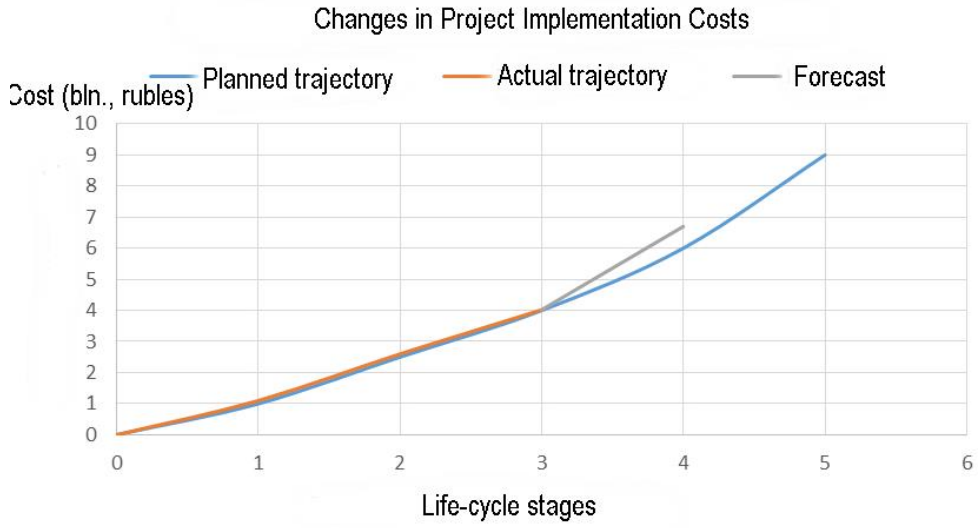
Source: own elaboration.

Figure 2 - An example of planned and actual trajectory of project costs

If the actual costs exceed the planned values, we can consider managerial decisions to bring the actual costs trajectory to the planned line. Let's examine this issue in detail.

As a rule, the changes in project costs are connected to adverse risk factors and uncertainty, which are present in the course of project implementation (Nechaev and Prokopieva 2014). For the purpose of overcoming

these negative situations we need a mechanism of forecast and risk management. Suppose that at a certain stage of the space project we project the exceeding of actual costs and know the probable amount of financial resources, which will exceed the cost of the project. This situation is illustrated in Figure 3, in which we can find a planned trajectory of change in costs, actual trajectory (at the time of implementing stage 3) and a forecast trajectory at the time of implementing stage 4.



Source: own elaboration.

Figure 3 - An example of planned and actual trajectory of project costs

The exceeding of forecast project costs over the planned one is explained by risk factors affect. By the quantitative assessment of the risk of exceeding the implementation cost of the space project at some stage we mean the difference between the expectation of the relationship of real and planned values to the planned value:

$$R_S = E\left(\frac{S_Э - S_Э^0}{S_Э^0}\right). \tag{8}$$

Suppose that at this stage it is necessary to implement *Q* of research operations. Let us assume that every operation is characterized by $S^0(M_i)$ amount of $S(M_i)$, which determines the probable sum of project costs in the process of its implementation taking into account the possible risk factors impact. In this case the risk of exceeding costs at this stage depends on the amount of $(S(M_i) - S^0(M_i))$, for every operation of this stage.

The formula of risk assessment of the exceeded implementation costs for this stage of the project *Q*, which includes operations, can be written as follows:

$$R = E\left(\frac{(S(M_1) - S^0(M_1)) + (S(M_2) - S^0(M_2)) + \ldots + (S(M_Q) - S^0(M_Q))}{S^0(M_1) + S^0(M_2) + \ldots + S^0(M_Q)}\right). \tag{9}$$

Thus the sum of losses depends on planned amount of this stage project costs and level of risk

$$L_Э = L(R_Э, S_Э^0). \tag{10}$$

According to the definition of risk (1), the formula for defining the sum of losses can be presented as follows:

$$L_{Э} = R_{Э} \cdot S_{Э}^{0}.$$

(11)

This kind of risks can be managed at a lower level, namely at the time of detailed examining every operation.

3. Experiments

So, let's describe the economic and mathematical model of analysing risks associated with financial losses at different stages of the project for the development of high-tech products. Our economic and mathematical modeling is guided by GOST (All-Union State Standard) ISO/IEC 31010-2011 31010:2009 "Risk management - Risk assessment techniques" (ISO/IEC 2009)). One of the techniques used for analysing risks is the method of constructing the probability and impact matrix. According to this method the process of loss arising in the project at a stage can be described as a system of causes of increasing costs (risk factor) and a set of negative impact of risk factors. Every impact in the framework of this scheme corresponds to the amount of financial losses L_j, which in turn corresponds to the sum of additional money needed to overcome the impact of risk factors.

To assess the negative impact of risk factors let's employ a value b_i of assessing risk influence on financial losses arising. This value is allocated according to a certain probability law and takes values in the interval from 0 to 1. For practical use, it is advisable to use discrete laws of distribution of such values. With the known discrete law the mathematical expectation of risk factor the intensity F_i can be determined as follows:

$$b(F_i) = \sum_{j=1}^{n} b^j \cdot p^j,$$

(12)

where p^j - the probability of risk factor F_i with impact on the loss arising b^j, where j - a predetermined set of indices of discrete law of distribution.

In a general case, every risk factor and its impact cause financial losses, but this impact is uneven. That is why we have to employ in our model a weighting coefficient w_{ij} of a risk factor, standing for a degree of this risk impact on financial losses arising. Having this values this formula for assessing extra money needed for an operation M within the stage can be written as follows:

$$L_M = \sum_{j=1}^{m} L_j \sum_{i=1}^{n} w_{ij} b_i. \quad (13)$$

Included in the model weighting coefficients w_{ij} should be defined according to method of defining matrix of probability and impact, which elements demonstrate the degree of risk impact on financial losses for every of the following (Table 1)

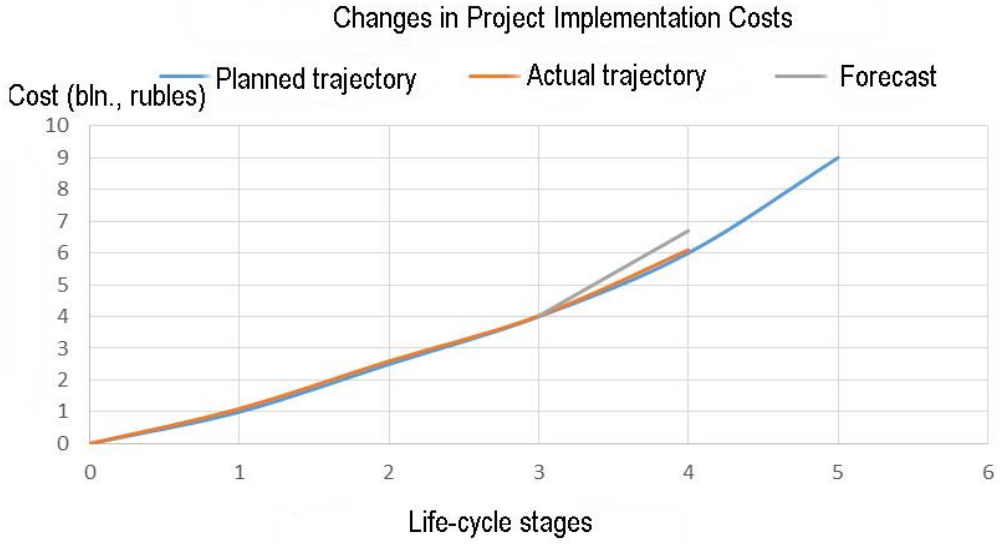
Table 1 - Matrix of probability and impact

	Impact 1	Impact 2	...	Impact m
Factor 1	w_{11}	w_{12}	...	w_{1m}
Factor 2	w_{21}	w_{22}	...	w_{2m}
...	...	...	...	...
Factor n	w_{n1}	w_{n2}	...	w_{nm}

Source: own elaboration.

Expert methods as well as various regression models are widely used for filling these matrices. It should be noted that $\sum_{i=1}^{n} w_{ij} = 1, \quad j = 1,2,...,m$ (14)

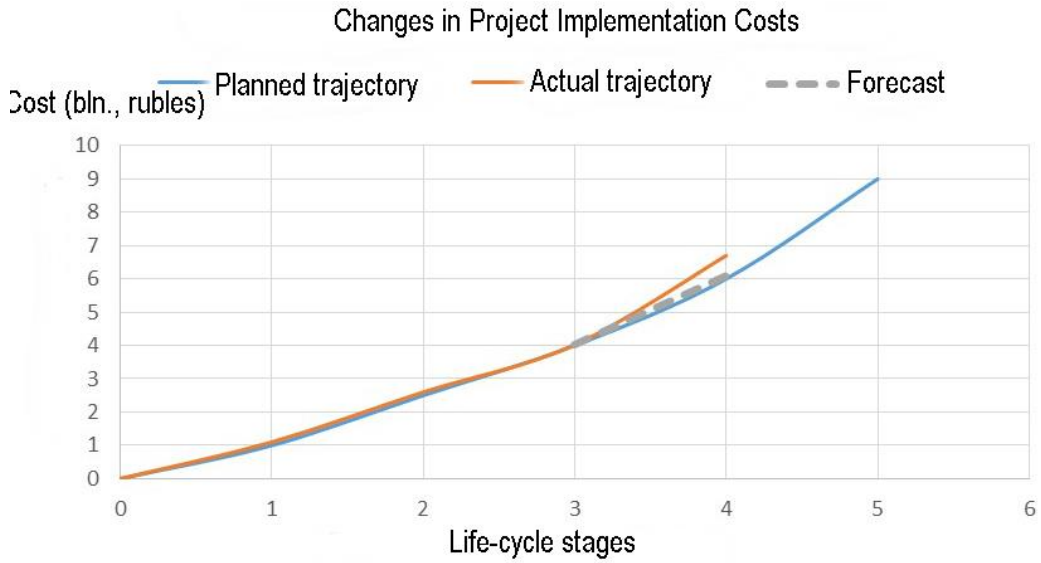
The discrete law of probability of risk distribution in the process of implementing an event as well can be defined by different techniques of economic forecast, which will be demonstrated below. Let's show the example of using the proposed economic mathematical model. Figure 4 shows an example of sustainable project management, when at the 4th stage of its implementation it is possible to predict the possible exceeding of the project cost, and take appropriate measures to return the project cost onto the planned trajectory.



Source: own elaboration.

Figure 4 - Sustainable project management

Figure 5 illustrates another situation where the risks of increasing costs cannot be correctly predicted, which results in increased project cost over the plan.



Source: own elaboration.

Figure 5 - Unsustainable project management

Next, we will give an example of calculation, illustrating the described situations. Suppose risk factors and its impact analysis in the event implementation at stage 4 events identified 10 risk factors and 4 its impacts.

Let us demonstrate the techniques used for the calculation of the degree of risk factors impact at the implementation stage. It is necessary to assess the probability of “currency fluctuation risk” and its impact. Ti assess it we need to have projected values of foreign exchange set by governmental financial regulators. The risk lies in exceeding the real exchange rate over the forecast at the time of the project implementation. Suppose the discrete law of probability distribution for this risk factor describes the exceeding in percentage of forecast. This law of probability distribution is given in Table 2.

Table 2 – The law of probability distribution

Exceeding of real exchange rate (%)	0%:	to 10%:	10-20%:	20-30%:	30-40%:
Normalized values	0.0	0,14	0,43	0,71	1.00
Probability	0,8	0,10	0,05	0,03	0,02

Source: own elaboration

To calculate the degree of a risk factor impact as supporting values of the discrete law let us consider the class mark, normalized per unit. Thus,

$$b = 0 \times 0,8 + 0,14 \times 0,1 + 0,43 \times 0,05 + 0,71 \times 0,03 + 1 \times 0,02 = 0,077 \quad (15)$$

Another way to assess the degree of risk impact can be exemplified by inflation assessment. Indeed, the high inflation could increase the cost of the project. One of the techniques of risk assessment is recommended in GOST (All-Union State Standard) ISO/IEC 31010--2011 "Risk Management". The technique of risk assessment" ISO/IEC 31010-2009 Risk management - Risk assessment techniques") is the Monte-Carlo method, which is used "to establish the system changes resulting from changes in the input data with due regard to input data distribution and its correlation to output data. The analysis can be used for the model, which defines the correlation between input and output data. Input data can be described as random values with a corresponding distribution and their inherent uncertainty. In this sense, the Monte Carlo method corresponds to goal setting in the process of risk assessment. The basis of this method is the consideration of intervals, in which lies the probable rate of inflation. Normally, inflation is forecast at multiple levels (positive, negative, etc.), and on the basis of the forecast the expected inflation rate of a given interval can be estimated. Next according to Monte-Carlo method the stochastic values are played out by the formula in the following way:

$$Y_i = a^i_{j-1} + (a^i_j - a^i_{j-1}) \frac{(\xi - \sum_{l=1}^{j-1} p^i_l)}{p^i_j} \quad (16)$$

In this formula $[a_{j-1}, a_j]$ the segments, which may have the actual value Y_i, and p_j^i the corresponding probability for a given segment, and ξ is a random variable uniformly distributed in the segment (0, 1). After a large number of tests with different values of a parameter ξ as an assessment of each of the random variable Y_i theoretical mean expectancy is taken. As an estimation, we take theoretical mean expectancy normalized to the maximum predicted value of the parameter (Table 3).

Table 3 - Theoretical mean expectancy normalized to the maximum predicted value of the parameter

Rate of inflation	7,4%-9,4%	9,4%-11,4%	11,4%-13,4%
Probability	0,1	0,65	0,25

Source: own elaboration.

As a result of the calculation using the Monte Carlo method, we get 10.6% as the expected value of inflation. Thus, as an estimate of the degree of risk factors "Inflation" we can consider the following value equal to the difference between the expected and planned in the project value, divided by the difference between the maximum predicted value and planned one in the project. Suppose the project planned 10% of inflation rate, then

$$b = (10,6 - 10) - (13,4 - 10) = 0,18 \quad (17)$$

Using the proposed approach, we can estimate the degree of other risk factors. To achieve the resilience of the project implementation we assessed the probability of excess of the project costs. To do this, the risk matrix has been made up (Table 4), the probable values of excess of costs in the realization of each of the effects (Table 5) and laws of probability distribution were determined for the risk factors with specific intensities (Table 6).

Table 4 - Risk matrix

Weights w_{ij}	Impact 1	Impact 2	Impact 3
Factor 1	0,15	0,08	0,06
Factor 2	0,06	0,10	0,08
Factor 3	0,04	0,14	0,10

Weights w_{ij}	Impact 1	Impact 2	Impact 3
Factor 4	0,20	0,20	0,15
Factor 5	0,11	0,11	0,07
Factor 6	0,17	0,09	0,10
Factor 7	0,03	0,04	0,20
Factor 8	0,06	0,03	0,10
Factor 9	0,15	0,01	0,12
Factor 10	0,03	0,20	0,02

Source: own elaboration

Table 5 - Probable maximum value of financial losses resulted from each of the impact, billions of rubles

Impact 1	Impact 2	Impact 3
0,45	0,32	0,15

Source: own elaboration

Table 6 - Probable degree of risk impact

	Degree of occurrence
Factor 1	0,52
Factor 2	0,46
Factor 3	0,34
Factor 4	0,25
Factor 5	0,45
Factor 6	0,4
Factor 7	0,07
Factor 8	0,54
Factor 9	0,24
Factor 10	0,18

Source: own elaboration.

By the formula we received the value of probable losses in realizing the given event:

$L_M = 0,317$ (18)

Suppose, as a result of event aimed at risk management we managed to decrease negative influence of the factors, and then the probable estimate of the risk impact is presented in Table 7.

Table 7 - The probable degree of risk occurrence after the risk management event

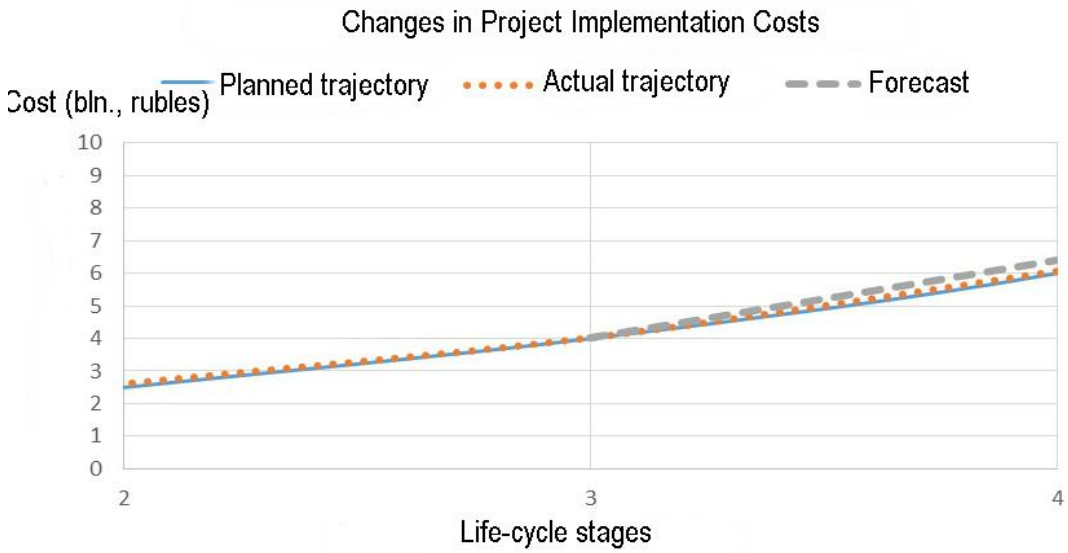
	Intensity of risk occurrence
Factor 1	0,12
Factor 2	0,04
Factor 3	0,08
Factor 4	0,02
Factor 5	0,05
Factor 6	0,07
Factor 7	0,04
Factor 8	0,02
Factor 9	0,06
Factor 10	0,10

Source: own elaboration.

A new value of probable losses after realizing a given event:

$L_M = 0,055$ (19)

A significant reduction in financial losses (more than 5 times) as a result of taking the necessary decisions on risk management suggests large project management sustainability. The calculation results are shown in Figure 6.



Source: own elaboration.

Figure 6 - Demonstration of sustainable project management at stage 4

Conclusion

Prediction of probable losses in the preparation for the project activities on the production of space products facilitates timely risk management and increase of the economic sustainability of the high-tech project implementation. Thus, measures for predicting and considering the probability of risk factors contribute to the preservation of the competitive advantages of the current project. Taking risks into account in the implementation of projects is one of the instruments that accompany the process of organizing the production of new types of products to enhance the company's competitiveness.

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Selected Determinants of Quality of Life and Their Implications for Health System

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Abstract:

Health spending in European countries grew until 2009 at a faster pace than in other sectors of the economy and the health sector is gaining a larger share of gross domestic product (GDP). At a time of financial and economic crisis in 2008 many European countries have begun to reduce health expenditure in order to cope with large budget deficits and increasing debt ratio. Although these restrictions were necessary, some measures may have an impact on the modification of the fundamental objectives of health systems. Continuous monitoring of data, health indicators and health systems is now extremely important. For this reason, it is essential to underpin the underlying determinants of lifestyle diseases in developed countries which influence health financing system directly, as well as indirectly and they are reflected in many indicators and determinants of life expectancy.

In this paper, I pay attention to selected determinants such as alcoholism, smoking and obesity that have side effects apparent not only from a macro point of view, but also greatly affect the quality of life of individuals, whether in primary or caused intentions.

Keywords: health systems, healthcare, quality of life, determinants, alcohol consumption, taxes.

JEL Classification: H51, I15, I18.

1. Introduction

European countries have spent considerable funds in recent decades to ensure the health of their population. Life expectancy at birth has increased in the member states of the European Union (EU) by more than six years since 1980 and reached 79 years in 2010, with premature mortality significantly reduced. More than three quarters of this age can be projected to survive without limitation of activity. Increasing life expectancy has been stimulated and prompted by the improvement of living and working conditions and certain types of behaviour of citizens in relation to health and but also better access to healthcare and quality healthcare. This is declared by indicators of significant decrease in mortality after a heart attack or stroke. Improvement of health brings in many cases considerable financial costs and therefore is the question of financing the health systems a priority in most countries.

2. Effectiveness measurement of health sector and its determinants

Healthcare systems differ among countries. Although there are significant differences, especially in terms of financing, regulation, management and organization, their common feature is the effort to achieve the primary objective in terms of improving the health status of the country and thus solve the everyday question of making the satisfaction of medical needs the number one priority. Healthcare market is characterized by many specifics and the basic economic rules are applied in it. Based on the principle of subsidiarity the healthcare in the EU subjects to (according to the Maastricht Treaty) there is no template organization and financing of the health system in each country. Financial sustainability of healthcare is also one of the main problems of individual countries. Findings of the OECD (2010) declare a faster growth of total expenditure on healthcare in all its member countries compared to the growth of their economies. It evokes a huge challenge in many countries and at the same time provides an opportunity to find an effective way to provide high quality healthcare that would take available resources into account. Demographic projections indicate an increasing prevalence of demand for healthcare and its costs. Predictions of population growth over 65 years till 2020 and 2040 indicate that the proportion of retirees will increase significantly in all EU countries (Blue et al. 2016). Therefore, the measurement of effectiveness of health systems is becoming a major question, particularly because of its methodological complexity and problems associated with variations in health systems, infrastructure, market dynamics, epidemiology and demography. Even at the micro level, the issue of measuring the effectiveness of complex. One of the concerns of healthcare providers involved in the effectiveness is a fact that own measurements (custom indicators) are not sufficiently transparent and do not give relevant answers to questions concerning the effectiveness (Amato *et al.* 2005). Some extreme cases related to effectiveness measurement are also known.

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Those were the subject of lawsuits against users of indicators (Gashi – Mojsoska-Blazevski 2016). Interest in this area is enhanced by the fact that thousands of indicators in specific areas of healthcare were set up at international level and were adapted to measure effectiveness and quality. Ensuring of their uniform application in the interest of benchmarking is constantly being a serious problem.

Measurement of quality of life can be realized on the basis of subjective or objective perception of an individual or a combination of both. Objective evaluation uses mainly statistical information on population health, educational attainment, economic situation and data from the area of safety, material ensuring of people, etc. The objective quality of life is a set of economic, health, social conditions and the environment that have an impact on human life (De Maeyer *et al.* 2010). Subjective evaluation uses data obtained from the collected opinions of individuals. Subjective quality of life refers to satisfaction of people, their sense of comfort and happiness, their perception of their own position in society which is related to values and culture. Most commonly it is found out in the form of a questionnaire survey. Experts label the objective view of the life quality with the English term "welfare" and the subjective view of the life quality with the term "well-being". Subjective and objective measures of quality of life may not bring the same results; it can result in different levels of quality of life. The main reason for the differences in the results obtained is that the objective measurements do not reflect the quality of life in individuals´ happiness and contrast to the subjective measurements of quality of life (Bakaniene *et al.* 2016, Bart 2012).

For this reason, Babinčák (2013) conducted public opinion survey dealing with the public consideration of happiness and happy life. The survey results showed the following criteria for happiness:

- having a family that can help and support,
- having a friend who can be trusted and who can help,
- having children without serious health problems,
- having a compassionate and loving partner,
- having a job for themselves and their partner that brings satisfaction and sufficient funds.

Based on the above specifications quality of life can be distinguished into two models of quality – American and Scandinavian. While the Scandinavian model takes into account the objective view of the quality of life and is based on material factors, American model is based on intangible factors and it takes into account the subjective view of the quality of life (Krebs *et al.* 2016).

There are several empirical studies that demonstrate the inaccuracy of allegations that people living in poor countries are less happy than those living in wealthier countries. On the other hand, the subjective perception of quality of life based on changes of GDP in poorer countries was able to change over time. The GDP growth has brought subjectively perceived improvement in quality of life in poorer countries, which means that the population sighted difference in their current quality of life and the past quality of life, for example, fifty years ago, as a result of GDP growth. In richer countries, GDP growth over time does not cause any changes in the subjective assessment of quality of life. This means that people fifty years ago evaluated their life quality the same as at present times, or they did not associate it with an increase in GDP of the country (Šoltés and Gavurová 2014a).

3. Quality of life indicators

Most countries evaluated the long-term quality of life and progress through the indicator GDP. Currently, this method is often criticized by experts and not considered GDP as an indicator of sufficient ability to express the quality of life of the population. Criticism mainly refers to the fact that the value of this indicator is not immediately passed into the social life and the GDP indicator focuses on consumption and personal relationships are disregarded. GDP indicator shall continue to be appropriate indicator of economic growth toward the goal of increasing economic output, but to understand the overall progress, not just economic growth, we need to analyse much more (Wu *et al.* 2016, Singh *et al*. 2016). As a result of the above criticisms of GDP there are new indicators that examine the different quality of life.

These indicators are mentioned by various global institutions, resp. programs, such as United Nations Development Programme (UNDP – Human Development Report), World Bank (WB, World Development Indicators, Monitoring Environmental Progress), World Health Organization (WHO database Health For All), United Nations DESA (Indicators of Sustainable Development), World Resource Institute (World Resources), United Nations (FAO database FAOSTAT, Eurostat (Pressure Indicates Project), European environment Agency (Yearly- Indicator- Based Report), the OECD (Organisation for economic co-operation and development, Core

Set of environmental Indicators), IUCN (now World conservation union and the concept of the welfare of the nation) and other " (WHO 2014, OECD 2014).

A great variety of indicators from various sources using different methods for determining values cause opacity in the monitored issue. Therefore, the UN decided to design its own set of indicators at the macro level and on this basis, provide comparisons among countries. First obtained data were published in 1996 in Indicators of Sustainable Development Framework and Methodologies, in Slovakia known as the Blue Book. Indicators originally proposed were tested on selected countries and modified, reduced or supplemented in the following years. Jolly classified the life quality indicators into the following categories (Šoltés and Gavurová 2014a):

- economical indicators – focus on the economic aspects, which include, for example, indicators dealing with income levels, unemployment,
- social indicators – focus on education, health, etc.,
- indicators of subjective well-being – represent unique assessment of life aspects of individuals.

Various indicators are often used to construct the overall index, which bring several advantages and also disadvantages. The main advantage of the index is that it summarizes the data obtained from multiple indicators into a single number, which allows viewing, comparing and working with fewer values, and thereby achieving better clarity. The major disadvantage is considered to be a risk of distortion of the index value. One of the causes of value distortion is a way of compiling the index itself, which means that into the calculation of the index only selected variable are included. This may result in the fact that the values of the index will not reflect the actual situation in the concerned area. Another common cause of index values distortion is inappropriate determination of the weights each variable is weighted. The consequence is a weak explanatory power and predictive value obtained through the index (Bart 2012, Ştefanescu *et al.* 2013).

4. Health, medical status and their impact on quality of life

It is well known that not to be healthy is not only the physical problems, but also it also affects individual´s psyche and causes intellectual and social change. Health is considered a basic human right and is determined by several factors, which may act individually or they may be linked. Health is an important aspect of quality of life, particularly in the subjective assessment of quality of life, whereas health affects the activity of a person and the feeling of life satisfaction. Health is understood not only as the absence of disease or various disabilities, but overall as a state of mental, physical and social well-being. Poor health is indicated by diseases, negative feelings, lack of exercise, excessive weight, etc. According to Tokárová health is "overall (physical, mental and social) condition of a person which allows him to achieve optimal quality of life and does not preclude the efforts of other people" (Tokárová *et al.* 2013, Krebs *et al.* 2016).

Health can be understood not only as an individual's health but also as health of the whole community. It has to be sad that the individual impacts on the whole community and the community impacts on the individual. View of the quality of life varies with the differences of communities. One evaluation criteria can be considerable more important by one community in assessing the quality of life than by another community. Because of this the common values are becoming the key in assessing the quality of community life. The look of one community to another community with different ethnicity can be listed as an example. If one community is different from most communities, such as life style, natural conditions, cultural circumstances, it may be considered as a community with worse quality of life, nevertheless, this community is happy with its life quality and does not perceive it as worse (Šoltés and Gavurová 2014b).

When perception of health as a global health, the most influencing factors are the ones that can have a large effect on humanity, such as nuclear plant explosion. WHO divided health to *„ physical, mental and social well-being and the absence of disease or disorder. In the common understanding of health are these indicators combined into one common denominator, which is a way of life“* (WHO 2014).

Individual health status has a major impact on his quality of life. According to Antonosky factors such as tobacco, alcohol, toxins in the air, the amount of protein and fat, fruit and vegetable intake, physical activity and optimism of an individual have a great impact on health. A society with individuals in good health along with other values such as education creates not only social, but also economic development. The level of health is also linked to life expectancy. Longer, healthier life does not make a benefit only from an economic point of view, but it allows people to spend more time with loved ones and to enhance their quality of life. If the measurement of quality of life focuses specifically on the health of people, the term health-related quality of life (HRQoL) is being used (Antonosky 1967).

The effort of countries is to improve the health status of the population which should include the provision of access to health care. A sufficient number of doctors, nurses, medical equipment, beds in the medical

equipment and likewise should be ensured in each country. Many countries, some European countries included, have problems in this area. Demand for medical treatment significantly affects the age of the population. Inhabitants in productive age more frequently suffer from illnesses and thus more frequently seek medical care (Gavurová, Štefko and Bačík 2014, Arraras *et al*. 2016, *Ştefanescu et al.* 2013).

According to Páleník funds are intended to improve the population´s health in older age as an investment. For example, for the European continent is typical that cardiovascular diseases, which occur especially to older people are a cause of the half of deaths. In economic terms, this costs the European continent around 10 billion Euro to treat individuals suffering from these diseases and approximately 64 billion Eur cost the absence of these individuals at work. Of course, there are also many other types of diseases the treatment and effects of which consume a significant proportion of the countries´ national income. The increased health spending also has a share on the problems of European countries in fulfilling the Stability and Growth Pact. Health improvement, especially in aging population would reduce the losses in terms of finances, which are associated with individuals´ poor health (Palenik *et al.* 2013).

I would like to draw your attention to a group of factors called lifestyle. Lifestyle is an expression of way of life, it represents a certain type of behaviour by individuals or groups with own specific practices. Tourism is now often associated with the characteristics of the conditions that lead to the determination of the quality of life. Lifestyle contributes to health up to 50%, genetics, on the other hand, only up to 10 – 15%. In this work, I will focus on selected factors in the group, which are often termed as risk factors because of their negative impact on the health of the individuals.

5. Risk factors

There are many risk factors with negative impact on population health. The basic ones, often considered as risk factors with the greatest impact on public health, are smoking, alcohol and obesity. There are several studies that deal with comparing countries on the basis of one of these risk factors.

Smoking is considered a major cause of premature health problems and, also, as a cause of the associated decrease in quality of life, particularly in countries that are classified in the category of developed countries. Smoking is in many cases leading to problems related to respiratory system and often to problems associated with cardiac activity. The risk is higher when the individual consumes tobacco products long and often. The use of tobacco has an impact on longevity of an individual; it reduces the life approximately by 8 – 10 years on average. Not only is a shorter lifespan recorded among smokers, but also a poorer quality of life (Palenik *et al.* 2013).

The most commonly tobacco product used worldwide are cigarettes, which make up to 96% of all tobacco products. Cigarette is a tobacco product created to transport the nicotine into the body in a generally attractive and acceptable form. Addictive substance in cigarettes is nicotine. Nicotine is a highly toxic chemical which is generally used in industrial pesticides. There is only a small amount of nicotine in a cigarette which cannot cause poisoning. It is estimated that nicotine addiction arises after a use of approximately 100 cigarettes. Then, in the case of efforts to stop using tobacco products withdrawal symptoms such as irritability, stress, concentration difficulties or insomnia are being showed. Almost every smoker is addicted to nicotine. There are very few smokers who do not smoke daily. In Slovakia and neighbouring countries tobacco products such as pipes, cigars or manually processed cigarettes are used in a lesser extent (De Maeyer *et al.* 2013).

Smoking not only impacts the health of the smoker, but it also has a number of economic consequences. These include (Palenik et al. 2013):

- decline in GDP due to growth in the number of deaths in working age and the related state expenditures for the leftovers,
- due to an increased susceptibility to common diseases caused by tobacco use more frequent sick leave is happening which was linked to the cost of treatment and, again, fall in GDP,
- serious illness resulting from smoking often require long and costly treatment,
- growth of expenditure in relation to the damage caused by fire damage and, in the context of eliminating the negative impacts of discarding residues of used tobacco products on the environment

State interventions in the fight against tobacco:

- economic actions: increasing the excise tax on tobacco products, causing an increase in prices of tobacco products themselves, which ultimately leads to reducing their consumption,
- legislative actions: restriction on the use of tobacco in public places, sales restrictions (such as a ban on sales to individuals under the age of 18 years), warning labels on tobacco product packaging, incorporation of data on the composition of tobacco products directly on the packaging,

- other actions: the effort to prevent and reduce illegal transactions, provision of information through a variety of programs specifically targeted at certain groups of people, mostly promoted programs in schools, the use of mass media channels to inform the public about the negative consequences of tobacco use, technical assistance for quitting the use of tobacco products (Palenik *et al.* 2013, Arraras *et al.* 2016, Gashi, Mojsoska and Blazevski 2016).

According to a World Bank study on the cost of actions related to the prevention of smoking are lower than the cost of removing or mitigating its negative effects.

Current activities of the European Union (EU) are supporting its member states in order to reduce the consumption of alcohol and to avoid the risk that can threat the individuals and the society. Despite the outlining of various action plans, recommendations, resolutions and other declared motions oriented towards the elimination of negative effects and consequences of alcoholism on the population and the financial aspect of health system, it can be stated that at the community level, this state can be barely influenced. Alcohol consumption has also a quantifiable economic dimension for the countries. For example, EU countries spend on average 1,3% of GDP on removal of these effects. In 2010, the estimated financial burden caused by alcohol consumption throughout the EU was 156 billion Eur, which is approximately 310 Eur for every EU citizen. Excessive alcohol consumption is a problem that has many dimensions related mainly to significant health, economic and social consequences. It is considered to be a serious public health problem and is the most important preventable risk factor for several diseases. Alcohol damages the gastrointestinal, nervous and reproductive systems.

Excessive use of alcohol is associated with liver cirrhosis, certain cancers, increased risk of sudden brain stroke, high blood pressure, an increased incidence of cardiomyopathy and arrhythmias. Alcoholism influences not only the life of an alcoholic, but also its surroundings, and it is therefore appropriate for the state to intervene in this area. Among the most affordable, most effective and most commonly used actions the control of alcohol availability and price regulation are included. State control in this area has an impact on customers, health services, crime, and employers in general industry (De Maeyer – Vanderplasschen – Broekaert 2010). As evidenced by the latest research of OECD (2014) the highest alcohol consumption per capita (in liters) is Luxembourg (15,3 liters), Lithuania (13,2 liters) and Romania (12,7 liters). EU-27 average is 10,7 liters per capita, which is identical level of consumption for Slovakia. The risk of harmful alcohol use varies according to the age, gender and other biological characteristics of the consumer and the environment. Excessive alcohol consumption is one of the major risk factors that can be prevented. Harmful use of alcohol is usually also associated with certain infectious diseases such as HIV/AIDS, tuberculosis and pneumonia. A significant proportion associated with alcohol use results from the unwanted and intentional injuries, such as in traffic accidents, violent behaviour or as a result of suicides. Harmful use of alcohol disturbs the development of individuals and society. It can destroy the lives of individuals and injure the basic structures of human society. Especially young people lose their barriers due to alcohol consumption, which can increase promiscuity and unwanted pregnancies. As demonstrated by the results of a study by the International Agency for Research on Cancer (IARC 2013), which is a part of the WHO, alcohol is also a major carcinogen and cancer risk increases proportionally with the amount of alcohol consumed, while the detrimental effects are starting to show already at a consumption of one glass of alcohol per day. According to the results of studies cancer is usually apparent after 2 – 15 years of drinking and the riskiest is the group of people who consume alcohol more widely, or daily. Cancer risk drops to a level of people who never drank until about 15 years of abstinence (OECD 2014, WHO 2014, Jolly et al. 2014).

Social costs of alcohol abuse in this context are important and much higher than with tobacco or drugs. For example, in England the cost of providing health care associated with alcohol abuse was estimated at 1,7 billion GBP per year. Estimated annual costs of crime and anti-social behaviour conditional upon alcoholism are estimated at over 7,3 billion GBP, while the costs of productivity loss of 6,4 billion GBP per year. The overall impact of alcoholism in England can be evaluated at about 20 billion GBP a year. In contrast, the alcohol beverage industry in the UK is associated with around a million jobs and an annual turnover of more than 30 billion GBP (Bart 2012, Blue *et al.* 2016).

The last one of the mentioned risk factors is obesity. Obesity is not only an aesthetic problem; it is also linked to the occurrence of other serious medical conditions that can cause death. The most frequently occurring diseases related to obesity include hypertension, heart disease, vascular disease and increased risk of stroke. The percentage of obese people and overweight people is increasing rapidly especially in the adult population. The increase in number of people suffering from overweight or obesity is mainly due to diet high in fat and sugar, the imbalance between the different components of the diet, lack of exercise, sedentary lifestyle and, of course, the genetic influences. The result of overweight and obesity is the reduction of quality of life (Dixon *et al*. 2010).

6. Economic benefits of alcohol consumption for Slovak Republic

Europe plays a pretty big role on the alcohol market; it is the source of a quarter of world´s production of alcohol and over half of the wine production. 70% of alcohol export and about a half of the world´s import is directed into EU. Although the majority of this trade takes place between the EU, the alcohol market delivers about 9 billion Eur. The countries with a very high consumption also includes Slovakia, where, according to the OECD is consumed on average 11,8 liters of pure alcohol per man per year. The average value is calculated from the published data of OECD since 1960. Alcohol in Slovak Republic (and in most countries) subject to excise tax (consumption tax). These taxes use to change and the tax on alcohol in no exception. Rates of the actual excise taxes on alcohol are shown in Table 1.

Table 1 - Rates of excise taxes on alcohol, 2015

KIND		BASIC RATE	REDUCED RATE
Beer		product of 7,907% from 108€ and coefficient 0,042	product of 5, 847% from 1080€ and coefficient 0,042
Wine	Silent	product of 0% from 1080 € and coefficient 0,125	----------
	Sparkling	product of 59% from 1080€ and coefficient 0,125	----------
	Sparkling with alcohol content above 8.5%	product of 59% from 1080€ and coefficient 0,085	----------
	Intermediates	product of 59% from 1080€ and coefficient 0,125	----------
Pure alcohol		1080 Eur/hl	540 Eur/hl

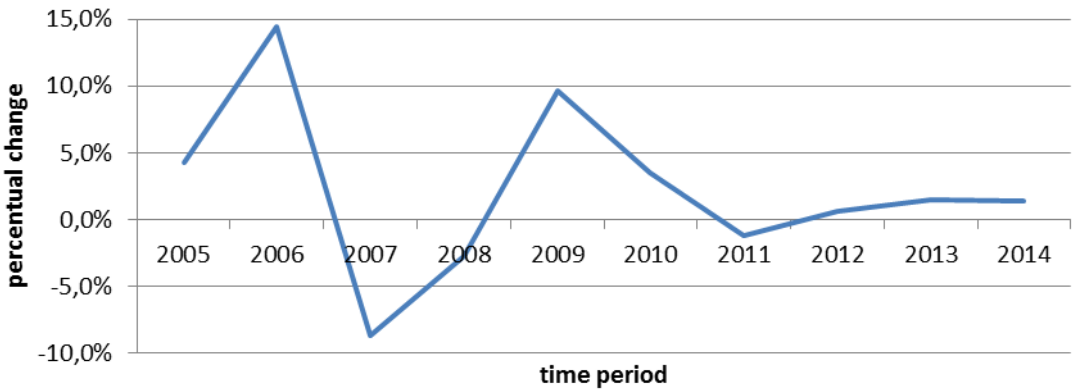
Source: Ministry of Finance of the Slovak Republic 2015

It is important to show how has this charge changed in time and how the revenues of the country have has changed. Excise tax belongs to indirect taxes. Indirect taxes are not paid by taxpayers – consumers of goods and services directly, they are paid indirectly. They are transferred by vendors (sellers, dealers, retailers) and service providers. Among indirect taxes are included the process value added tax consumption tax (a tax on mineral oil, alcohol, beer, wine, tobacco and tobacco products, green taxes). The highest amount of taxes paid by citizens is from the value added tax. Taxes on tobacco and tobacco products have risen by 50% in four years. Green taxes are paid for the consumed coal, gas and electricity since 2008 (households are exempt from paying). For the calculation of government´s revenues from these taxes the accrual recognition principle is used, which is based on accrual captures transactions when they occur, not at the time of their payment. The development of government´s revenues from excise taxes from previous years can be seen in Table 2, Figure 3.

Table 2 -Total revenues to the state budget from excise taxes (mil. Eur), 2005 - 2015

Yeas	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenues	1659,6	1730,9	1981,0	1809,2	1761,2	1930,8	1998,0	1973,3	1985,0	2015,0	2042,7

Source: Ministry of Finance of the Slovak Republic 2015, Slovensko.sk 2015



Source: Ministry of Finance of the Slovak Republic 2015, Slovensko.sk 2015

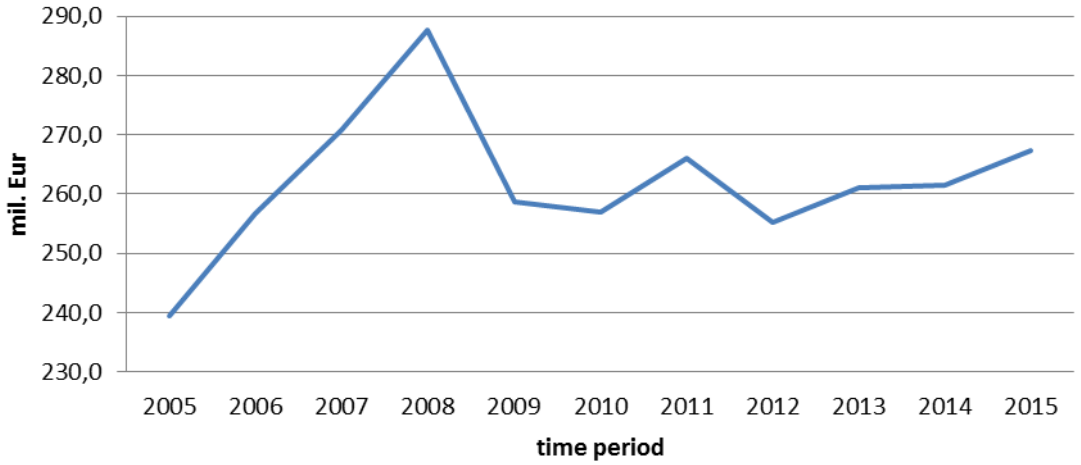
Figure 3 - Total revenues to the state budget from excise taxes (mil. Eur), 2005 – 2015

Although the annual change is every year smaller, it can be seen that the income of this kind is growing since 2009. Average annual change since 2006 (in 2005 this information was not available) was 2,3%. The most interesting part for us is the revenues from excise taxes on alcohol, namely pure alcohol, beer and wine. The development of these earnings is shown in the Table 3, Figure 4 and Figure 5.

Table 3 - Revenues to the state budget from the excise tax on alcohol, 2005 - 2015

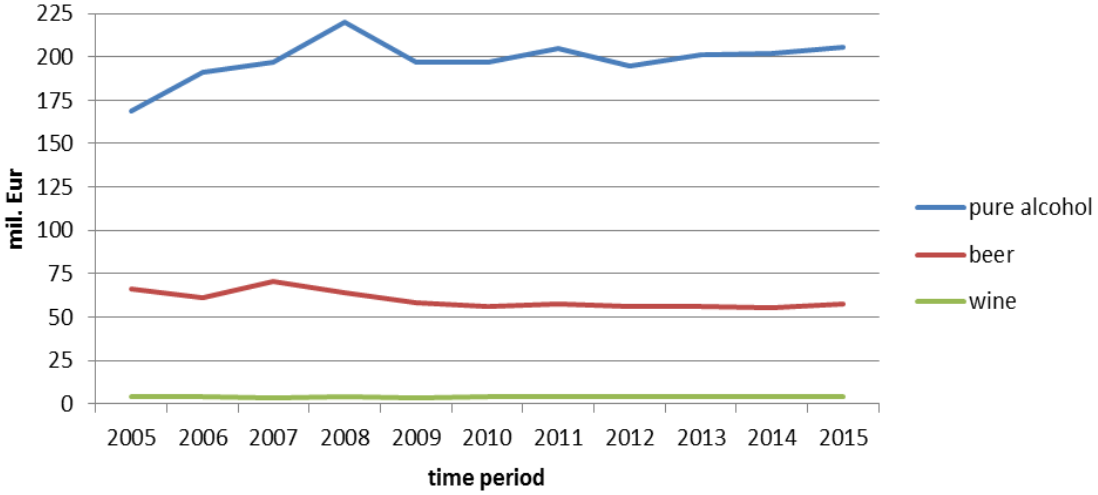
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
From pure alcohol	169,1	191,5	196,7	219,8	197,0	196,9	204,7	195,0	201,0	201,8	205,7
From beer	66,1	61,4	70,3	63,9	58,1	55,8	57,3	56,1	56,0	55,4	57,3
From wine	4,2	3,9	3,7	3,9	3,7	4,3	4,0	4,2	4,0	4,2	4,4
TOTAL	239,4	256,8	270,7	287,6	258,8	257,0	266,0	255,3	261,0	261,4	267,4

Source: Ministry of Finance of the Slovak Republic 2015, Slovensko.sk 2015



Source: Ministry of Finance of the Slovak Republic 2015, Slovensko.sk 2015

Figure 4 - Revenues from excise taxes on alcohol in total (mil. Eur), 2005 – 2015



Source: Ministry of Finance of the Slovak Republic 2015, Slovensko.sk 2015

Figure 5 - Revenues from excise taxes on pure alcohol, beer and wine (mil. Eur), 2005 – 2015

As it can be seen, the trend in revenue growth from excise taxes has also reflected in the revenue from alcohol which has growing character since 2012. During this period the country had revenues of 255,3 mil. Eur in 2012 till 267,4 mil. Eur in 2015. The growing character has been reflected in revenues from pure alcohol (regularly since 2012). Revenues from taxes on beer and wine tended to stick to the line of constant and fluctuated around an average value of 59,8 mil. Eur on beer (the largest income was achieved in 2007 of 70,3 mil. Eur) and 4,0 mil. Eur wine (in wine there were no anomalies).

Conclusion

Health indicators and data, they are based on need to be monitored because of several reasons. They are extremely important for the assessment of the country and the effectiveness of its health sector. They can essentially affect the lifestyle of people and they overall well-being. The most important determinants are smoking, alcohol consumption and obesity, which are the subject of interest of this paper.

Social and economic costs cover the negative economic impacts of alcohol consumption on the material welfare of the society as a whole. They comprise both direct costs - the value of goods and services delivered to address the harmful effects of alcohol, and indirect costs - the value of personal productive services that are not delivered as a consequence of drinking. In industrialized countries, estimates of social and economic costs of alcohol use can reach a certain value of the Gross Domestic Product (GDP). Estimating the costs of the impact of alcohol on the material welfare of society is often difficult and requires estimates of the social costs of treatment, prevention, research, law enforcement, lost productivity and some measure of years and quality of life lost.

It is important to look at this problem also from another way, by a comparison of those costs and the benefits for the country, for the economy. It is also presented in this article. Basic costs that flow into the Slovak economy from alcohol consumption are high and are a big part of the state budget. Therefore, before every decision making, it is essential to take into account also this point of view and include it into the decision-making process to achieve he most optimal outcome for the health status of citizens and the homeland economy, also.

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