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Does High Public Health Expenditure Slow Down Economic Growth?

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Abstract:

This study examines the non-monotonic relationship between public health expenditure and economic growth in 97 countries from 1981 to 2010, using the dynamic panel threshold technique. The paper contributes to existing literature by providing new evidence on the relationship between public health expenditure and economic growth. The findings show that public expenditure has a non-linear effect on economic growth. Specifically, health expenditure is beneficial to growth until a certain threshold level, above the threshold point, however; public health expenditure impedes growth. In addition, when the impact of public health expenditure on growth is contingent on life expectancy, the results reveal that below the threshold of life expectancy, health expenditure enhances growth; but any increase in longevity above the threshold, health expenditure lessens growth.

Keywords: public health expenditure, life expectancy, economic growth, dynamic panel threshold.

JEL Classification: H51, O47, J11, C23.

1. Introduction

Governments finance health both directly, through spending on the health sector, and indirectly, through spending on other related social sectors – to improve education levels or reducing poverty, for instance. Although it contains only the direct aspect, the proportion of government expenditure allocated to the health sector provides insight into the value of that government place on health, which may vary greatly across countries. The income differences across countries may to large extent explains the huge variations in resources allocated to health. In general, health accounts for a higher share of Gross Domestic Product as countries get wealthier (Missoni and Solimano 2010). Nowadays, the impact of public health spending on economic growth is determined by the high level of human capital and economic productivity. The increasing number of aging population and the cost of health care driven by the demographic and epidemiological transitions cause a burden on public finances especially public health financing (Potrafke 2010, Colombier 2011). The impact of public expenditure on health considered an influential factor that affects economic growth. Specifically, more public health expenditure generates higher life expectancy, and hence, longevity tends to improve economic growth (Reinhart 1999). In other words, the effect of health expenditure from public source of financing is indirect because, it leads to better health outcome and thus health status affects growth positively. On the other hand, the monotonic impact of life expectancy on economic growth was questionable by recent studies, especially when the demographic transition stage is taken into consideration, the relationship might have a non-monotonic pattern (Kelley and Schmidt 1995, Zhang *et al.* 2003, An and Jeon 2006, Cervellati and Sunde 2011, Kunze 2014). Consequently, the public expenditure effect on economic growth may not be the same for the entire countries with regard to their economic development and demographic transition stages (Aísa and Pueyo 2006). Importantly, Carboni and Medda (2011) argue that paying no attention to the possibility of a non-monotonic effect of public expenditure on economic growth may lead to misspecification.

This study aims to examine the non-monotonic effect of public health expenditure on economic growth taking the heterogeneity related to the demographic transition into account. Particularly, whether or not there existed a threshold level of public health expenditure in the public expenditure-growth nexus, where public health expenditure stimulates growth up to a certain point and hinders growth after expenditure on health surpasses the threshold. In addition, the relationship between public health expenditure and economic growth may be contingent on the level of life expectancy, where public health spending encourages growth up to a certain threshold point and slows down the growth rate after life

expectancy exceeds the threshold point. In this study, the effect of health spending on growth is investigated in 97 developed as well as developing countries during the period 1981-2010. The recent dynamic panel threshold estimation procedure introduced by Kremer *et al.* (2013) is adopted to address the non-linear relationship between health expenditure and growth.

2. Literature review

The Keynesian view emphasizes the role of government spending as a key factor that raises the aggregate demand and stimulates long-run economic growth. On the other hand, Wagner's law indicates that the GDP growth is the main factor that drives government expenditure. The findings of Govindaraju *et al.* (2011) favoured the Keynesian view rather that Wagner's law in case of Malaysia, whereas some other studies found mixed evidence the support both views (Samudram *et al.* 2009; Narayan *et al.* 2008; Wu *et al.* 2010). Although the neoclassical economists limit the role government and public policy in the economy, Barro (1990) extended the endogenous growth model to incorporate government spending. He showed that an increase in unproductive government expenditures reduce growth and saving rates; the two rates increase initially with productive government spending but subsequently fall. Moreover, Barro and Sala-i-martin (1992) pointed out that the neoclassical growth models are able to explain the role of a wide array of government expenditures, such as transportation, public utilities, and national defence, in economic growth. Importantly, Barro (2013) highlighted the impact health spending in determining economic growth in the long-run beside the feedback impact of economic growth in stimulating health expenditure.

Alternative point of view inspired by the non-monotonic relationship between government expenditure and growth according to Barro (1990), and the non-monotonic relationship between life expectancy and economic growth in agreement with some empirical studies (Kelley and Schmidt 1995; Zhang *et al.* 2003; An and Jeon 2006), and the idea that higher life expectancy generates economic growth, whereas higher government expenditure lessen growth (Reinhart 1999); Aísa and Pueyo (2006) developed model with endogenous longevity predicts non-monotonic relationship between public health spending and economic growth. In developing countries, on one hand, where life expectancy is noticeably low an increase in public health care expenditure will be translated into higher life expectancy and thus leads to stimulating growth. On the other hand, in developed countries where life expectancy is considerably high, any further increase in government health spending can have an adverse effect on economic growth. Recently, Carboni and Medda (2011) introduced a neoclassical growth model that capture the non-monotonic relationship between public spending and economic growth. The model categorizes the size of government and the structure of government expenditure, which maximizes the growth rate and the long-run per capita income level. More importantly, they argued that ignoring the hypothesis of non-linearity and the impact of different public expenditures have on economic performance results in models that suffer from misspecification. Therefore, the traditional linear models may lead to biased and misleading estimates.

Various empirical evidence is drawn from time series analysis of a single country, which can provide the policy makers with helpful recommendations. In this regard, Colombier (2011) estimated the impact of different type public expenditures on economic growth in Swiss. The results of Autoregressive Distributed Lag (ARDL) revealed that government expenditures on education, transport infrastructure and administration enhance economic growth. The author argued that although health expenditure from public source of financing could be beneficial to growth, the evidence on health still insufficient to reach a comprehensive conclusion. Therefore, further investigation on the relationship between health expenditure and economic growth is needed. Similar study that adopted time series analysis by Eryigit *et al.* (2012) who examined the long-run relationship between health, education and defence expenditures, and economic growth in Turkey using Vector Error Correction Model (VECM) for the period 1950–2005. They exposed that government expenditures on health and education have positive long-run impact on economic growth, whereas the government spending in defence is negatively related to growth; suggesting for a trade-off between health-education and defence expenditures to improve the long-run growth. Although Tang (2009) failed to establish cointegration relationship, he found evidence of bidirectional causality between public health spending and economic growth in Malaysia. Furthermore, the relationship between the aggregated and disaggregated public expenditures and economic growth in Ghana are examined by Nketiah-Amponsah (2009) using time series analysis from 1970 to 2004. The findings revealed the aggregated expenditure; health and infrastructure expenses encourage economic growth while expenditure on education has no impact on growth.

Panel data is commonly used in economic growth literature, for example Beraldo *et al.* (2009) tested the impact of public and private expenses in health and education on economic growth in 19 OECD countries between 1971 and 1998. The results were consistent with some previous empirical studies that exhibit positive and significant impact of health and education expenditures on growth. Health expenditure is found to have stronger impact on growth compare to education. Interestingly, the expenditure from public source of financing stimulates economic growth more than private expenditure does. Further, Dao (2012) investigated the impact of various government expenditures on economic growth

in 28 developing countries. Surprisingly, the outcome of the analysis showed negative and significant relationship between government expenditure on health and education on economic growth. The author pointed out that the unexpected sign of the coefficients could be attributable to the problem of multicollinearity. In general, the government spending in social sectors results in improvement in human capital in the form of health and education. In this context, Baldacci *et al.* (2008) provided evidence from 118 countries regarding the link between social spending, human capital and economic growth. They found that public spending on health and education enhanced the level of human capital (health and education) which generate higher growth rate. Utilizing the GMM estimator, Kesikoglu and Oztyrk (2013) assessed the impact of health and education expenditures on economic growth 20 in OECD countries from 1999 to 2008. According to the results of their study, a strong positive impact for health and education expenses on economic growth have been found. In addition, the GDP growth is found to have a feedback impact on both types of expenditures. Additionally, Khan *et al.* (2015) examined the relationship and causality between health expenditure and economic growth in South Asian Association for Regional Cooperation (SAARC) countries using panel cointegration and Granger causality approaches for the period 1995-2012. The results of dynamic ordinary least squares (DOLS) reported positive and significant coefficient of health expenditure as an essential growth determinant. The causality test revealed a unidirectional causal relationship running from economic growth to health expenditure.

It is worth mentioning that the heterogeneity across countries, such as differences in income level and demographic transition, have serious implications that may lead to different conclusions regarding the relationship between public expenditures and economic growth. For instance, Wang (2011) provided evidence from 31 countries on the relationship between health expenditure and economic growth, which may largely, depends on different levels of economic development, for example in low or high income countries health expenditure may not effectively enhance growth. Similarly, Martins and Veiga (2014) explored the impact of government size and public expenditure on economic development (Human Development Index) using the generalized method of moment system-GMM for 156 countries during the period 1980-2010. The findings exhibited that the size of the government has an inverted U-shaped impact on economic development especially in developed countries. While public expenditures on defence, education, social protection and health have a non-monotonic relationship with economic development. Outstandingly, as suggested by Carboni and Medda (2011), Hajamini and Falahi (2014) investigated the non-linear relationship between government expenditure as a share of GDP on economic growth in developing countries using panel threshold model developed by Hansen (1999) during the period 1981–2007. The results showed non-monotonic relationship pattern, in which the threshold of government spending is 16.2% and 16.9% for low and lower-middle income countries, respectively. Particularly, the findings indicate that below the threshold point the impact of government expenditure is positive insignificant, whereas above the threshold the impact is negative and statistically significant for both income groups.

3. Methodology and the data

3.1 Empirical model

The model is inspired by the endogenous growth model, which allows us to examine the non-monotonic associations between public health expenditure and economic growth:

$$GDPG_{it} = \beta HE_{it} + \theta X_{it} + \mu_{it} \qquad (1)$$

where $GDPG_{it}$ is GDP growth rate, HE_{it} is public health expenditure, X_{it} is a vector of explanatory variables: INI_{it} is the log of initial income, LE_{it} is life expectancy at birth, HC_{it} is the average year of secondary schooling as a proxy of human capital in form of education, INV_{it} is investment as a percentage of GDP, INS_{it} is institutions corruption level, μ_{it} is the residual term, i= 1, …, N represents country and t= 1, …, T indicates time.

To evaluate the relationship between public health expenditure and economic growth in different countries, the dynamic panel threshold method of Kremer *et al.* (2013) is adopted as follow:

$$GDPG_{it} = \eta_i + \beta_1 HE_{it} I(HE_{it} \leq \lambda) + \gamma_1 I(HE_{it} \leq \lambda) + \beta_2 HE_{it} I(HE_{it} > \lambda) + \theta X_{it} + \mu_{it} \qquad (2)$$

Where η_i is individual-specific effect, and μ_{it} is the residual that assumed to be $\mu_{it} \sim (0, \sigma^2)$. The indicator function $I(\cdot)$ specifies countries into groups according to the threshold variable HE_{it}, and λ denotes the effect of public health expenditure depending on whether HE_{it} is below or above the threshold level. X_{it} contains number of explanatory variables that are partially endogenous, and the slope parameters are assumed to be regime independent. The X_{1it} comprises exogenous variables, whereas X_{2it} comprises endogenous variables like the initial income INI_{it}. The estimator allows for different regime intercepts (γ_1). The effect of public health expenditure on growth can be described by $\hat{\beta}_1(\hat{\beta}_2)$ which represent the marginal effect of public health expenditure on economic growth in the low (high) public health expenditure regime, i.e., when public health expenditure is below (above) the threshold level.

The effect of public health expenditure on growth can be contingent on life expectancy, which can be estimated by the following model:

$$GDPG_{it} = \eta_i + \beta_1 HE_{it} I(LE_{it} \leq \lambda) + \gamma_1 I(LE_{it} \leq \lambda) + \beta_2 HE_{it} I(LE_{it} > \lambda) + \theta X_{it} + \mu_{it} \quad (3)$$

Equations (3) estimates the effect of health expenditure, contingent on life expectancy, on growth. The indicator function $I(\cdot)$ shows the groups according to the threshold variable LE_{it}, and λ represents the threshold values of LE_{it}, and the influence of public health expenditure on growth is provisional on whether LE_{it} is below or above the threshold.

3.2. Fixed-effects elimination

First, the country specific-effect η_i is eliminated via the forward orthogonal deviations transformation procedure recommended by Arellano and Bover (1995) to eliminate the fixed-effects. The alternative transformation procedures like within and first-differencing, lead to unreliable estimates[1]. Thus, the within and the first-differencing transformation procedures are inappropriate because their violation of the distributional assumptions underlying Hansen (1999) and Caner and Hansen (2004).

The unique feature of the forward orthogonal deviations transformation procedure is that the serial correlation of the transformed residual terms is avoided by subtracting the average of all future observations. The forward orthogonal deviations transformation procedure is performed as follow:

$$\mu_{it}^* = \sqrt{\frac{T-t}{T-t+1}} \left[\mu_{it} - \frac{1}{T-t}(\mu_{i(t+1)} + \cdots + \mu_{iT}) \right]$$

And hence, the above transformation keeps the residual terms serially uncorrelated. (Kremer *et al.*, 2013)

3.3. Estimation procedure

According to Caner and Hansen (2004) first, the reduce form regression of the endogenous variables X_{2it} as a function of the instruments Z_{it} is estimated by least squares to obtain the predicted values $\hat{X}_{2it}$. Second, the predicted values of X_{2it} are substituted into Equation (2) and the threshold coefficient λ is estimated using least squares. Symbolize the subsequent sum of squared residuals as S(λ). The aforementioned step is repeated for a strict subset of the support of the threshold variables HE and LE in Equations (2) and (3), respectively. Third, the threshold value λ is chosen according to the smallest sum of squared residuals, i.e., $\hat{\lambda}$ = argmin S$_n$ (λ).

Comparable to Hansen (1999), and Caner and Hansen (2004), the critical values of the threshold are at 95% confidence interval:

$$\Gamma = \{\lambda : LR(\lambda) \leq C(\alpha)\}$$

Where $C(\alpha)$ is the 95% percentile of the asymptotic distribution of the likelihood ratio $LR(\lambda)$. The underlying likelihood ratio is adjusted to account for the number of time periods used for each cross-section (Hansen 1999). After the threshold $\hat{\lambda}$ is identified, the generalized method of moments GMM is used to estimate the coefficients for the instruments and the estimated threshold $\hat{\lambda}$. Following Arellano and Bover (1995), Kremer *et al.* (2013) and Law and Singh (2014) the instruments used is the lagged dependent variable.

3.4 The data

The panel data analysis is used to evaluate the effect of public health expenditure on economic growth in 97 developed and developing countries for the period from 1981 to 2010. In line with the economic literature, the data is averaged for 5 years which is more appropriate with GMM estimators. Moreover, averaging the data lean towards smoothing business cycle effect (Law and Singh 2014). The panel is unbalanced and thus, there are six observations as a maximum for each country.

The public health expenditure is measured as government expenditure on health as a percentage of GDP. The source of public health expenditure from 1981 to 2005 is Globalization-Health Nexus Database (GHND), and from 2006 to 2010 is World Bank and author calculation as an extension for GHND data. The data for GDP growth rate, initial GDP per capita (US$ 2005 constant prices) and life expectancy are obtained from World Development Indicators. The average years of secondary schooling is obtained from Barro and Lee (2013) dataset. The investment as a share of GDP and degree of institutions' corruption are obtained from International Monetary Fund (IMF) and International

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[1] See Kremer *et al.* (2013) for details.

Country Risk Guide (ICRG), respectively. Table 1 and 2 show the descriptive statistics and correlation matrix of the variables used in the study.

Table 1 - Descriptive statistics

	Mean	Std. Dev.	Min	Max
GDP growth	3.36	2.64	-8.99	13.47
Initial income	8.18	1.55	4.75	11.10
Public health expenditure	3.54	2.09	0.18	8.93
Life expectancy	67.83	9.84	36.12	82.85
Human capital	2.55	1.39	0.13	6.84
Investment	22.21	6.55	0	50.76
Institutions	2.94	1.39	0	6

Source: Authors' analysis.

Table 2 - Correlation matrix

	GDPG	INI	HE	LE	HC	INV	INS
GDPG	1.00						
INI	-0.22	1.00					
HE	-0.23	0.69	1.00				
LE	-0.01	0.79	0.58	1.00			
HC	-0.09	0.73	0.63	0.71	1.00		
INV	0.33	0.12	0.02	0.31	0.20	1.00	
INS	-0.07	0.55	0.55	0.42	0.43	-0.01	1.00

Source: Authors' analysis.

Note: GDPG = is GDP growth rate. INI = is initial GDP per capita. HE = is public health expenditure. LE = is life expectancy. HC = is human capital average year of schooling. INV = is investment as percentage of GDP. INS = institution measured by corruption index.

4. The empirical findings

To assess the effect of public health expenditure on economic growth, the dynamic panel threshold technique was used. Figure 1 reveals the threshold value of public health financing, calculated using the conditional least squares estimator. The threshold level is determined conditional to the minimum residual sum of squares. The estimation of different threshold values is repeated for a range of ratios between 0.18 to 8.93%. The figure shows how the residual sum of squares changes with the increment in public health financing, and the minimum is reached at 5.23. This indicates that the threshold level of public health financing is about 5.23 as a percentage of GDP.
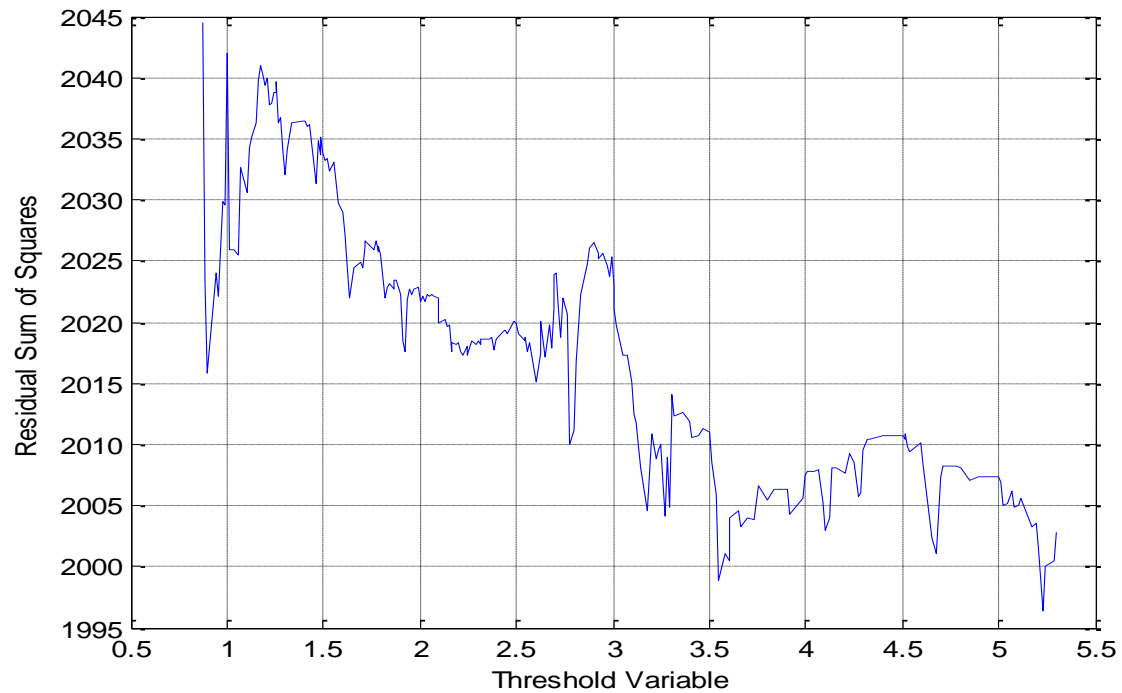
Source: author calculation for equation (2).

Figure 1–Threshold Value of Public Health Financing

Table 3 shows the results of the estimated Equation (2) and (3), where the impact of health expenditure on growth is contingent on itself in the first model and life expectancy in the second model. In the first model, the estimated threshold value is about 5.23 percent of GDP with 95% confidence interval [0.89-5.30]. It can be seen from the data in Table 3 that 132 out of 531 numbers of observations are above the threshold point of public health expenditure. The outcomes display that the two regimes of public health expenditure parameters $\hat{\beta}_1$ and $\hat{\beta}_2$ are both significant, but positive below the threshold, and negative above the threshold. In the second model, the results reveal the effect of health expenditure on growth conditional on life expectancy and the threshold is about 56.11 years with 95% confidence interval [53.47-58.96]. Moreover, the estimated public health expenditure coefficient below life expectancy threshold boosts economic growth, but the coefficient above the threshold indicates that health expenditure lessen growth.

Table 3 - Results of the dynamic panel threshold

	Model 1 (*HE* threshold)	Model 2 (*LE* threshold)
Threshold estimates		
$\hat{\lambda}$	5.23	56.11
Confidence interval (95%)	[0.89-5.30]	[53.47-58.96]
Impact of public health expenditure:		
$\hat{\beta}_1$	0.383* (0.199)	1.101*** (0.328)
$\hat{\beta}_2$	-0.657*** (0.191)	-0.233* (0.124)
Impact of covariates:		
INI_{it}	-0.305 (2.277)	-0.781 (2.151)
LE_{it}	0.179** (0.071)	0.191*** (0.069)
HC_{it}	0.049 (0.446)	0.156 (0.439)
INV_{it}	0.130*** (0.027)	0.118*** (0.028)

	Model 1 (*HE* threshold)	Model 2 (*LE* threshold)
INS_{it}	0.059 (0.111)	0.131 (0.107)
$\widehat{\gamma_1}$	-4.467*** (1.404)	-4.003*** (1.091)
Observation	531	531
N	97	97
Observation below $\hat{\lambda}$	399	79
Observation above $\hat{\lambda}$	132	452

Source: Authors' analysis.

Notes: ***, ** and * indicate significant at 1%, 5% and 10%, respectively. The standard errors are reported in parentheses. The sample period: 1981–2010 (5-year average).

In the two models, the parameters of initial GDP per capita, life expectancy, human capital, investment, and institutions are in line with our expectation. The coefficients of initial GDP are negative which satisfy the convergence condition, but it is insignificant in both models. The coefficients of life expectancy are positive and significant in the two models. Likewise, the impact of investment as a share of GDP is positive and significant in both models. However, the human capital and institutions coefficients are positive but insignificant in the two models.

A prior study by Carboni and Medda (2011) has noted the importance of considering the possible non-monotonicity between public expenditure and growth. The present study was designed to determine the effect of public health expenditure on economic growth, taking the demographic change represented by the increase in life expectancy into account. The most obvious finding to emerge from the analysis is that the effect of public health expenditure on economic growth is non-monotonic. Unambiguously, public expenditure up to a certain threshold motivates growth, and beyond this threshold, health expenditure impedes growth. The results of this study are in contrary to most studies that adopted linear model to estimate impact of public expenditure on growth which are subject to misspecification (Carboni and Medda 2011), however; it consistent with those of other studies that suggest public expenditure have a non-linear effect on economic growth (Wang 2011, Martins and Veiga 2014, Hajamini and Falahi 2014). Another interesting finding is that when the impact of public health expenditure on economic growth is contingent on life expectancy, the findings suggest that health expenditure to a certain level of life expectancy promotes growth, but in any further life expectancy, the increment in public health expenditure negatively affects economic growth. This finding corroborates the ideas of Reinhart (1999), who suggested that life expectancy generates economic growth, whereas higher government expenditure lessen growth, and Aísa and Pueyo (2006) who argued that where life expectancy is low, such as in poor countries, any increase in public health care expenditure will enhance life expectancy and thus leads to higher growth rate, however; where life expectancy is high, such as in rich countries, any further increase in public health expenditure negatively affects economic growth.

A possible explanation for the non-monotonic relationship between public expenditure and growth is the fact that expenditure for medical care rapidly rises when individuals get older and the share of aging population increases (Galama 2011). In addition, as elderlies' consumption becomes relatively important, any increase in longevity enhances public health spending and hence reduces growth. According to Barro (2013) the expenditure on health would have diminishing returns due to the declining productivity of aging population. More importantly, the demographic transition has essential effects on rising health expenditure, especially in developed countries where the increasing number of aging population put more pressure on the public health system (Potrafke 2010).

4.1. Robustness tests

Table 4 contains the some robustness analysis to support the main findings of the study. First, we use fixed effects (FE) model that estimate with considering the specific effects of the countries in model 3. Second, we use the generalized method of moment (GMM) estimation technique to estimate the model shown in Equation (2) in a linear and non-linear forms, in models 4 and 5, respectively. It is worth mentioning that public health expenditure and its quadratic form are treated as endogenous variables since GMM enables us to obtain unbiased estimates by using instruments. The analysis of FE shown in Table 4 model 3 indicates the existence of non-linear relationship pattern between public health spending and growth with threshold value 4.01. The results of the linear specification obtained from the analysis of GMM are presented in Table 4 model 4. What is interesting in this data is that the findings are similar to previous one of dynamic panel threshold except that public health expenditure is negative and insignificant. According to Carboni and Medda (2011), however, this estimation is subject to misspecification problem. Therefore, the Ramsey RESET test is

used to verify whether the model is correctly specified or not. The p-value of RESET test reported below the table 4 is 0.02, which indicates that the model is misspecified. On the other hand, the findings of the non-linear specification are shown in Table 4 model 5. It clear that the results support the findings of non-linearity between public health spending and growth and the threshold equal to 4.95. From the above findings we can point out that paying attention for the possible non-linearity between public health expenditure and economic growth is required. In addition, adopting more appropriate techniques such as dynamic panel threshold and GMM can help to reduce the biasness due to endogeneity problem.

In order to show how the linear estimation might be misleading, the study used the scatter graph to represent the relationship between public health expenditure and economic growth. Figure 2 shows linear representation and trend line for the relationship, which indicates a negative link between health expenditure and economic growth. However, the non-linear association is represented in Figure 3. It can be seen from the line trend that at the initial stage public health expenditure is positively related to GDP growth, but after certain level, any increase in public health expenditure is negatively related to GDP growth. These findings further support the idea that public expenditure-growth nexus is non-monotonic as shown in the earlier findings of this study.

Table 4 - Findings of Fixed Effect and GMM

	Model 3 (FE)	Model 4 (GMM)	Model 5 (GMM)
$\hat{\lambda} = \left\lvert \frac{\hat{\beta}_1}{2\hat{\beta}_2} \right\rvert$	4.011	-	4.955
INI_{it}	-2.517*** (0.591)	-6.390*** (2.048)	-0.135 (0.231)
PH_{it}	1.130*** (0.290)	-0.113 (0.164)	4.906*** (1.726)
PH_{it}^2	-0.142*** (0.153)	-	-0.495*** (0.150)
LE_{it}	0.199*** (0.045)	0.234*** (0.069)	-
HC_{it}	0.566** (0.258)	0.161 (0.368)	-2.395 (1.809)
INV_{it}	0.131*** (0.023)	0.196*** (0.036)	2.838** (1.150)
INS_{it}	0.015 (0.103)	-0.241 (0.162)	-2.361** (1.121)
Hansen test	-	[0.21]	[0.31]
AR (1) p-value	-	[0.01]	[0.25]
AR (2) p-value	-	[0.11]	[0.13]

Source: Authors' analysis.

Notes: ***, ** and * indicate significant at 1%, 5% and 10%, respectively. The standard errors are reported in parentheses, and between [ ] are the p-values of Hansen test and serial correlation tests. The sample period: 1981–2010 (5-year average). The time dummies included are jointly significant. In addition, the functional form RESET test p-value is (0.02) for model 3.

GDP Growth versus Public health Expenditure

$y = -0.113x + 4.37$
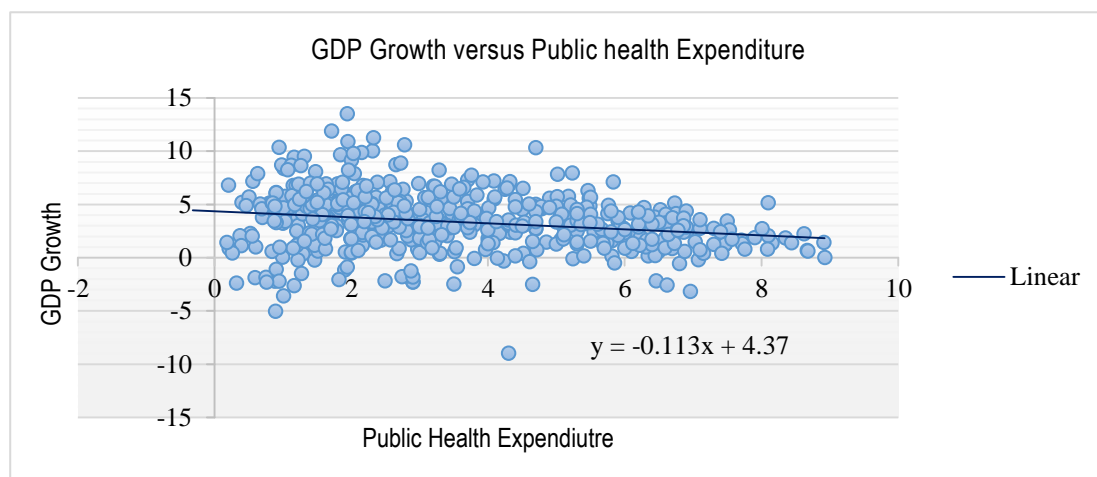
Source: author calculation, and the data from the abovementioned data sources.

Figure 2 - Linear scatter

GDP Growth versus Public health Expenditure

$$y = -0.66x^2 + 0.38x - 4.47$$
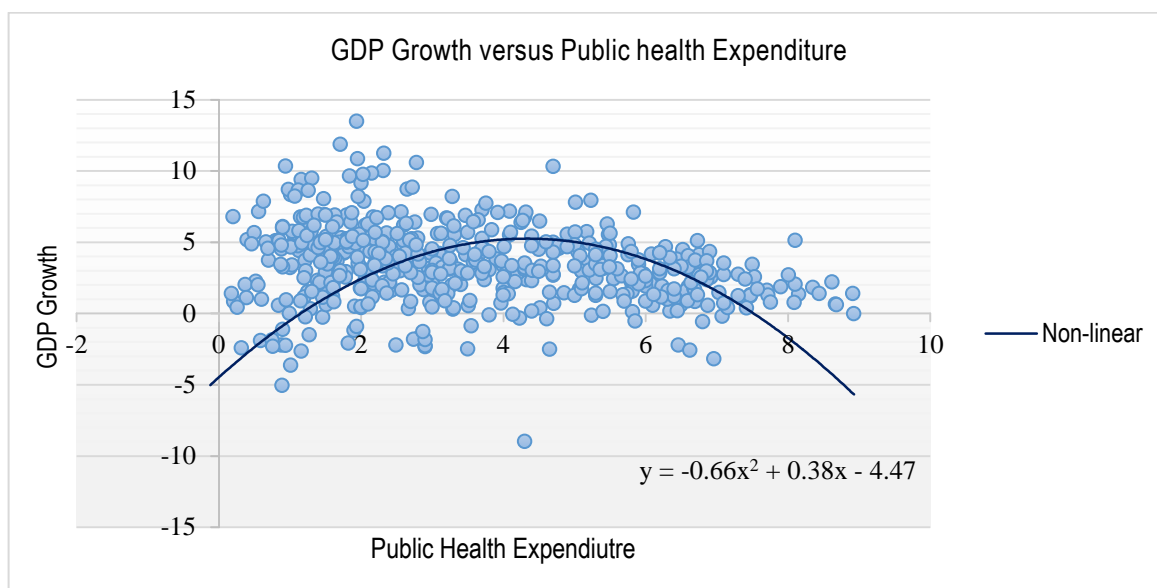
Source: author calculation, and the data from the abovementioned data sources.

Figure 3 - Non-linear scatter

Conclusion

The main goal of the current study was to assess the non-monotonic relationship between health expenditure from public source of financing and economic growth, utilizing large sample of 97 developed and developing countries over the period 1981-2010. The study aimed to determine whether or not there exists threshold level of public health expenditure in its relationship with economic growth. In addition, the claim made by Aísa and Pueyo (2006) that the impact of public health expenditure on growth is contingent on life expectancy is also investigated in this study. More appropriate estimation technique, the dynamic panel threshold introduced by Kremer *et al.* (2013), was used to achieve the objectives of the study. The empirical results showed that there is a non-monotonic relationship between public health expenditure and economic growth contingent on a certain threshold level of health expenditure. Specifically, when health expenditure is below the threshold, it positively affects economic growth, indicating that further public expenditure on health enhances the growth rate of the economy. However, when public health expenditure is above the threshold, the effect of health expenditure on growth is negative. This shows that any further increase in public expenditure will adversely affect growth. The findings, furthermore, enhance our understanding that the non-monotonic relationship between health expenditure and economic growth is contingent on life expectancy. It has been shown that the impact of public health expenditure on growth below life expectancy threshold was positive and statistically significant, however any increase in longevity above the threshold point will make economic growth react negatively to any change in public expenditure on health.

The current findings suggest that in developing countries where life expectancy is low, any increase in public health expenditure stimulates growth through enhancing life expectancy. However, in developed states where life expectancy is relatively high any increase in health expenditure by the public have an adverse impact on economic growth. An implication of this is that the demographic transition has important effects on increasing public health expenditure, mainly in developed countries where the growing number of aging population put more pressure on health systems. Therefore, greater efforts are needed to ensure the efficiency of public finances and health care systems in both developed as well as developing countries.

References

[1] Aísa, R., Pueyo, F. (2006). Government health spending and growth in a model of endogenous longevity. *Economics Letters*, 90(2): 249–253. DOI:10.1016/j.econlet.2005.08.003

[2] An, C.-B., Jeon, S.-H. (2006). Demographic change and economic growth: An inverted-U shape relationship. *Economics Letters*, 92(3): 447–454. DOI:10.1016/j.econlet.2006.03.030

[3] Arellano, M., Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics,* 68: 29–51. DOI:10.1016/0304-4076(94)01642-D

[4] Baldacci, E. *et al.* (2008). Social Spending, Human Capital, and Growth in Developing Countries. *World Development,* 36(8):1317–1341. DOI:10.1016/j.worlddev.2007.08.003

[5] Barro, R.J. (1990). Government Spending in a Simple Model of Endogenous Growth. *The Journal of Political Economy,* 98(5): 103–125. Retrieved from http://www.jstor.org/stable/2937633

[6] Barro, R.J. (2013). Health and Economic Growth. *Annals of Economics and Finance,* 2: 305–342.

[7] Barro, R.J., Lee, J.W. (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of Development Economics,* 104: 184–198. DOI:10.1016/j.jdeveco.2012.10.001

[8] Barro, R.J., Sala-i-martin, X. (1992). Public Finance in Models of Economic Growth. *Review of Economic Studies,* 59(4): 645–661. DOI:10.1016/S0164-0704(96)80041-3

[9] Beraldo, S., Montolio, D., Turati, G. (2009). Healthy, educated and wealthy: A primer on the impact of public and private welfare expenditures on economic growth. *Journal of Socio-Economics,* 38(6): 946–956. DOI:10.1016/j.socec.2009.06.013

[10] Caner, M., Hansen, B.E. (2004). Instrumental variable estimation of a threshold model. *Econometric Theory,* 20: 813–843. DOI: 10.1017/S0266466604205011

[11] Carboni, O. A., Medda, G. (2011). Government spending and growth in a neoclassical model. Mathematics and Financial Economics, 4(4): 269–285. DOI:10.1007/s11579-011-0045-2

[12] Colombier, C. (2011). Does the composition of public expenditure affect economic growth? Evidence from the Swiss case. *Applied Economics Letters,* 18(January 2015): 1583–1589. DOI:10.1080/13504851.2011.554361

[13] Dao, M.Q. (2012). Government expenditure and growth in developing countries. Progress in Development Studies, 12(1): 77–82. DOI:10.1177/146499341101200105

[14] Eryigit, S.B., Eryigit, K.Y., Selen, U. (2012). The Long-Run Linkages Between Education, Health and Defence Expenditures and Economic Growth: Evidence From Turkey. *Defence and Peace Economics*, 23(6): 559–574. DOI:10.1080/10242694.2012.663577

[15] Galama, T. (2011). A Contribution to Health Capital Theory, Available at: http://www.rand.org/content/dam/rand/pubs/working_papers/2011/RAND_WR831.pdf

[16] Govindaraju, V.G.R.C., Rao, R., Anwar, S. (2011). Economic growth and government spending in Malaysia: A re-examination of Wagner and Keynesian views. *Economic Change and Restructuring*, 44: 203–219. DOI:10.1007/s10644-010-9099-z

[17] Hajamini, M., Falahi, M.A. (2014). The nonlinear impact of government consumption expenditure on economic growth : Evidence from low and low-middle income countries. *Cogent Economics & Finance,* 2(1): 1–15. DOI:10.1080/23322039.2014.948122

[18] Hansen, B.E. (1999). Threshold effects in non-dynamic panels : Estimation, testing, and inference. *Journal of Econometrics,* 93(2): 345–368. DOI:10.1016/S0304-4076(99)00025-1

[19] Kelley, A.C., Schmidt, R.M. (1995). Aggregate population and economic growth correlations: the role of the components of demographic change. *Demography*, 32(4): 543–555. DOI: 10.2307/2061674

[20] Kesikoglu, F., Oztyrk, Z. (2013). Relationship Between Human Capital and Economic Growth : Panel Causality Analysis for Selected OECD Countries. *Journal of Economic and Social Studies,* 3(1): 153–162. DOI: 10.14706/JECOSS11315

[21] Khan, H.N. *et al.*, (2015). Health Care Expenditure and Economic Growth in SAARC Countries (1995 – 2012): A Panel Causality Analysis. *Applied Research in Quality of Life,* pp.1–23. DOI:10.1007/s11482-015-9385-z

[22] Kremer, S., Bick, A., Nautz, D. (2013). Inflation and growth: new evidence from a dynamic panel threshold analysis. *Empirical Economics,* 44(2): 861–878. DOI:10.1007/s00181-012-0553-9

[23] Law, S.H., Singh, N. (2014). Does too much finance harm economic growth? *Journal of Banking & Finance*, 41: 36–44. DOI:10.1016/j.jbankfin.2013.12.020

[24] Martins, S., Veiga, F.J. (2014). Government size, composition of public expenditure, and economic development. *International Tax and Public Finance,* 21(4): 578–597. DOI:10.1007/s10797-014-9313-4

[25] Missoni, E., Solimano, G. (2010). Towards Universal Health Coverage: the Chilean experience. *World Helth Report.*

[26] Narayan, P.K., Nielsen, I., Smyth, R. (2008). Panel data, cointegration, causality and Wagner's law: Empirical evidence from Chinese provinces. *China Economic Review*, 19(1): 297–307. DOI:10.1016/j.chieco.2006.11.004

[27] Nketiah-Amponsah, E. (2009). Public spending and economic growth: evidence from Ghana (1970–2004). *Development Southern Africa,* 26(3): 477–497. DOI: 10.1080/03768350903086846

[28] Potrafke, N. (2010). The growth of public health expenditures in OECD countries: do government ideology and electoral motives matter? *Journal of health economics*, 29(6): 797–810. DOI:10.1016/j.jhealeco.2010.07.008

[29] Reinhart, V.R., (1999). Death and taxes: their implications for endogenous growth. *Economics Letters,* 62(3): 339–345. DOI: 10.1016/S0165-1765(98)00250-X

[30] Samudram, M., Nair, M., Vaithilingam, S. (2009). Keynes and Wagner on government expenditures and economic development: The case of a developing economy. *Empirical Economics,* 36: 697–712. DOI: 10.1007/s00181-008-0214-1

[31] Tang, C.F., (2009). An Examination of the Government Spending and Economic Growth Nexus for Malaysia Using the Leveraged Bootstrap Simulation Approach. *Global Economic Review,* 38(2): 215–227. DOI: 10.1080/ 12265080902903266

[32] Wang, K.M. (2011). Health care expenditure and economic growth: Quantile panel-type analysis. *Economic Modelling,* 28(4): 1536–1549. DOI: 10.1016/j.econmod.2011.02.008

[33] Wu, S.Y., Tang, J.H., Lin, E.S. (2010). The impact of government expenditure on economic growth: How sensitive to the level of development? *Journal of Policy Modeling,* 32(6): 804–817. DOI: 10.1016/j.jpolmod.2010.05.011

[34] Zhang, J., Zhang, J., Lee, R. (2003). Rising longevity, education, savings, and growth. *Journal of Development Economics,* 70(1): 83–101. DOI: 10.1016/S0304-3878(02)00088-3

Risk Management Tools in Russian Aviation Engineering Companies

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Abstract:

This paper covers on the approaches to risk management tools in Russian aviation engineering companies. The topic is of urgency as in high volatility external environment it is imperative for companies to take steps on lowering and preventing risks. The authors are rationalizing the insufficiency of using the international standards of risk management to ensure the stability of a company. The authors recommend applying various quality/quantity analysis methods to solve risk management issues. Special attention is paid to the cognitive modeling technology which allows to: study the issues described by inexplicit factors and mutual relationships; structuralize and formalize the knowledge on the emerging processes/phenomena and obtain new knowledge on possible future changes; study upcoming scenarios and create viable and highly efficient solutions on that basis.

Keywords: risk management, risk management tools, aviation engineering, cognitive analysis.

JEL Classification: G32.

1. Introduction

The macroeconomic and political events of the past two years have shown demonstratively that in the contemporary global business environment threats and uncertainty are dominating. Risks are present everywhere – internal and external, mutually related, growing and continuously varying. That situation prioritizes the issues of identification, assessment and prevention of risks for any company. For Russian aviation engineering companies, operating under the sanctions imposed by the EU, risk management issue is the most urgent. Enhancement of stability to external environment challenges suggests not only the use of the advanced practices in risk management, but seeking for new solutions via adaptation of known risk management tools to particular business environment.

The international risk management practice is based on relevant standards and recommendations developed by experts and accepted by professional communities:

- Risk Management Standard (risk management standard developed by the Federation of European Risk Managers Association (FERMA);
- Enterprise Risk Management (Integrated corporate risk management standards COSO), the USA;
- Australian/New Zealand Risk Management Standard (AS/NZS 4360);
- BS 31100, Code of Practice for Risk Management (the UK).

In Russia, risk management in compliance with the international standards is declared by large integrated entities. That is conditioned by the need for public informing of stakeholders of the performance in the annual report format. (Aleksandrova and Aleksandrova 2014)

The opportunity to detect the real attitude to risks by corporate top management and staff using unbiased methods is rather low. Therefore, the assessments obtained through questioning a wide range of national top managers within a long time are virtually the only available source of insider information on the situation and trends in that business management area.

2. Methodology

This research is theoretically based on the works by Russian and foreign scholars on risk management issues. The object of this research was the data from the empirical studies by Pricewaterhouse Coopers, KPMG, Central Economics and Mathematics Institute of RAS (CEMI) and annual reports of Russian aviation engineering companies.

As the methodological basis, the following methods were applied: analysis, synthesis, comparison, induction, deduction, cognitive analysis. While writing this paper, the authors considered the results and conclusions made by numerous works by Russian and foreign risk management, strategic management, innovative marketing professionals.

On the basis of the works available, the authors' concept of the architecture of risk management system for Russian aviation engineering companies has been described.

3. Results

Science and technology-intensive nature of aviation engineering products suggests developed innovative infrastructure. The Russian aviation engineering innovative infrastructure is the set of entities operating as customers and providers of investment projects and programs, investors and end-users of innovations and innovation process servicing organizations (Aleksandrova and Lukyanova 2012, Lyasnikov *et al.* 2014).The key role in the development of the national aviation engineering is played by integrated structures consolidating aviation engineering enterprises by the product. The target objective of the Russian industrial integrated structures is the efficient distribution of resources and financing projects, minimizing the scatteration of limited investment opportunities for most enterprises and thus intensifying the innovative process both in subsectors and the sector in general. To date, sectoral holdings have been established in aviation engineering subsectors like aircraft engineering, helicopter engineering, aviation engine engineering, aviation instrumentation engineering, aviation equipment and air armament. The distinctive feature of the sector is the operation of independent scientific and manufacturing enterprises (SME) built into the value chain of aircraft solving the tasks of development and manufacturing of science-intensive components of aviation equipment (Aleksandrova *et al.* 2015).

Orientation of the Russian aviation engineering companies towards breakthrough innovations and import phase out suggests a lot of work to be done under certain innovation programs and projects in close cooperation with partners (Sekerinand Gribov 2014). As evidenced by the research done by S. Zaichenko, quality limiters of innovation projects results are resource opportunities, low scientific potential, and lack of qualified engineering staff (Zaichenko *et al.* 2014). The main development barriers, as opined by experts, are high risks of new technologies implementation in connection with political events. It should be noted that political risks are among the core risks in the export sales of military products (Dudin *et al.* 2014).

Empiric research of risk management system in Russian companies, leaded by R.M. Kachalov in 2005-2014, showed that 80% of respondents admitted the operation of their companies risky. Risk management function in companies is as a rule exercised by own efforts: either regularly as scheduled or from time to time upon the resolution of senior management but in compliance with the approved procedure (Kachalov and Pletenenko 2014). Such results, as opined by the authors of this paper, evidence the underestimation of risk management function in the achievement of stability and business safety goals.

As per PwC's report *Risks in review. Ensuring competitive advantage in instability conditions*, there is some discrepancy in the assessment of risk management by CEOs and experts. So, 52% of the Russian respondents are convinced that their companies are efficiently managing risk. However, the study results showed that:

- Only 24% of respondents developed risk appetite identification system. The information on the level of a risk which a company is ready to accept in the course of operation was advised to all the staff.
- Only 24% of respondents state that risk management and strategic management in their companies are fully mutually compliant.
- Only 20% of respondents efficiently monitor risk appetite and stability of their companies using key indicators of risk and other monitoring tools.
- 12% have fully integrated risk management strategy which aligns risk management process with strategic planning. (Risks in Review. Ensuring Competitive Advantage in Instability Conditions, 2015)

Leading sectoral holdings PAO *United aircraft corporation* (UAC), AO *United engines corporation* (UEC), AO *Russian helicopters* differently create their policies in risk management. For instance, CEOs of PAO UAC responsibly recognize that the operation of its subsidiaries is also exposed to a number of risks which may greatly change the expected performance. The company every year is implementing continuous actions to prevent the emergence and minimize possible effects of various negative factors on production and operation. Strategic guidance in risk management is exercised by the Board of Directors of PAO UAC. Risk management strategy is implemented via resolutions of the Board and respective orders/resolutions of UAC President. Audit committee of PAO UAC approved Risk management policy (Official Web Page of AO United Engines Corporation, 2014). The main risk groups are: sectoral, country-level, financial, legal and issuer-related.

Risk management approaches used in AO UEC provide for the implementation of measures on prevention and minimizing of the two risk groups: legal and financial. Meantime the level of risks is assessed as low and moderate (Official Web Page of AO United Engines Corporation, 2014).Risk management is the due control over the observance of the civil, foreign currency, labor, and customs regulations. UEC admits that is to a various extent exposed to foreign

currency risk, interest rate change risk, credit risk and liquidity risk. Risk management is implemented by the staff in compliance with procedures. For instance, due liquidity reserve level is maintained by comparing terms of repayment of liabilities and cash receipt from financial assets, maintaining open credit limits on the level compliant with stress-test of liquidity risk.

In AO *Russian helicopters,* risk management functions are the competence of the audit committee of the Board of Directors (Official Web Page of AO Russian Helicopters, 2014). The integrated risk management model implemented in that holding is based on the Standard COSOand AS/EN 91100C. On the corporate level, risk database is maintained, containing the description of the holding's core strategic risks and their holders as well as plans and procedures for managing those risks. Risk management efficiency monitoring is exercised by risk managers.

Assessing the quality of risk management systems in leading sectoral holdings, the authors note that the work on the improvement of risk management processes and instruments is continuous. However, none of the said companies account for the impact of reputational risk factors on image and business reputation; although, as opined by M.O. Korobko, the impact of reputational risk on corporate capitalization may reach 20-25% (Korobko 2014).

We opine that on the corporate level risk management system for the Russian aviation engineering companies should be built under the principle of "third line of defense". It was recommended by the Basel Committee as a tool for monitoring and assessment of risks for globally system-relevant banks (Basel Committee on Banking Supervision, 2013). In our model, the first line of defense from a risk is the competence of business units and holders of business processes (Figure1). Their functions include operational control over risks, maintaining risks within the prescribed limits, realization of steps on minimizing and prevention of risks via standard procedures. The second defense line suggests finding and identifying risks on the strategic level and development of steps upon early-warning signals. On that level of our model, a special corporate division is responsible for the development of risk management procedures, monitoring of core risk indicators and making reports. Risk managers maintain the register of risks, make their profiles and model the state of innovation projects risk portfolio.
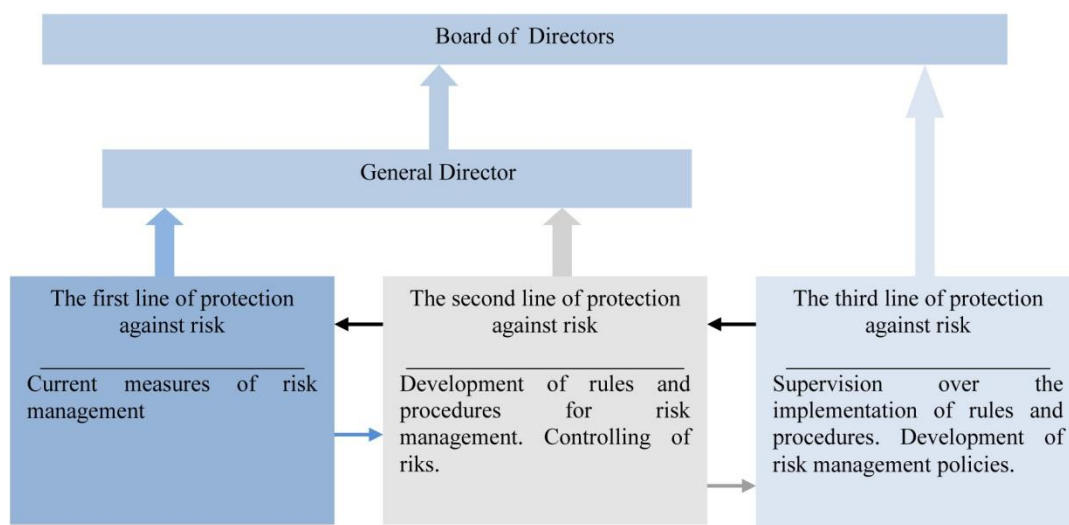
Figure 1 - Risk management system model: three lines of defense

Supervision and critical assessment of the efficiency of the risk management system is done on the third line of defense. Those functions are imposed on the audit committee of the Board of Directors. The final level of liability and readiness for accepting a risk is determined by the Board of Directors. The submitted risk management model is aimed at understanding and managing all risks via systematic approach to their identification, assessment and control.

Articles by Russian and European scholars rather widely review on the contemporary management tools on risk analysis and control. However, not any standard tool allows working efficiently. The shift in emphasis from the control and analysis of past periods to the analysis of future multivariate scenarios suggests the reconsideration of risk management tools for the Russian aviation engineering companies. The authors of this paper also opine that it is necessary to use independent tools at each risk management stage.

If there is enough statistical information on known risks, we should apply the group of economic and mathematical methods for forecasting scenarios. Effective management tools for quantitative information are studied by V.D. Sekerin and M.J. Parfenova (Sekerin and Avramenko 2014, Parfenova and Babishin 2014). At the monitoring stage, Foresight Diamond is useful for choosing the required tools. Orienting by the panes of a diamond, a researcher may make a choice for creative/consulting/conclusive methods to solve a particular problem (Popper 2012). In complex

and uncertain situations when no statistical information is available on new factors of risks and threats, cognitive analysis should be applied. The difficulties of identifying various kinds of risks and problems in connection with their assessment relate to the simultaneous implementation by the Russian aviation engineering companies of many projects at various lifecycle stages, causing high level of uncertainty in fulfillment of the assumed corporate liabilities. The risk is especially high at the R&D stage (Dudinand Lyasnikov 2014). Scenario analysis in that case will give a greater effect for decision making rather than traditional extrapolation methods (Aleksandrova 2015).The research by Meissner and Wulf also evidences in favor of decision making based on scenario forecast. Wulf *et al.* offer an efficient tool for the neutralization of cognitive and behavioral bias in making strategic decisions (Meissner and Wulf 2013, Meissner *et al.* 2015).The portfolio approach, as opined by Linton and Vonortas, is called to ensure a more exact assessment of uncertainty and other specific factors influencing socio-economic effects of scientific R&D. The scholars offer to supplement the traditional scientific research quality expertise by systematic portfolio meta-analysis. Each incentive claiming for support may be considered an element of a comprehensive system (portfolio). The classic expertise based on the scientific level of each project as a rule causes undeliberate duplication of puzzle elements and undesirable spaces between them. The portfolio approach allows to eliminate or to minimize undeliberate duplication and spaces in the objective coverage of particular researches. In those conditions, all the projects regardless from the level of related risks and expected results are aimed at the achievement of the socio-economic targets set forth (Linton and Vonortas 2015).

Aviation engineering companies are simultaneously working in a great number of innovation projects. We apply the portfolio approach in the risk management context assuming that risk portfolio is the aggregate risk of innovation projects set, its value does not exceed the risk appetite level accepted by a company. Innovation projects risks are identified in this paper as uncertain events which, if emerging, have positive/negative effect on the integral assessment of risk portfolio. Risk portfolio management is a process of managing risk clusters/groups including identification, assessment, prioritization of risks, seeking conditional and unconditional dependencies, building correlation models, balancing risks inside portfolio, and finally their monitoring and control. Managing risk portfolio of innovation projects differs from projects risk management due to special features of risks behavior: interdependence, inter offset, synergy.

We opine that an efficient tool for modeling the state of a risk portfolio is the cognitive approach. We built cognitive map of risk portfolio for SME in aviation components engineering (Figure 2). To build the cognitive map, the information about risks and their sources at all the stages of the lifecycle of innovation projects was obtained via expert questionnaires. Corporate leaders and chief specialists acted as experts. We note that we have analyzed the projects which are implemented and have some common parameters: customer's country, kind of product, type of object.

Cognitive map/model building process comprises the following procedures:

▪ identifying factors to be included in the model;

▪ finding cause and effect relationship between factors;

▪ finding the nature (positive/negative) and the strength of the relationship between factors with the following linguistic scale: 0.1 –very weak; 0.3 –weak; 0.5 – moderate; 0.7 –strong; 0.9 –very strong.
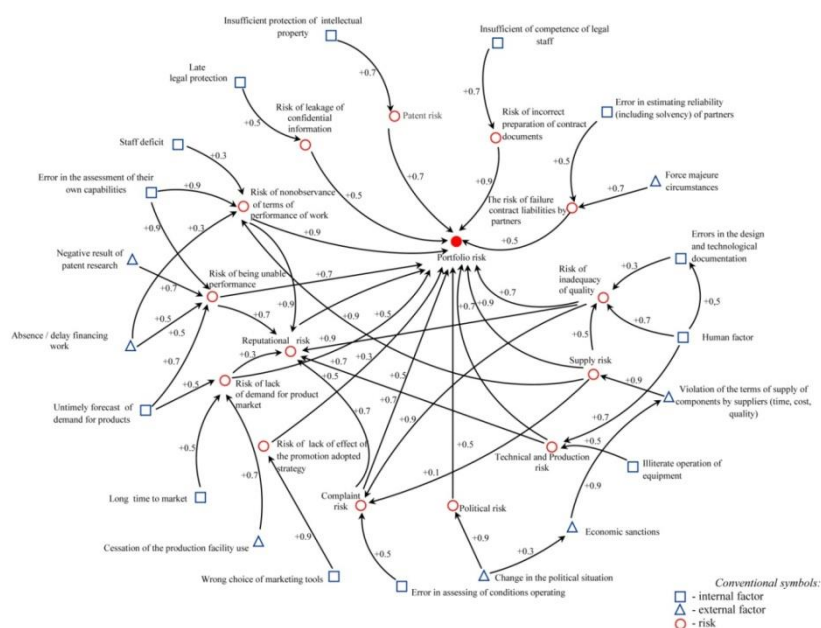
Figure 2 - Cognitive map (model) of innovation project risk portfolio of SME in aviation components engineering

Then, using the expert assessment method, causal relationships (concepts) between the vertices of the cognitive mapwere identified. As the concepts, both risk factors (external and internal) and various kinds of risks were identified, which should be managed via a developed system to achieve the main goals of an innovation project. Then the nature and strength of the relationship between the vertices of the cognitive mapwere found. On the map it is clearly seen that virtually for any stage of project there is a probability of works completion delay under the influence of the internal factors like lack of staff and wrong assessment of own capabilities (for instance, production-related). But the strongest causal relationship is with the procurement risk which may be a consequence of the economic sanctions in case of working with foreign partners. The result of the emergence of some or other risk at a respective stage of an innovation project will be the financial risk, the probability of which to a great extent predetermines the project success in general. Also, we note that the consequence of risks emerging under the influence of certain internal factors is the reputational risk. Its emergence, for instance, at the initial stages of an innovation project may have a negative impact for the implementation stage.

Conclusions

In the complex conditions of the operation of the Russian aviation engineering sector, related, on the one hand,to the sanctions policy by the EU,and on the other hand, to the need for enhancement of the national defense, the issues of identification and accounting for risks in the course of the development and manufacturing of science-intensive products are urgent.

The current ambiguous situation requires continuous corporate improvement and optimization of risk management. Companies have to resist growing competition and lack of qualified staff, and monitor rapidly developing technologies.

Due to its specifics, the operation of the Russian aviation engineering companies requires the development of an integrated system of risk management. As the architecture of such rick management system, the model of *three lines of defense* is rationalized.

To build a risk management system it is recommended to apply the portfolio approach. Risk portfolio of innovation projects is a set of innovation projects, balanced from the risk appetite standpoint, created with the goal to ensure security and achieve corporate strategic development goals. Risk portfolio should be modeled via the cognitive approach based on cognitive analysis. Within this article's research, the following basic conclusions have been made:

- Russian aviation engineering companies recognize the importance of risk management system in the achievement of strategic goals;
- the risk management approaches applied at that stage provide for the implementation of actions in connection with prevention and lowering the level of two risk groups: legal and financial;
- it is required to expand the tools at every stage of risk management (identify, analyze, plan, monitor, respond);
- the experience of the use of various models and methods based on cognitive maps proves their feasibility in solving risk management issues.

Our research in cognitive analysis of risks will be continued.

References

[1] Aleksandrova, A.V., Lukyanova, E.V. 2012. Science-Intensive Aviation Engineering Products Promotion Technology. *Economics and Management in Engineering*, 4: 47-52.

[2] Aleksandrova, A.V., Aleksandrova, K.D. 2014. Capitalization Management from Stakeholders' Standpoint. *International Research Journal*, 2-2(21): 34-35.

[3] Aleksandrova, A.V., Protsenko, Ye.V. 2015. Scientific and Manufacturing Enterprises as a Crucial Element of Innovative Structure of Aviation Engineering. In A.V. Babkin (Ed.), Economic Restructuring: Theory and Instruments, Saint-Petersburg: Polytechnic University Publishing, pp: 373-398.

[4] Aleksandrova, A.V. 2015. Cognitive Technologies to Support Making Managerial Decisions. In S.G. Falko (Ed.), Bulletin of Scientific Works of the 6th International Congress on Controlling "Controlling Challenges and Requirements to Controllers, Moscow, pp. 6-11.

[5] Dudin, M.N., Lyasnikov, N.V., Sekerinand, V.D., Gorohova, A.E. 2014. Historical Aspects of Global Transformation of Engineering Thought in Industry and Agriculture in the Context of Changing the Technological Modes. *American-Eurasian Journal of Sustainable Agriculture*, 8(6): 17-22.

[6] Dudin, M.N., Lyasnikov N.V., Veselovsky M.Y., Sekerinand V.D. and Aleksakhina, V.G. 2014. The Problem of Forecasting and Modeling of the Innovative Development of Social-Economic Systems and Structures. Life *Science Journal*, 11(8): 549-552. Date Views 08.01.2016 www.lifesciencesite.com

[7] Kachalov, R.M. and Pletenenko, O.A. 2014. Economic Risk in National Business: Look-Back Analysis of Questionnaires for 2005-2014. In Collection of Scientific Works "Theory and Practice of Institutional Transformations in Russia", Moscow: Central Economic and Mathematical Institute of RAS, pp: 155-161.

[8] Korobko, M.O. 2014. Definition, Types and Specifics of Corporate Reputational Risk. *Controlling*, 1(51): 18-21.

[9] Linton, J. and Vonortas, N. 2015. From Research Project to Research Portfolio: Meeting Scale and Complexity. *Foresight-Russia*, 9(2): 38–43.

[10] Lyasnikov, N.V., Dudin, M.N., Sekerin, V.D., Veselovskyand, M.Y. and Aleksakhina, V.G. 2014. The National Innovation System: the Conditions of Its Making and Factors in Its Development. *Life Science Journal*, 11(6): 535-538. Date Views 08.01.2016 www.lifesciencesite.com/lsj/life1106/078_24751life110614_535_538.pdf.

[11] Meissner, P. and Wulf, T. 2013. Cognitive Benefits of Scenario Planning: Its Impact on Biases and Decision Quality. *Technological Forecasting and Social Change*, 80(4): 801-814.

[12] Meissner, P., Sibony O. and Wulf, T. 2015. Are you Ready to Decide? McKinsey Quarterly, April. Date Views 08.01.2016 www.mckinsey.com/insights/strategy/are_you_ready_to_decide.

[13] Parfenova, M.J, Babishin, V.D., Yurkevich, E.V., Dudinand M.N. and Sekerin, V.D. 2014. Methodology Making Management Decisions Based on a Modified Ramsey Model. *Asian Social Science*, 10(17): 292-301.

[14] Popper, R. 2012. Monitoring is sledovaniy budushchego [Mapping Futures Studies]. *Foresight-Russia*, 6(2): 56-74 (in Russian).

[15] Sekerin, V.D, Avramenko, S.A. Veselovskyand, M.Y., Aleksakhina, V.G. 2014. B2G Market: The Essence and Statistical Analysis. *World Applied Sciences Journal*, 31(6): 1104-1108. Date Views 08.01.2016 www.idosi.org/mejsr/mejsr17%2810%2913/8.pdf

[16] Sekerin, V.D. and Gribov, V.D. 2014. The Miles Stones of Logistics Management Development. World *Applied Sciences Journal*, 30(4): 454-459. Date Views 08.01.2016 http://www.idosi.org/wasj/wasj30(4)14/11.pdf

[17] Zaichenko, S., Kuznetsova T. and Roud, V. 2014. Features of Interaction between Russian Enterprises and Research Organizations in the Field of Innovation. *Foresight-Russia*, 8(1): 6-23.

*** Basel Committee on Banking Supervision, 2013. Principles for Effective Risk Data Aggregation and Risk Reporting.Date Views 08.01.2016 http://www.bis.org/publ/bcbs239.pdf

*** Official Web Page of AO Russian Helicopters. Date Views 25.10.2015 www.russianhelicopters.aero/ru/

*** Official Web Page of AO United Engines Corporation. Date Views 02.11.2015 www.uk-odk.ru/files/Godovoi_otchet_ODK_2014.pdf.

*** Official Web Page of PAO United Aircraft Corporation. Date Views 10.11.2015 www.uacrussia.ru/ru/

*** Risks in Review. Ensuring Competitive Advantage in Instability Conditions, 2015. Date Views 15.11.2015 www.pwc.ru/ru/riskassurance/publications/risk-in-review.html

A Framework for Assessing Sustainability of Farming Enterprises

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Abstract:

This paper gives an answer to two important questions: „what is sustainability of farming enterprises?" and „how to assess sustainability of farming enterprises?". First, major shortcomings of dominating approaches for assessment of sustainability of farming enterprises like individual and family farms, agro-companies, agro-cooperatives etc. are summarized, and the needs for improvement underlined. Second, evolution of the "concept" and the major approaches for assessing sustainability of farming enterprises is discussed. More adequate definition of the farming enterprise's sustainability is suggested as ability of a particular form to maintain its governance, economic, social and ecological functions in a long term. Finally, a specific for the conditions of Bulgarian agriculture framework for assessing sustainability of farming enterprises is proposed. The later includes a system of appropriate principles, criteria, indicators, and reference values for evaluating governance, economic, ecological and social aspects of farming enterprise's sustainability as well as an approach for their integration and interpretation. The ultimate objective of this study is to work out an effective framework for assessing sustainability of farming enterprises of different type in the specific economic, institutional and natural environment, assist farm and agro-business management and strategies, and agricultural policies and forms of public intervention in agrarian sector.

Keywords: farm sustainability, governance, economic, social, ecological aspects, framework for assessment.

JEL Classification: Q12, Q13, Q15, Q18, Q2, Q3, Q5.

1. Introduction

Around the globe the issue of assessment of sustainability of farming enterprises such as individual and family farms, agri-firms, ago-cooperatives etc. is among the most debated by the researchers, farmers, agri-business managers, investors, policy-makers, interest groups, and public at large (Andreoli and Tellarini, Bachev 2005, 2009, 2010, 2012, Bachev and Petters, Bastianoni *et al.*, Cauwenbergh *et al.*, FAO, Fuentes, Häni *et al.*, OECD, Rigby *et al.*, Sauvenier *et al.*, UN). The question "what is the level of sustainability of different type of farming enterprises during to present programing period of EU CAP implementation?" is also particularly topical at the current stage of development of European agriculture. Despite the enormous progress in the theory and practice in that new evolving area, still there is no consensus on "what is (how to define) sustainability of farming enterprises", "what is the relation between the farm and the agrarian sustainability", and "how to evaluate the sustainability level of farming enterprises" in a dynamic world, where hardly there is anything actually "sustainable". This paper suggests a framework for assessing sustainability of farming enterprises (The Farms) in the condition of EU CAP implementation. First, the needs for improvement of the system of sustainability assessment are underlined. Second, evolution of the "concept" of farm sustainability and the main approaches for its assessment is analyzed, and on that base a more precise definition of the sustainability of farming enterprises suggested. Finally, a system of principles, criteria and indicators for assessing sustainability of farms at the current stage of agrarian development in Bulgarian is proposed. Ultimate objective is to assist farm and agri-business management, and agricultural policies and forms of public intervention in agrarian sector.

2. Needs for improvement of sustainability assessment

In academic publications, official documents and agricultural practices there is a clear understanding that "farms sustainability and viability" is a condition and an indicator for agrarian sustainability and achievement of sustainable development goals. Also it is widely accepted that in addition to "pure" production and economic dimensions, the farm sustainability has broader social and ecological aspects, which are equally important and have to be taken into account when measure the overall sustainability level. There are suggested and used numerous indicators for assessing agrarian sustainability at "farm level" and diverse approaches for their integration and interpretation.

However, most of the assessments of agricultural sustainability are at industry, national or international level (FAO, OECD), while the important "farm level" is usually missing. Consequently, the important links between the farm management and impacts on agro-ecosystems and their sustainability are not properly studied. (Sauvenier *et al.*)

Besides, often the estimates of farms sustainability and agrarian sustainability unjustifiably are equalized. Agrarian sustainability has larger dimensions and in addition to the sustainability of individual farms includes: the importance of individual (type of) farms in the overall resources management and the socio-economic life of households, region and industry; and the collective actions of diverse agrarian agents; and the overall (agrarian) utilization of resources and the impacts on natural environment; and the amelioration of living and working conditions of farmers and

farm households; and the overall state and development of agriculture and rural households; and the (participation in) overall social governance; and the food security, and the conservation of agrarian capability, etc. (Bachev 2015).

For example, the experience around the globe shows, that there are many "highly" sustainable farms little contributing to agrarian sustainability – numerous "semi-market" holdings and subsistence farms, large enterprise based on leased-in lands, public farms etc. in Bulgaria with "low" standards for environmental protection (Bachev 2010). On the other hand, the sustainable agrarian development is commonly associated with the restructuring and adaptation of farms to constantly evolving market, institutional, and natural environment. This process (pre)determines the low sustainability (non-sustainability) and the diminishing importance of farms of certain type (public, cooperative, small-scale), and the modernization of another part of them (diversification of activity, transformation of family farms into partnerships, firms, vertically-integrated forms, etc.).

Furthermore, in most cases a holistic approach is not applied, and the "pure" economic (income, profitability, financial independence etc.), "pure" production (land, livestock and labor productivity, eco-conservation technologies etc.), "pure" ecological (eco-pressure, harmful emissions, eco-impact etc.), and "pure" social" (social responsibility) aspects of farm development are studies (assessed) independently from one another. In most of the available frameworks for assessing sustainability level there is no hierarchical structure or systemic organization of the aspects and the components of farm sustainability, which (pre)determines the random selection of sustainability indicators.

Also the critical "governance" functions of the farm, and the costs associated with the governance (known as "transaction costs"), and the relations between different aspects of farm sustainability are mostly ignored. Nevertheless, very often the level of the managerial (governance) efficiency and the adaptability of farm predetermine the overall level of sustainability independent from the productivity, social or ecological responsibility of activity (Bachev 2004, Bachev and Peeters 2005).

Now it is broadly recognized that the farm "produces" multiple products, "private" and "public" goods - food, rural amenities for hunting, tourism, landscape enjoyment), environmental and cultural services, habitat for wild animals and plants, biodiversity, including less desirable ones such as waste, harmful impacts etc. Therefore, all these socio-economic and ecological functions of the farm have to be taken into account when assessing its sustainability.

The farm is not only a major production but an important governance structure for organization (coordination) of activities and transactions in agriculture, with a great diversity of interests, preferences, goals, skills etc. of participating agents (owners, managers, workers, etc.). Therefore when assessing sustainability and efficiency of different type of farms (subsistent, member oriented, profit making, part-time employment, conservation, etc.) to take also into account their comparative potential in relation to the alternative market, private, public, etc. (including informal) modes of governance of agrarian activity (Bachev 2004, Bachev and Peeters 2005).

In each particular stage of the evolution of individual countries, communities, eco-systems, sub-sectors of agriculture and type of farms, there is a specific knowledge for the agrarian sustainability (e.g. for the links between human activity and climate change), individual and social value system (preferences for "desirable state" and "economic value" of natural resources, biodiversity, human health, preservation of traditions, etc.), institutional structure (rights on food security and safety, good labor conditions, clean nature and biodiversity, of vulnerable groups, producers in developing countries, future generations, animal welfare, etc.), and goals of socio-economic development.

Thus, the understanding, content, and assessment of the agrarian and farm sustainability are always specific for a particular historical moment (period) of time and for a particular socio-economic, institutional and natural environment, in which a farm is functioning. For example, many otherwise "sustainable" farms in East Europe were not able to comply with the high EU standards and restrictions for product quality, safety, ecology, animal welfare etc. and ceased to exist or entered into "unsustainable" grey sector after the accession of countries to the European Union.

Majority of suggested frameworks for sustainability assessment apply an "universal" approach for "faceless" farms, without taking into consideration the specificity of individual holdings (type, resource endowment, specialization, stage of development) and the environment in which they function (competition, institutional support and restrictions, environmental challenges and risks, etc.). What is more, usually most systems cannot be practically used by the farms and managerial bodies, since they are "difficult to understand, calculate, and monitor in everyday activity" (Hayati *et al.*).

There are a numerous approaches for defining and assessing sustainability of farming enterprises. In the next part of the paper we analyze the evolution of the concept of farm sustainability, and the major approaches for its definition and assessment.

3. Approaches for defining and assessment of farm sustainability

3.1. Sustainability as an alternative ideology and a new strategy

Sustainability movements of farmers and consumers initially emerged in the most developed countries (Switzerland, UK, USA etc.) as a response to concern of particular individuals and groups about negative impacts of agriculture on non-renewable resources and soil degradation, health and environmental effects of chemicals, inequity,

declining food quality, decreasing number of farms, decline in self-sufficiency, unfair income distribution, destruction of rural communities, loss of traditional values, etc. (Edwards *et al.*). In that relation the term "sustainable agriculture" [2] is often used as an umbrella term of *"new" approaches* in comparison to the "conventional" (capital-intensive, large-scale, monoculture, etc.) farming, and includes organic, biological, alternative, ecological, low-input, natural, biodynamical, regenerative, bio-intensive, bio-controlled, ecological, conservative, precision, community supportive etc. agriculture.

After that in the concept of sustainability more topical *"social" issues* have been incorporated such as: modes of consumption and quality of life; decentralization; community and rural development; gender, intra ("North-South") and inter-generation equity; preservation of agrarian culture and heritage; improvement of nature; ethical issues like animal welfare, use of GM crop etc. (VanLoon *et al.*).

For the first time the Rio Earth Summit addressed the *global problem of sustainable development* and adopted its "universal principles" (UN 1992). They comprise: rights on healthy and productive life in harmony with nature for every individual; protecting the rights of future generation; integration of environmental, social and economic dimensions at all levels; international cooperation and partnerships; new international trade relations; application of precaution approach in respect to environment; polluter liability; environmental impact assessment; recognition of women, youth, and indigenous role and interests; peace protection, etc. In a numerous international forums since 1992 these principles have been specified, amplified and enriched. The last UN Conference on Climate Change in Paris concluded with an agreement to cut emissions and tackle climate change between most (196) countries of the planet (UN 2015).

The emergence of that *"new ideology"* has been also associated with a considerable shift of the "traditional understanding" of the development as a theory and policy. In addition to the economic growth, the later now includes a broad range of social, ethical, environment conservation etc. objectives. The modernization of the policies of EU, and diverse international organizations (World Bank, FAO, etc.), and the (national, international) Programs for Agrarian and Rural Development are confirmation of that. In the official documents the general understanding of sustainability is specified and "translated" into language of practice in the form of laws, regulations, instruction, approaches for assessment, system of "good practices" for farmers, etc.

Apart from that general (declarative) description of the sustainability, there have also appeared more "operational" definitions for sustainability. For instance, sustainability of farm is often defined as *"set of strategies"* (Mirovitskaya and Ascher). The managerial approaches that are commonly associated with it are: self-sufficiency through use of on-farm or locally available "internal" resources and know how; reduced use or elimination of soluble or synthetic fertilizers; reduced use or elimination of chemical pesticides and substituting integrated pest-management practices; increased or improved use of crop rotation for diversification, soil fertility and pest control; increase or improved use of manures and other organic materials as soil amendments; increased diversity of crop and animal species, reliance of broader set of local crops and local technologies; maintenance of crop or residue cover on the soil; reduces stocking rates for animals; employment of holistic, life-cycle etc. management of farm and resources; full pricing of agricultural inputs and charges for environmental damages, etc. Accordingly, the level of sustainability of a particular farm is measured through changes in the resources use (e.g. application of chemical fertilizers and pesticides) and the introduction of alternative (sustainable) production methods, and their comparison with the "typical" (mass distributed) farms.

However, interpreting sustainability as "an approach of farming" is not always useful for adequate assessment of sustainability and for "guiding changes in agriculture". Firstly, strategies and "sustainable practices", which emerge in response to problems in some (developed) countries, are not always appropriate for specific conditions of other countries. For instance, a major problem in the Bulgarian farms has been insufficient and/or unbalanced compensation with chemical fertilizers of taken with yields N, K, and P; low rate of farmland utilization and irrigation; widespread application of extensive and primitive technologies (insufficient utilization of chemicals, application of too much manual labor and animal force, gravity irrigation); domination of miniature and extensive livestock holdings, etc. (Bachev 2010). Apparently, all these problems are quite different from the negative impacts on the natural environment as a result of the over-intensification of farms in the old states of the European Union and other developed countries.

Moreover, the priorities and hierarchy of the goals in a particular country also change in time, which makes that approach unsuitable for comparing sustainability of farms in different subsectors, countries and in dynamic (in time). For instance, in EU until 1990s the food security and maximization of output was a main priority, which was replaced after that by the food quality, diversity and safety; conservation and improvement of natural environment and biodiversity; protection of farmers' income; market orientation and diversification; care for animal welfare; preservation and revitalization of rural communities, etc.

Secondly, such understanding of farm sustainability may lead to rejection of some approaches associated with modern farming but nevertheless enhancing sustainability. For example, it is well-known that biodiversity and soil fertility are preserved and improved through efficient tillage rather than "zero tillage" and bad stewardship to farmland.

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[2] The term firstly introduced by the Australian scientists Gordon McClymont (Wikipedia).

Application of such approaches in the past led to enormous challenges and even to loosing of the "agrarian" character of many agro-ecosystems in Bulgaria and other countries alike (Bachev 2010). At the same time, there are many examples for "sustainable intensification" of agriculture in many countries around the world.

Third, such understanding of farm sustainability makes it impossible to evaluate the contribution of a particular strategy to sustainability since that specific approach is already used as a "criterion" for defining sustainability.

Forth, because of the limited knowledge and information during the implementation of a strategy it is likely to make errors ignoring some that enhance sustainability or promoting others that threaten (long-term) sustainability. For examples, the problems associated with the passion on "zero and minimum" tillage in in the past in Bulgaria are well-known. Similarly, many experts do not expect a "huge effect" on environmental sustainability from the "greening" of the EU CAP during the new programing period (Hendricks).

Fifth, a major shortcoming of that approach is that it totally ignores the economic dimensions (absolute and comparative efficiency of resources utilization), which are critical for determining the level of farm sustainability. It is obvious that even the most ecologically clean farm in the world would not be sustainable "for a long time" if it does not sustain itself economically.

Last but not least important, such an approach does not take into account the impact of other critical (external for the farm) factors, which eventually determine the farm sustainability, namely the institutional environment (existing public standards and restrictions), evolution of markets (level of demand for organic products of farms), macroeconomic conditions (opening up of high paid jobs in other industries), etc. It is well known that the level of sustainability of a particular farm is quite unlike depending on the specific socio-economic and natural environment in which it functions and evolves. For instance, introduction of the support instruments of the EU CAP in Bulgaria (direct payments, export subsidies, Measures of NPARD) increased further sustainability level of large farms and cereal producers, and diminished it considerably for the small-scale holdings, livestock farms, vegetable and fruits producers (Bachev *et al.*).

Furthermore, some negative processes associated with the agrarian sustainability in regional and global scale, could impact "positively" the sustainability of some farms in a particular region or country. Example, focusing on harmful emissions of a particular farm does not make a lot of sense in the conditions of a high overall (industrial) pollution in the region (contrary it will be a greater public tolerance toward farms polluting the environment); global worming increases productivity of certain farms in Bulgaria and other Northern countries since it improves cultivation conditions, reduces the risk of frost, allows product diversification, etc. (Bachev 2013).

3.2. Sustainability as a system characteristic

Another approach characterizes sustainability of agricultural system as *"ability to satisfy a diverse set of goals through time"* (Brklacich *et al.*; Hansen; Raman). The goals generally include: provision of adequate food (food security), economic viability, maintenance or enhancement of natural environment, some level of social welfare, etc. Numerous frameworks for sustainability assessment of farms are suggested which include ecological, economic and social aspects (Fuentes; Lopez-Ridaura, Masera, and Astier; Sauvenier *et al.*). According to the objectives of the analysis and the possibilities for evaluation, divers and numerous indicators are used for employed resources, activities, impacts, etc.

However, usually there is a "conflict" between different qualitative goals – e.g. between increasing the yields and income from one side, and amelioration of the labor conditions (working hours, quality, safety, remuneration) and negative impact on environment from the other side. Therefore, there is a standing question *which element of the system is to be sustainable* as preference is to be given on one (some) of them on the expense of others[3]. Besides, frequently it is too difficult (expensive or practically impossible) to determine the relation between the farm's activity and the expected effects – e.g. the contribution of a particular (group of) farms to the climate change.

For resolution of the problem of "measurement" different approaches for the "integration" of indicators in "numeric", "energy", "monetary" etc. units are suggested. Nevertheless, all these "convenient" approaches are based on many assumptions associated with the transition of indicators in a single dimension, determining the relative "weight" of different goals, etc. Rarely, the integration of indicators is based on wrong assumptions that the diverse goals are entirely interchangeable and comparable. For instance, the "negative effects form the farming activities" (environmental pollution, negative effects on human health and welfare, etc.) are evaluated in Euros and Dollars, and they are sum up with the "positive effects" (different useful farm products and services) to get the "total effect" of the farm, subsector, etc. Apparently, there is not a social consensus on such "trade-offs" between the amounts of farm products and destroyed biodiversity, the number of sick or dead people etc.

Also it is wrongly interpreted that sustainability of a system is always an algebraic sum of the sustainability levels of its individual components. In fact, often the overall level of sustainability of a particular system-the farm is

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[3] By definition the agricultural production means destruction of natural «sustainability» of natural eco-systems, in particular destruction and demolition of natural biodiversity.

(pre)determined by the level of sustainability of the (critical) element with the lowest sustainability – e.g. if a farm is financially unsustainable it breaks down. Besides, it is presumed that farm sustainability is an absolute state and can only increase or decrease. Actually, "discrete" state of non-sustainability (e.g. failure, closure, outside take over) is not only feasible, but a common situation in farming around the globe.

Another weakness of the described approach is that "subjectivity" of the specification of goals link criteria for sustainability not with the farm itself but with the value of pre-set goals depending on the interests of the and/or stakeholders, the priorities of the development agencies, the standards of the analysts, the understanding of the scientist, etc.). In fact, there is a great variety of (types of) farms as well as preferences of the farmers and farm-owners – e.g. "own supply" with farm products and services; increasing the income or profit of farm households, preservation of the farm and resources for future generations, servicing communities, maximization of benefits and minimization of costs for final consumers, etc.

Besides, at lower levels of the analysis of sustainability (parcel, division, farm, and eco-system) most of the system objectives are exogenous and belong to a larger system(s). For example, satisfying the market demands less depends on product of a particular (group of) farm(s); many ecological problems appear on regional, eco-system, national, transnational or even global scale, etc.

Actually, the individual type of farms and agrarian organizations have their own "private" goals – profit, income, servicing members, subsistence, lobbying, group or public (scientific, educational, demonstration, ecological, ethical, etc.) benefits. These proper goals rarely coincide (and often are in conflict) with the goals of other systems (including the system as a whole). At the same time, the extent of achieving all these specific goals is a precondition (incentive, factor) for the sustainability of the diverse type of organizations of agrarian agents (Bachev 2004).

Furthermore, different type of farms (individual, family, cooperative, corporative) have quite unlike internal structure as goals of individual participants not always coincide with the goals of the entire farm. While in the individual and family farm there is a "full" harmony (the owner-farmer), in more complex farms (partnership, cooperative, corporation) often there is a conflict between the individual and the collective goals ("division of ownership from farming and/or management"). For instance, in Bulgaria and around the globe there are many highly sustainable organizations with a changeable membership of the individual agents (partners, cooperative members, shareholders, etc.).

Therefore, the following question is to be answered: *sustainability for whom* in the complex social system – the entrepreneurs and the managers of the farm, the working owners of the farm, the farm households, the outside shareholders, the hired labor, the interests groups, the local communities, the society as a whole.

Last but not least important, many of described approaches for understanding and assessing sustainability do not include the essential "time" aspect. However, as rightly Hansen pointed it out: "if the idea for continuation in time is missing, then these goals are something different from sustainability" (Hansen). The assessment of the sustainability of the farm has to give idea about *future,* rather than to identify past and present states (the achievement of specific goals in a particular moment of time). For example, the worldwide experience demonstrates that due to the bad management, inefficiency or market orientation of the cooperative and public farms many of their members leave, fail or set up more efficient (and sustainable) private structures (Bachev 2010). Simultaneously, many farms with low sustainability in the past are currently with an increasing socio-economic and ecological sustainability as a result of the changes in the ownership, strategy, state policy and support, liberalization and globalization of economies, etc.

Another approach interprets sustainability as an *"ability (potential) of the system to maintain or improve its functions"* (Hansen; Lopez-Ridaura, Masera and Astier, Mirovitskaya and Ascher, VanLoon *et al.*). Accordingly, initially main system attributes that influence sustainability are specified as: stability, resilience; survivability; productivity; quality of soil, water, and air; energy efficiency; wildlife habitat; self-sufficiency; quality of life; social justice, social acceptance, etc. After that, indicators for the measurement of these attributes are identified and their time trends evaluated usually for 5-10 and more years. For instance, most often for the productivity indicators such as yield, product quality, profit, income etc. are used. In the Agricultural Economics they are also widespread models for the "integral productivity" of the factors of production (land, labor, capital, innovation).

The biggest advantage of such as approach is that it links sustainability with the system itself and with its ability to function in future. It also gives an operational criterion for sustainability, which provides a basis for identifying constraints and evaluating various ways for improvement. Besides, it is not complicated to quantitatively measure the indicators, their presentation as an index in time, and appropriate interpretation of sustainability level as decreasing, increasing, or unchanged. Since trends represent an aggregate response to several determinant that eliminate the needs to devise complex (and less efficient) aggregation schemes for sustainability indicators.

Above suggested methods however, have significant shortcomings, which are firstly related with the wrong assumption that the future state of the system can be approximated by the past trends. What is more, for newly established structures and farms without a (long) history it is impossible to apply that approach for assessing

sustainability. However, in most East European countries and in some other regions (Former USSR, China, Vietnam etc.), namely such structures dominate in farming which emerged in the last 10-20 years.

Furthermore, the "negative" changes in certain indicators (yield, income, water and air quality, biodiversity, etc.) could be result of the "normal" processes of operation of the farm and larger systems, part of which the evaluated farm is (e.g. the fluctuation of market prices, the natural cycles of climate, the overall pollution as a result of industrial development, etc.) without being related with the evolution of sustainability of the farm. For instance, despite the environmentally friendly behavior of a particular farm, the ecological state of the farm could be worsening, if the needed "collective eco-actions" by all farms in the region are not undertaken.

In order to avoid above mentioned disadvantages, it is suggested to compare the farm indicators not in time, but with the average levels of farms in the sub-sector, region etc. However, the positive deviation from the averages not always gives a good indication for the sustainability of farms. There are many cases when all structures in a particular (sub)sectors and regions are unsustainable (dying sectors, uncompetitive productions, "polluting" environment subsectors, deserted regions, financial and economic crisis, etc.). Also there are examples for entire agro-ecosystems, of which the individual "sustainable" farms are a part, they are with a diminishing sustainability or unsustainable as a result of the negative externalities (on waters, soils, air) caused by farms in other regions and/or sectors of the economy, the competition for resources with other industries or uses (tourism, transport, residence construction, natural parks, etc.).

In addition, an essential problem of such an approach is that it is frequently impossible to find a single measure for each attribute. The later necessitates some subjective "commensuratement" and prioritizing of the multiple indicators, which is associated with already described difficulties of other approaches for sustainability assessment.

That approach also ignores the institutional and macroeconomic dimensions, the unequal goals of different type of farms and organizations, and the comparative advantages and the complementarity of the alternative governing structures (Bachev 2004, 2010). Namely these factors are crucial when we talk about the (assessment of) sustainability of micro-economic structures like individual and family farms, agro-firms, and agro-cooperatives.

Therefore, sustainability of the individual type of farms cannot be properly understood and assessed without analyzing their comparative production and governance potential to maintain their diverse functions in the specific socio-economic and natural environment in which they operate (Bachev 2004, Bachev and Peeters 2005). For instance, the high efficiency and sustainability of the small-scale holdings for the part-time employment and subsistency in Bulgaria and East Europe cannot be properly evaluated outside of the analysis of the household and the rural economy. Similarly, the high efficiency of the cooperative farms during the post-communist transition has been caused not by the superior comparative productivity comparing to the family holdings, but on the possibility to organize activities with a high dependency ("assets specificity") for members in the conditions of a great institutional and economic uncertainty[4].

As a production and management unit, the sustainability of a particular farm will be determined both from its activity and the managerial decisions (efficiency, ability for adaptation to evolving environment), *and* the changes in the external environment (market dynamics and crisis, public support and restrictions, extreme climate, etc.). The later are able to significantly improve or deteriorate the sustainability of individual farms, independent of the management decisions of the individual holdings. Example, direct subsidies from the EU have increased considerably the sustainability of many previously less sustainable Bulgarian farms (Bachev *et al.*).

Finally, there exists no farm (individual, from a certain type) or any other system, which is sustainable "forever". Therefore, the assessment of the "sustainability" of the farm is also associated with the answer to the question *for how long – for what period of time* we are talking about?

Considering the constant evolution of the features and the concept of sustainability from one side, and the evolution of the entire agrarian system from the other side, the sustainability is increasingly perceived "as a process of understanding of changes and adaptation to these changes" (Raman). According to that new understanding, the agrarian (and farm) sustainability is always specific in time, situation, and component, and characterizes the potential of agricultural systems to exist and evolve through adaptation to and incorporation of the changes in time and space. For example, in the current stage of the development respecting the "rights" of farm livestock and wild animals ("animal welfare") is a substantial attribute of the farm sustainability.

Moreover, the incorporated internal dynamisms of the system also implies an "end life" (there is no system which is sustainable forever) as a particular agrarian system is considered to be sustainable if it achieves (realizes) its "expected lifespan". For instance, if due to the augmentation of the income of the farm households the number of subsistence and part-time farms is decreasing while the agrarian resources and effectively transferred to other (novel, larger) structures, this process should not be associated with a negative change in the sustainability of farms in the

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[4] For evaluating the governance efficiency of the farms and the agrarian organisations not always are appropriate the quantitative indicators, but it is also necessary a profound qualitative (comparative, discrete, structural) analysis (Bachev, 2004, 2011).

region or subsector. On the other hand, if a particular farm is not able to adapt to the dynamic economic, institutional and climate changes through adequate modernization in technology, product, and organization, it is to be evaluated as low sustainable.

The characterization of sustainability has to be "system-oriented" while the system is to be clearly specified, including its time and spatial boundaries, components, functions, goals, and importance in the hierarchy. That implies taking into account the diverse functions of the agricultural farms at the current stage of development as well as the type and efficiency of the farm, and its links (importance, dependency, and complementarity) with the sustainability (economy) of the households, the agrarian organizations, the region, the eco-system and the entire sectors (industry).

The sustainability has to reflect both the internal capability of the farm to function and adapt to environment as well as the external impact of constantly evolving socio-economic and natural environment on the operation of the individual farm. However, it is to be well distinguished the features of relatively independent (sub)systems – e.g. while the "satisfaction from farming activity" is an important social attribute of the farm sustainability, the modernization of the social infrastructure and services in rural areas is merely a prerequisite (factor) for the long-term sustainability of the individual farm.

Furthermore, the sustainability approach is to allow a comparative analysis of the diverse agricultural systems – e.g. farms of different type and kind in the country, farms in different countries, etc. Thus all approaches, which associate comparability only with the "continues (quantitative) rather than discrete property" of a system (Hansen 1996, Sauvenier *et al.* 2005) are to be rejected. In fact, there is no reason to believe that the sustainability of an agricultural system could only increase or decrease. Discrete features ("sustainable"-"non-sustainable") are possible, and of importance for the farm managers, interests groups, policy makers (Bachev and Peeters 2005).

Characterization of the sustainability must also be predictive since it deals with future changes rather than the past and only the present. And finally, it should be diagnostic, and to *focus intervention* by identifying and prioritizing constraints, testing hypothesis, and permitting assessments in a comprehensive way.

In addition, the sustainability has to be a criterion for the guiding changes in policies, and farming and consumption practices, agents' behavior, for focusing of research and development priorities, etc. In that sense, analysis of the levels and the factors of "historical" sustainability of farms (the "achieved level of sustainability") in a region, subsector, other countries, etc. are extremely useful for the theory and practice. The assessments of the past states help us both to precise the approach and the system and importance of sustainability indicators as well as identify critical factors and trends of the sustainability level of farms. On the later base, efficient measures could be undertaken by the managers, state authority, stakeholders etc. for increasing the current and the future level through education, direct support, innovation, restructuring, partnerships, etc.

Last but to least important, the sustainability is to allow facile and rapid diagnostic, and possibility for intervention through identification and prioritizing of restrictions, testing hypothesis, and giving possibility for comprehensive assessments. The later suggests that the sustainability concept and assessment is easy to understand and practical to use by the agents without evaluation to require huge costs (economic "justification" of undertaking assessment or increasing its precision).

Accordingly it is to be worked out a system of adequate principles, criteria, and indicators for assessing the individual aspects and the overall level of sustainability of the farms in the specific conditions of each country, particular subsector, region, ecosystem, etc. Each of the elements of such a hierarchical system is to meet certain conditions (criteria) like: discriminating power in time and space, analytical soundness, measurability, transparency, policy relevance, transferability for all type of farms, relevance to sustainability issue, etc. (Sauvenier *et al.*).

For instance, in Bulgaria, like in many other countries, there is no such an "issue" nor any institutional restrictions (norms) exists, and when an assessment of the farm sustainability is performed it is not important to include the "contribution" to the greenhouse gas emission of the livestock and machineries[5]. At the same time, the number of animals on unit of farmland is of critical importance since the underutilization or over-exploitation of pastures as well as the mode of storing and utilization of the manure is critical for the sustainable exploitation of natural resources in the country.

The definition of the sustainability of the farm has to be based on the "literal" meaning of that term and perceived as a system characteristics and "ability to continue through time". It has to characterize all major aspects of the activity of a farm, which is to be *managerially sustainable*, and *economically sustainable*, and *ecologically sustainable*, and *socially sustainable* (Figure 1).

Therefore, the farm sustainability characterizes the ability (internal potential, incentives, comparative advantages, importance, and efficiency) of a particular farm to maintain its governance, economic, ecological and social functions in a long-term.

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[5] Despite the fact that they are a major source of emissions in the sector (EEA)
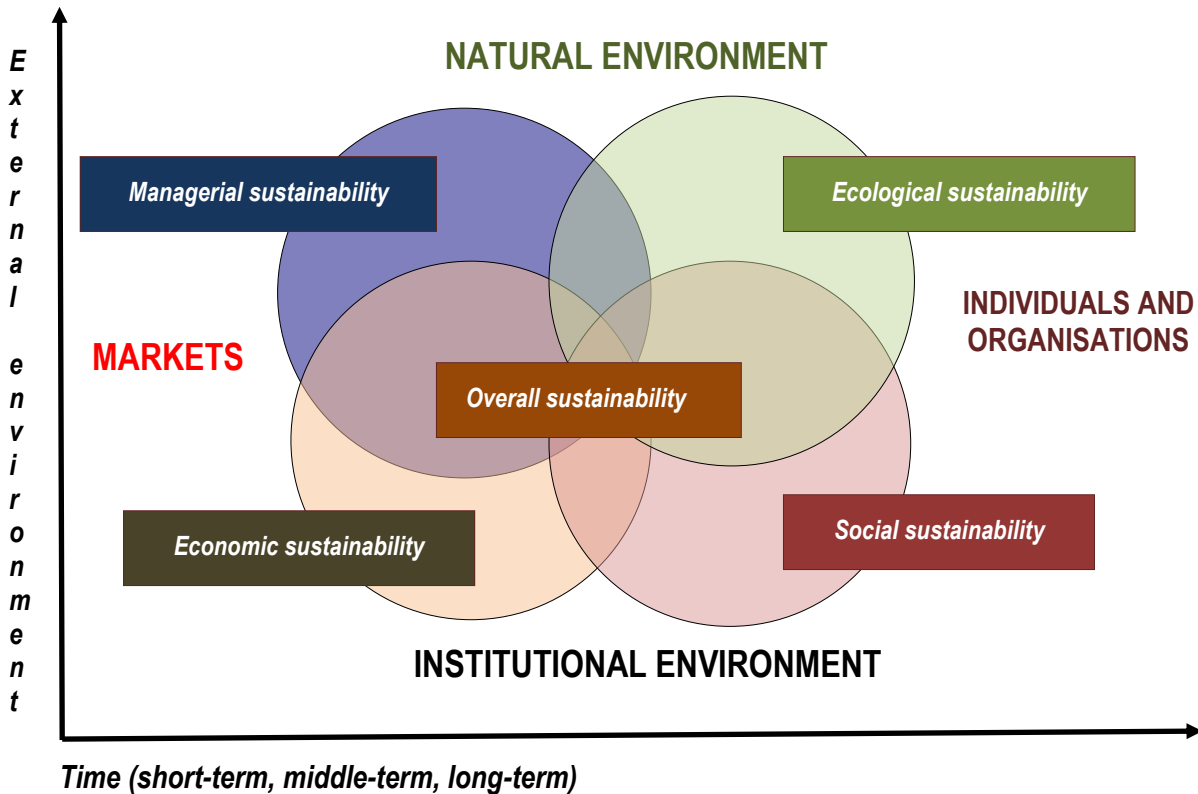
Source: Author

Figure 1 - Sustainability of Farming enterprise

A farm is sustainable if:

▪ it has a good *governance efficiency* – that is to say it is a preferable for the farmers (owners) form and has the same or greater potential for governing of activities and transactions comparing to other farms or economic organizations (Bachev 2004);

▪ it is *economically viable* and efficient – that is to say it allows acceptable economic return on used resources and a financial stability of the enterprise;

▪ it is *socially responsible* in relation to farmers, hired labor, other agents, communities, consumers and society, that is to say it contributes toward improvement of welfare and living standards of the farmer and rural households, preservation of agrarian resources and traditions, and sustainable development of rural communities and the society as a whole;

▪ it is *environmentally friendly* – that is to say its activity is also associated with the conservation, recovery and improvement of the components of natural environment (lands, waters, biodiversity, atmosphere, climate, ecosystem etc.) and the nature as a whole, animal welfare, etc.

Depending on the combination of all four dimensions, the sustainability of a particular farm could be *high, good, unsatisfactory,* or the farm is *unsustainable*. For instance, the farm may have high governance and economic sustainability, and a low ecological and social sustainability. Nevertheless, in any case, the low or lack of sustainability of the farm in any of the four aspects (pre)determines the overall level of farm sustainability – e.g. inferior governance efficiency means a low overall sustainability of the farm.

The level of sustainability of the farm is to be evaluated in a *short-term* (the programing period), a *midterm* (the current generation of farmers) and a *long-term* (the next generation) scales.

The assessment of the sustainability of the farms has to be always made in the specific socio-economic, ecological, etc. rather than an unrealistic (desirable, "normative", ideal) context. In that sense, the employment of any "Nirvana approach" for determining the criteria for the sustainability (not related to the specific environment of the farm "scientific" norms of agro-techniques; a model of farming in other regions or countries; assumptions of perfectly defined and enforced property rights and institutional restrictions; an effectively working state administration; a situation without missing markets and public interventions, etc.) is not correct.

Taking into account of the external socio-economic and natural factors let also identify the major factors, which contribute to the sustainability of a particular farm – e.g. competitiveness, adaptability, evolution of farmers and agrarian

organizations, access to public programs, level of state support, institutional environment, extreme climate, plant and livestock diseases, etc.

In a long-term there exists no economic organization if it is not efficient otherwise it would be replaced by more efficient organization (Bachev 2004). Therefore, the problem of assessment of the sustainability of the farms is directly related to the assessment of the levels of governance, production and ecological efficiency of farms.

In addition, it has to be estimated the potential of the farm for adaptation to the evolving market, economic, institutional, and natural environment through effective changes in the governing forms, size, production structure, technologies, behavior, etc. If the farm does not have potential to stay at or adapt to a new more sustainable level(s) it will diminish its comparative efficiency and sustainability, and eventually would be either liquidated or transformed into another type of organization (Bachev 2004, Bachev and Peeters 2005).

For instance, if a particular farm faces enormous difficulties meeting institutional norms and restrictions (e.g. new quality and environmental standards of the EU; higher novel social norms; new demands of rural communities, etc.) and taking advantage from the institutional opportunities (access to public subsidies and support programs); or it has serious problems supplying managerial capital (as it is in a one-person farm when an aged farmer does not have a successor), or in supply of needed farmland (a big demand for lands from other agrarian entrepreneurs or for non-agricultural use), or funding activities (insufficient own finance, impossibility to sell equity or buy a credit), or marketing output and services (changing demands for certain products or needs of cooperative members, a strong competition with imported products); or it is not able to adapt to existing ecological challenges and risks (e.g. weather warming, extreme climate, soils acidification, water pollution, etc.), then it would not be sustainable despite the high historical or current efficiency. Therefore, the *adaptability of the farm* characterizes to a greater extend the farm sustainability and has to be used as a main criteria and an indicator for sustainability assessment[6].

4. Framework for assessing sustainability of farms in Bulgaria

4.1. Major definitions

Farming Enterprise (Farm): The farming enterprise is the main organizationally independent production and management unit in agriculture, which produce agricultural products and services (food for humans and animals, raw materials for processing, bio-energy, agro-ecosystem services, etc.) and/or maintain agricultural lands in a good agricultural and ecological state.[7]

The production of diverse agricultural products and services, and the organizational and the managerial apartness (autonomy) are essential criteria for the identification of the farm. Accordingly, a farm could be diversified in many productions and located in many areas, if it is managed by a single farmer. A particular entrepreneur may have several farms (e.g. an own farm and participation in a partnership, for organic and conventional production, etc.), which are separately registered and managed. A particular farm may not be entirely independent if it is a part of a vertically or horizontally integrated organization (ownership) – e.g. a part of the overall activity of a family firm, a cooperative, a research or educational institution, a division of the processing enterprise, restaurant, retailer of exporter.

Sustainability of the farm: Farm sustainability characterizes the ability (internal capability) of a particular farm to exist in time and maintain in a long-term its governance, economic, ecological and social functions in the specific socio-economic and natural environment in which it operates and evolves.

4.2. Aspects of farm's sustainability

Sustainability of the farm has four aspects, which are equally important and have to be always accounted:
- *managerial sustainability* – the farm has to have a good or high absolute and comparative efficiency for the organization of its activity and (internal and external) relations, and a high adaptability to evolving socio-economic and natural environment, according to the specific preferences (type of the farm, character of production, long-term goals, etc.) and capability (training, experience, available resources, connections, power positions, etc.) of the owners of the farm;
- *economic sustainability* – the farm has to have a good or a high productivity for utilization of natural, personal, material, and financial resources, enough ("acceptable") economic efficiency and competitiveness, and "normal" financial stability of activity;

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[6] Our suggestion to use "adaptability" as a criteria and an indicator for sustainability was incorporated in the holistic System for Assessing Sustainability of Agricultural Systems in Belgium. (Sauvenier *et al.*)

[7] According to the formal regulations in Bulgarian and EU farms do not have to be involved in agricultural production to get public subsidies, participate in public support programs etc. but they have to "manage agricultural land" requiring "maintaining a good agricultural and ecological state of agricultural lands".

- *social sustainability* – the far has to have good of a high social responsibility regarding farmers, workers, other agents, communities, and consumers, and contribute to the conservation of agrarian resources and traditions, improving welfare and living standards of farm households, and for the development of rural communities and the society as a whole;
- *ecological sustainability* – the far has to have a good and high ecological responsibility and its activity behavior) to be associated with a necessary ("socially desirable") conservation, recovery and improvement of the components of natural environment (landscape, lands, waters, biodiversity, atmosphere, climate, ecosystem services, etc.) and the nature as a whole, respecting animal welfare and other socially determined standards related to the nature.

4.3. Levels of sustainability assessment

The assessment of the sustainability of the farms could (is to) be done at different levels: an individual farm, farms of a particular type or kind, farms of a particular eco-system, farms in a particular region, farms of a particular subsector of agriculture, all farms in the country, farms in different countries.

The assessments at higher economic and special levels are aggregate of the assessment of the individual farms.

For a rapid diagnostic of the farm sustainability at higher levels may be also used a system of selected (farm level or aggregated) indicators, which adequately reflect the major aspects of the sustainability of individual holdings. For instance, level of N pollution in the ground waters in a region (ecosystem) could give a good insight on ecological sustainability of the farms in that region (ecosystem).

It is also necessary to estimate the importance of different (kind and type of) farms in the overall resources utilization, total agricultural output, social and economic life, impacts on environment, etc. of relevant ecosystems, regions, subsectors, and agriculture as a whole. The later "determines" the link of the sustainability of the farms with the agrarian sustainability, and makes it possible to take decisions for improving public policies and strategies of farms and agrarian organizations for sustainable development

4.4. Farms classification

The level of the sustainability of farms and their contribution to the agrarian sustainability usually depends on the farms' type and kind. The later requires classification of the farms according to a number of criteria.

The major types of farms according to the juridical status (forma registration) in Bulgarian are: Physical Person, Sole Trader, Corporation, and Cooperative, specified by the national legislation. Furthermore, they are forms with an open, close, mixed, publicly traded etc. membership. According to the type of ownership, the farms could be private, state, municipal, community, public, local, foreign, and hybrid. According to the economic and managerial autonomy there are (totally) independent, horizontally integrated and vertically integrated holdings. According to the market orientation the farms are: subsistence holdings and farms for servicing of members, "semi-market" farms, commercial farms, and business enterprises. According to their size the agricultural farms are: small scale, middle sized, and large as different criteria could be used to classify them for this indication – the size of managed land, number of grazed livestock, number of employed labor, gross income, "economic size" etc. According to the production specialization the farms in the country are classified in more or less aggregated groups: crop production (field crops, horticulture, permanent crops, etc.), livestock production (grazing livestock, pigs, poultry and rabbits, etc.), mixed production (mixed crops, mixed livestock, mixed crop-livestock, etc.). According to the ecological orientation and certification the farms are: with organic certification or in a transition period to organic certification, with conventional production, with ecological production, with mixed production, etc. According to the special private or social objectives the farms could be: experimental, demonstrative, educational, conservation and recovery of traditional breeds of livestock or varieties of crops, protected and/or certified origins, products, services etc. According to the location the farms are classified in different groups depending on which ecosystems they include or are part of (plain, mountainous, semi-mountainous, riverside, seaside, protected zoned and natural reserves, with high risk, etc.), and/or which administrative (region, municipality, country), geographical (border, North Bulgaria, etc.) or social and economic (well developed, developing, underdeveloped, unpopulated, declining activity) regions they are located in.

4.5. Taking into account of "time factor"

The assessment of the sustainability of the farms always is done in a specific historical moment of time (a certain date), which inevitably reflects the existing specific knowledge and preferences for the state of the farms and its impacts, the possibilities to identify, monitor, measure, and evaluate the different aspects of the sustainability and impacts of the farms, the available information and access to the first hand data from the farms, the needs of the farms' managers and agrarian policy, etc. in that particular moment (period) of time.

For the assessment of many of the dimensions of sustainability of the farms it is to be used (averaged) annual or multiannual data. That is required by the needs to eliminate the big variations of levels of the snapshot states (data, moment "picture") result of the "natural" economic, investment, agronomic, biological or climate cycles (e.g. profitability, financial liability, productivity, number of livestock, inputs of chemicals, volume of irrigation, crop rotation, etc.) or unavailability of another report, statistical, accountancy, first hand etc. information.

Two type of the assessment of the sustainability of the farm have to be distinguished:

- *historical* (retrospective) – for the level and dynamics during a certain "past" period of the evolution of the farm;
- *current* (actual) – giving idea about the "current" state of the farm and the likely level of sustainability in a shorter or longer perspective.
- Moreover, it is to be distinguished and made assessment on the *short-term, mid-term* and *long-term sustainability* of the farms.
- Often the sustainability of the farm is changeable in time, which necessitates the estimation of the realized or likely level for a particular (practical) horizon of time:
- *short-term* – the current programing period of the implementation of EU CAP or 5-7 years;
- *mid-term* – a relatively longer period of times (e.g. 5-10 years), as for the current assessment is necessary to take into account the remaining time of current generation of active farmers. The majority of Bulgarian farmers are in advanced age and they are going to retire in coming (10) years – that is why it is appropriate to use 8-10 years for that type of sustainability assessment.
- *long-term* – in a foreseeable longer-term 10-15 and more years, which is to be also greatly related with the conservation and the transfer of the farms and agrarian resources into the next generation(s).[8]

4.6. Hierarchical levels and formulation of indicators for assessment

The hierarchical levels, which facilitate the formulation of the system for assessing the sustainability of the farms, include well determined and selected *principles, criteria, indicators* and *reference values* (Figure 2).

Principles – the highest hierarchical level associated with the multiple functions of the agricultural farms. They are universal and represent the states of the sustainability, which are to be achieved in the four main aspects – managerial, economic, social and ecological. For instance, a Principle "the soil fertility is maintained or improved" in the Ecological aspect of the farm sustainability.
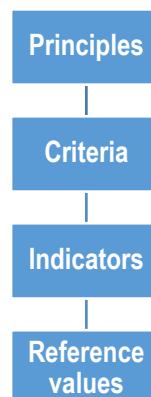
Source: adapted by the author from Sauvenier *et al.*

Figure 2 - Hierarchical levels of system for assessment of sustainability of farming enterprise

Criteria – they are more precise from the principles and easily linked with the sustainability indicators. They represent a resulting state of the evaluated farm when the relevant principle is realized. For instance, a Criteria "soil erosion is minimized" for the Principle "the soil fertility is maintained or improved".

Indicators – quantitative and qualitative variables of different type (behavior, activity, input, effect, impact, etc.), which can be assessed in the specific conditions of the evaluated farms, and allow to measure the compliance with a particular criteria. The set of indicators is to provide a representative picture for the farm sustainability in all its aspects. For instance, the Indicator named "the extent of application of good agro-technics and crop rotation" for the Criteria "soil erosion is minimized".

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[8] Assessment of the farms sustainability in a very long term (25-30 and more years) is both difficult (impossible) and impractical since there is little (reliable) information about future trends, factors, preferences, impacts etc. For such long-term «foresights» other methods of assessments are more appropriate (see COST) but they are beyond of the scope of this study.

Reference value – these are the desirable levels (absolute, relative, qualitative, etc.) for each indicator for the specific conditions of the evaluated farms. They assist the assessment of the sustainability level and give guidance for achieving (maintaining, improving) sustainability of the farm. They are determined by the science, experimentation, statistical, legislative or other appropriate ways. As a Reference value it could be used:

- *specific rule or standard* – e.g. application of good agricultural and ecological practices; labor safety standards; standards for animal welfare, etc;
- *formal restriction* – e.g. norm for acceptable pollution of waters, soils and air; ecological limit for Nitrate pollution of lands and waters, etc.;
- *norm for comparison* – e.g. optimum rate for chemical fertilization, pesticides application, water irrigation; extent of conservation of traditions, etc.;
- *minimum or maximum requirement* - e.g. lack of unsolvable problems for supply of needed agricultural land, labor, etc.; optimum extend of farm's liability, etc.;
- *limits of variation* – e.g. number of livestock on a unit of pasture land; diversity of population of wild birds and animals, etc.;
- *average values for similar farms* – e.g. average productivity and profitability of the farms in the region or subsector; diversity of cultural plants, etc.;
- *trends* – e.g. level of income and welfare of rural households, emissions of greenhouse gasses from the farms; level of diversity of insects and plants, etc.;
- *personal or collective preferences* - e.g. satisfaction from farming activity, preservation of traditions, varieties and technologies, etc.

Most of the Reference values show the level, which (presume to) guarantee the long-term farm sustainability. Depending on what extent it is achieved or overcome the farms could be with a *high, good,* or *low sustainability,* or to be *unsustainable.* For instance, the farms with higher than the average for the sector profitability or lower soils' acidity are more sustainable then others, while farms with accordingly inferior or greater values are with lower economic or ecological sustainability or (economically, ecologically) unsustainable.

Another part of the Reference values characterizes a condition for the sustainability, deviation of which indicates the state of insufficient sustainability or unsustainability. For instance, the farms have not complyied with the official standards for labor (working, safety etc.) conditions, animal welfare, application of banned chemicals and technologies, producing forbidden products (cannabis), etc.

The content and the importance of the principles, criteria, indicators and reference values are formulated/selected by the leading experts on farm sustainability. Moreover, they have to be permanently updated for the specific conditions of evaluated farms and according to the development of science, measurement and monitoring methods, available information, industry standards, social norms, etc.

We have profoundly studied out the available academic publications, official documents, and experiences in Bulgaria and other countries as well as carried our numerous consultations with the leading national and international experts in the area. On that base we have prepared a list (system) with potential principles, criteria, indicators and reference values for the contemporary conditions of Bulgarian farms.

After that we organized a special expertise with ten leading scholars working on the sustainability of the farms from the Institute of Agricultural Economics and the University of National and World Economy in Sofia, and the Agrarian University in Plovdiv. The experts discussed, complemented and evaluated the importance of the suggested by us principles, criteria, indicators and reference values, and selected the most adequate ones for the contemporary conditions of the development of Bulgarian farms (Table 1).

Table 1 - Principles, criteria, indicators and reference values for assessing sustainability of farms in Bulgaria

Principles	Criteria	Indicators	Reference values
Governance aspect			
Acceptable governance efficiency	Efficiency for governing of activity in relation to other feasible organization	Comparative efficiency for supply and management of workforce	Similar to alternative organization
		Comparative efficiency for supply and management of natural resources	Similar to alternative organization
		Comparative efficiency for supply and management of material inputs	Similar to alternative organization
		Comparative efficiency for supply and management of innovations	Similar to alternative organization
		Comparative efficiency for marketing of products	Similar to alternative organization

		Comparative efficiency for supply and management of finance	Similar to alternative organization
Sufficient adaptability	Farm adaptability	Level of adaptability to market environment	Good
		Level of adaptability to institutional environment	Good
		Level of adaptability to natural environment	Good
Economic aspect			
High economic efficiency	Economic efficiency of resource utilization	Level of labor productivity	Similar to the average for the sector
		Land productivity	Similar to the average for the sector
		Livestock productivity	Similar to the average for the sector
	Economic efficiency of activity	Profitability of production	Similar to the average for the sector
		Farm Income	Acceptable by the owner
Good financial stability	Financial capability	Return on own capital	Average for the sector
		Overall Liquidity	Average for the sector
		Financial autonomy	Average for the sector
Social aspect			
Good social efficiency for farmer and farm households	Farmers welfare	Income per a member of farm household	Similar to other sectors in the region
		Satisfaction of activity	Acceptable for the farmer
	Working conditions	Compliance with formal requirements for working conditions	Standards for working conditions in the sector
Acceptable social efficiency for not farmers	Preservation of rural communities	The extent farm contributes to preservation of rural communities	Overall actual contribution
	Preservation of traditions	The extent farm contributes to preservation of traditions	Overall actual contribution
Ecological aspect			
Protection of agricultural lands	Chemical quality of soils	Soil organic content	Similar to the typical for the region
		Soil acidity	Similar to the average for the region
		Soil soltification	Similar to the average for the region
	Soil erosion	Extent of wind erosion	Similar to the typical for the region
		Extent of water erosion	Similar to the typical for the region
	Agro-technique	Crop rotation	Scientifically recommended for the region
		Number of livestock per ha	Within limits of acceptable number
		Rate of N fertilization	Within limits of acceptable amount
		Rate of K fertilization	Within limits of acceptable amount
		Rate of P fertilization	Within limits of acceptable amount
		Extent of application of Good Agricultural Practices	Approved rules
	Waste management	Manure storage type	Rules for manure storage
	Water irrigation	Irrigation rate	Scientifically recommended rate for the region
Protection of waters	Quality of surface	Nitrate content in surface waters	Similar to the average for

		waters		the region
		Pesticide content in surface waters	Similar to the average for the region
	Quality of ground waters	Nitrate content in ground waters	Similar to the average for the region
		Pesticide content in ground waters	Similar to the average for the region
Protection of air	Air quality	Extent of air pollution	Acceptance from rural community
Protection of biodiversity	Variety of cultural species	Number of cultural species	Similar to the average for the region
	Variety of wild species	Number of wild species	Similar to the average for the region
Animal welfare	Norms for animal welfare	Extent of compliance with animal welfare norm	Standards for animal breeding
Preservation of ecosystem services	Quality of ecosystem service	Extent of preservation of ecosystem services	Acceptance from communities

Source: Author

For the selection of the indicators for the sustainability assessment a number of criteria have been used[9]: relevance to reflect sustainability aspects, discriminating power in time and space, analytical soundness, intelligibility and synonymity, measurability, governance and policy relevance, and practical applicability. The goal was to select a balanced (around a half for the governance, economic and social aspects, and the rest for the ecological aspect) system with sufficient (1-5 for each criteria), but not to many indicators (not more than 50), which would guarantee the efficiency of use.

4.7. Calculation, presentation, interpretation and integration of assessments

For assessing the sustainability level of individual farms it is necessary to use firsthand information provided by the farm managers (for behavior, activity, results, objectives), available report and statistical information, expert assessments by the professionals in the area, etc.

Often there are a number of (quite) different ways for calculating the level of each particular indicator. For instance, the Profitability of Production of the farm may be calculated by dividing the Net (Total, Agricultural) Income, the Gross (Total, Agricultural) Profit, the After Tax Profit etc. to the Total (Overall, Agricultural) Costs, the Current (Overall, Agricultural) Costs, the Variable (Overall, Agricultural) Costs etc. It is the same for most of other governance, economic, social and ecological indicators. It is important always to use the same (and most appropriate for the specific conditions of the evaluated farm) approach for calculating all sustainability indicators.[10] The same applies for the Reference Values employed in the sustainability assessment.

After the qualitative or quantitative value of every indicator is determined, it is to be compared with the relevant Reference Value. A level of a particular indicator on, within or close to the Reference Value(s) means a good or high sustainability, and vice versa.

Indicators which are not appropriate for a particular farm are to be excluded – e.g. "compliance with animal welfare norms" for holdings without livestock activity, "preservation of rural communities" for a single and remote from the residence areas high mountainous farm(s), etc.

Usually there is a "state of sustainability" of the farm with different values of a particular indicator. Thus the level of the sustainability is to be specified. We have asked the experts to determine different qualitative states of the sustainability (high, good, low, insufficient, none) for diverse deviations of the indicators values from the Reference values (Table 2).

Suggested approach let us determine and analyze the sustainability level for each indicator as well as undertake measures for the improvement of sustainability for areas (indicators) with inferior values. For instance, all indicators for the sustainability in a particular farm may be good but for the compliance with the animal welfare norms. Thus putting efforts to introduce and enforce the animal welfare standards in the farm would enhance the ecological and the overall sustainability of that holding.

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[9] For validation of sustainability indicators widely used method of Multi-criteria Expert Assessment has been used, which is well presented in professional publications (Sauvenier *et al. 2005*).

[10] E.g. details about calculation of most of the governance and economic indicators for the Bulgarian conditions are presented in our previous publications (Bachev 2010a, Koteva and Bachev 2010).

Table 2 - Levels of sustainability depending on the extent of achievement of the Reference Values for the sustainability indicator

Indicators	Reference value (RV)	Levels of sustainability				Non sustainable
		High	Good	Low	Insufficient	
1. Comparative efficiency for supply and management of workforce	Similar to alternative organization	>RV	= RV	< RV	< < RV	< < < RV
2. Comparative efficiency for supply and management of natural resources	Similar to alternative organization	>RV	= RV	< RV	< < RV	< < < RV
3. Comparative efficiency for supply and management of material inputs	Similar to alternative organization	>RV	= RV	< RV	< < RV	< < < RV
4. Comparative efficiency for supply and management of innovations	Similar to alternative organization	>RV	= RV	< RV	< < RV	< < < RV
5. Comparative efficiency for marketing of products	Similar to alternative organization	>RV	= RV	< RV	< < RV	< < < RV
6. Comparative efficiency for supply and management of finance	Similar to alternative organization	>RV	= RV	< RV	< < RV	< < < RV
7. Level of adaptability to market environment	Good	>RV	= RV	< RV	< < RV	< < < RV
8. Level of adaptability to institutional environment	Good	>RV	= RV	< RV	< < RV	< < < RV
9. Level of adaptability to natural environment	Good	>RV	= RV	< RV	< < RV	< < < RV
10. Level of labor productivity	Similar to the average for the sector	>RV	= RV	< RV	< < RV	< < < RV
11. Land productivity	Similar to the average for the sector	>RV	= RV	< RV	< < RV	< < < RV
12. Livestock productivity	Similar to the average for the sector	>RV	= RV	< RV	< < RV	< < < RV
13. Profitability of production	Similar to the average for the sector	>RV	= RV	< RV	< < RV	< < < RV
14. Farm Income	Acceptable by the owner	>RV	= RV	< RV	< < RV	< < < RV
15. Return on own capital.	Average for the sector	>RV	= RV	< RV	< < RV	< < < RV
16. Overall Liquidity	Average for the sector	>RV	= RV	< RV	< < RV	< < < RV
17. Financial autonomy	Average for the sector	>RV	= RV	< RV	< < RV	< < < RV
18. Income per a member of farm household	Similar to other sectors in the region	>RV	= RV	< RV	< < RV	< < < RV
19. Satisfaction of activity	Acceptable for the farmer	>RV	= RV	< RV	< < RV	< < < RV
20. Compliance with formal requirements for working conditions	Standards for working conditions in the sector	>RV	= RV	< RV	< < RV	< < < RV
21. The extent farm contributes to preservation of rural communities	Overall actual contribution	>RV	= RV	< RV	< < RV	< < < RV
22. The extent farm contributes to preservation of traditions	Overall actual contribution	>RV	= RV	< RV	< < RV	< < < RV
23. Soil organic content	Similar to the typical for the region	>RV	= RV	< RV	< < RV	< < < RV
24. Soil acidity	Similar to the average for the region	<RV	= RV	> RV	>>RV	>>>RV
25. Soil soltification	Similar to the average for the region	<RV	= RV	> RV	>>RV	>>>RV
26. Extent of wind erosion	Similar to the typical for the region	<RV	= RV	> RV	>>RV	>>>RV
27. Extent of water erosion	Similar to the typical for the region	<RV	= RV	> RV	>>RV	>>>RV
28. Crop rotation	Scientifically recommended for the region	= RV	> RV	>>RV	>>>RV	>>>>RV
29. Number of livestock per ha	Within limits of acceptable number	= RV	> RV<	>>RV<<	>>>RV<<<	>>>>RV<<<<
30. Rate of N fertilization	Within limits of acceptable amount	= RV	> RV<	>>RV<<	>>>RV<<<	>>>>RV<<<<
31. Rate of K fertilization	Within limits of acceptable amount	= RV	> RV<	>>RV<<	>>>RV<<<	>>>>RV<<<<

Indicators	Reference value (RV)	Levels of sustainability				Non
32. Rate of P fertilization	Within limits of acceptable amount	= RV	> RV<	>>RV<<	>>>RV<<<	>>>>RV<<<<
33. Extent of application of Good Agricultural Practices	Approved rules	= RV	> RV	>>RV	>>>RV	>>>>RV
34. Manure storage type	Rules for manure storage	= RV	> RV	>>RV	>>>RV	>>>>RV
35. Irrigation rate	Scientifically recommended rate for the region	= RV	> RV<	>>RV<<	>>>RV<<<	>>>>RV<<<<
36. Nitrate content in surface waters	Similar to the average for the region	>RV	= RV	< RV	< < RV	< < < RV
37. Pesticide content in surface waters	Similar to the average for the region	>RV	= RV	< RCV	< < RV	< < < RV
38. Nitrate content in ground waters	Similar to the average for the region	>RV	= RV	< RV	< < RV	< < < RV
39. Pesticide content in ground waters	Similar to the average for the region	>RV	= RV	< RV	< < RV	< < < RV
40. Extent of air pollution	Acceptance from rural community	>RV	= RV	< RV	< < RV	< < < RV
41. Number of cultural species	Similar to the average for the region	>RV	= RV	< RV	< < RV	< < < RV
42. Number of wild species	Similar to the average for the region	>RV	= RV	< RV	< < RV	< < < RV
43. Extent of compliance with animal welfare norm	Standards for animal breeding	>RV	= RV	< RV	< < PC	< < < RV
44. Extent of preservation of ecosystem services	Acceptance from communities	>RV	= RV	< RV	< < RV	< < < RV

Source: Author

In order to present visually in a graphic form diverse aspects and dimensions of the sustainability of a particular farm, and integrate different type of indicators for a particular criterion, principle and aspect of sustainability for one or a group of farms, the qualitative levels of each indicator are transformed into unitless Index of Sustainability (IS$_i$) using Table 3.

Table 3 - Scale for transformation of qualitative levels into Index of Sustainability for a particular indicator

Levels of sustainability	Index of Sustainability (IS$_i$)
High	1.00
Good	0.75
Low	0.50
Unsatisfactory	0.25
Non-sustainable	0.00

Source: Author

Figure 3 presents a result of the assessment on the level of sustainability of a case study farm in Bulgaria with a mix crop-livestock activity (Figure 3). It is apparent that in order to increase the overall sustainability of the holding it is to improve significantly the environmental protection activities of the farm. The later implies both a change in the strategy of the farm as well as targeted support policy of the state for stimulation of the eco-activity (function) of the farm.
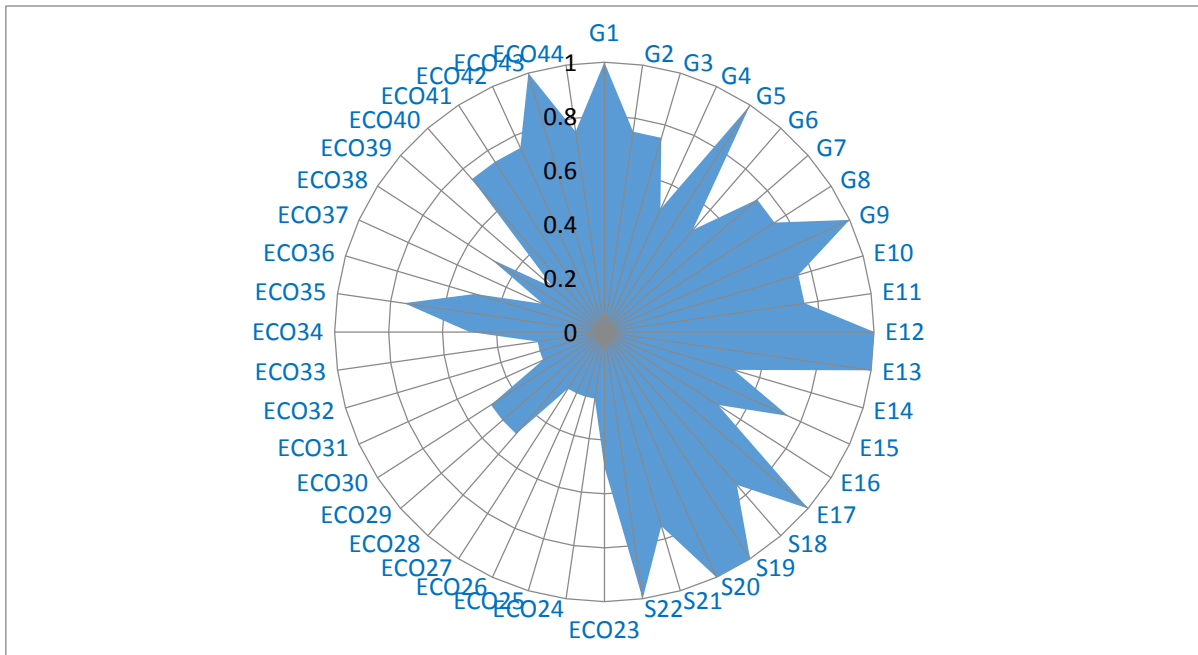
Source: Author

Figure 3 - Level of sustainability of a case study farming enterprise for all indicators

Very often individual indicators for each criterion and/or different criteria, principles and aspects of sustainability are with unequal, and frequently with controversial levels. That significantly hardened the overall assessment and requires an integration of the indicators.

The Integral Index for a particular criterion (IS_c), principle (IS_p), aspect of sustainability (IS_a) or overall level for the farm (IS_o) is an arithmetic average of indices of relevant indicators:

$$IS_{(c, p, a, o)} = \sum IS_{(i, c, p, a)}/n \qquad (n - \text{number of indicators}) \qquad (1)$$

Integral Index 1 or close to 1 means a high sustainability, Index around 0.75 means good sustainability, while Index 0 or close to 0 a state of non-sustainability. For interpretation of the integral assessments the Table 4 could be used.

Table 3 - Limits for grouping of integral assessments of sustainability of farming enterprises

Integral Index of Sustainability ($ISI_{p,a,o}$)	Sustainability level
0,86 - 1	High
0,63 - 0,85	Good
0,36 - 0,62	Low
0,13 - 0,37	Unsatisfactory
0 - 0,12	Non-sustainable

Source: Author

Figure 4 represents the integral assessment of a case study farm for all aspects of the sustainability. It is apparent that the evaluated farm is with a good overall sustainability, which is determined by the high social sustainability and the good economic and managerial sustainability. At the same time the evaluated holding is with a low integral ecological sustainability, which requires taking measures for improvement of eco-performance.
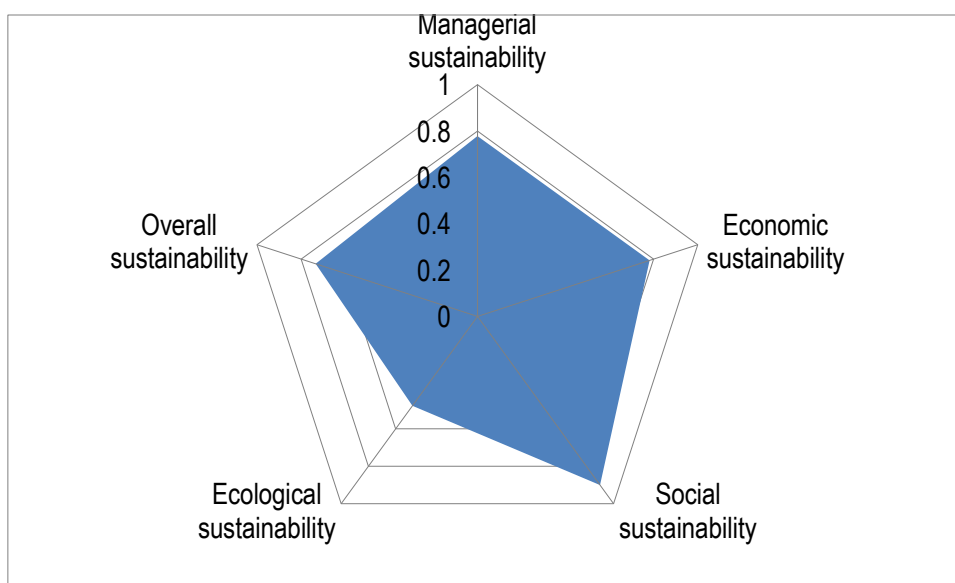
Figure 4 - Integral level of managerial, economic, social and ecological sustainability of a case study farming enterprise

It is well known that integration of indicators of different type is associated with much provisionality, as it implies an "equal importance" and certain "interchangeability" of the individual dimensions of sustainability. In particular, it presumes, that a low level of sustainability or a state of non-sustainability for one (several) indicator(s) could be "compensated" with a higher value of another (other) indicator(s) without a change in the integral level of sustainability. However, the later not always is true for the majority of indicators for the managerial and economic sustainability in a short-term, as well as in a longer-term for many of the indicators for social and ecological sustainability. For instance, a lack of governance or economic sustainability rapidly makes the entire farm unsustainable (transformation, failure).

According to the panel of experts it is not necessary to give a different weight for the individual indicators when calculating the Integral Index for particular criteria, principle, aspect or the overall level of sustainability. However, when the level of sustainability for any of the indicators is unsatisfactory or zero, it is to be analyzed its importance for the evaluated farm(s). Furthermore, in longer periods of analysis the lowest level of sustainability for any indicators (criterion) will also (pre)determine the integral level for the particular aspect and the overall level of the sustainability of the farm (Bachev 2010).

The overall and particular (aspect, principle, criterion, indicator) sustainability of the farms of a specific type, kind, and location is an arithmetic average of these of the individual farms.

The integration of indicators does not diminish the analytical power since it makes it possible to compare sustainability of the diverse aspects of the individual farm as well as of farms of different type and the entire sector. Besides, since the assessment of the sustainability levels for the individual indicators is a (pre)condition for the integration itself, the primary information always is available and could be analyzed in details if that is necessary.

Depending on the final users and the objectives of the analysis the extent of the integration of indicators is to be differentiated. While farm managers, investors, researchers etc. prefer detailed information for each indicator, for decision-making at the highest level are needed more aggregated data for the farms as a whole, major aspects of sustainability etc.

Acknowledge

Conclusion

Studying out the farming enterprise as a governance structure becomes a key for understanding its sustainability. Accordingly the sustainability of a farming enterprise (individual and family holding, agri-firm, agro-cooperative etc.) is to incorporate one new important dimension the "governance efficiency and adaptability" and its assessment include a new criteria and appropriate indicators for measurement and analysis. Furthermore, a "complete" assessment of sustainability levels would require a new type of macro and micro economic data on agent's preferences, transaction costs, institutional environment, impacts on environment and communities, etc.

Suggested in this paper system for assessment of the sustainability of farming enterprises will be tested in the coming months and after improvements will be used to assess the level of sustainability in one of the regions of Bulgaria.

Eventually, the tested system of assessing farms sustainability will be suggested for a wider use in the farming and managerial practices in the country and abroad.

References

[1] Andreoli, M. and Tellarini, V. (2000). Farm sustainability evaluation: methodology and practice, *Agriculture, Ecosystems & Environment*, Volume 77, (1–2): 43–52. http://dx.doi.org/10.1016/S0167-8809(99)00091-2

[2] Bachev, H. (2005). Assessment of Sustainability of Bulgarian Farms, proceedings, XIth Congress of the European Association of Agricultural Economists, Copenhagen.

[3] Bachev, H. (2004). Efficiency of Agrarian Organizations, in Farm Management and Rural Planning No 5, Kyushu University, Fukuoka, 135-150.

[4] Bachev, H. (2009). Mechanisms of Governance of Sustainable Development, *Journal of Applied Economic Science*, 4(2): 169-184.

[5] Bachev, H. (2010). Governance of Agrarian Sustainability, New York: Nova Science Publishers.

[6] Bachev, H. (2010a). Management of Farm Contracts and Competitiveness, VDM Verlag Dr.Muller**.**

[7] Bachev, H. (2011). Needs, Modes and Efficiency of Economic Organizations and Public Interventions in Agriculture, *Review of Economics & Finance*, 3: 89-103.

[8] Bachev, H. (2012). Evolution, Efficiency and Challenges of Environmental Management in Bulgarian Agriculture, in Vitale, K (editor) Environmental and Food Safety and Security for South-East Europe and Ukraine, Springer. http://dx.doi.org/10.1007/978-94-007-2953-7_6

[9] Bachev, H. (2013). Risk Management in Agri-food Sector, Contemporary Economics, 7(1): 45-62. http://dx.doi.org/10.5709/ce.1897-9254.73.

[10] Bachev, H. (2014). Environmental Management in Agriculture, Mechanisms, Forms and Efficiency, LAP LAMBERT Academic Publishing.

[11] Bachev, H. (2015). What is Sustainability of Farms? SSRN, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2705390.

[12] Bachev, H. and Peeters, A. (2005). Framework for Assessing Sustainability of Farms, *Farm Management and Rural Planning*, 6: 221-239.

[13] Bachev, H., Koteva, N. and Mladenova, M. (2014). The Effects of Implementing European Policies in Agricultural Holdings in the Republic of Bulgaria, *Economics*, Volume 21, 4(1): 90-106.

[14] Bastianoni, S., Marchettini, N., Panzieri, M. and Tiezzi, E. (2001). Sustainability assessment of a farm in the Chianti area (Italy), *Journal of Cleaner Production*, 9(4): 365–373. http://dx.doi.org/10.1016/S0959-6526(00)00079-2

[15] Brklacich, M., Bryant, C. and Smith, B. (1991). Review and appraisal of concept of sustainable food production systems, *Environmental Management*, 15(1): 1-14. http://dx.doi.org/10.1007/BF02393834

[16] Edwards, C., Lal, R., Madden, P., Miller, R. and House, G. (editors), (1990). Sustainable Agricultural Systems, Soil and Water Conservation Society, Iowa.

[17] Fuentes, M. (2004). Farms Management Indicators Related to the Policy Dimension in the European Union, OECD Expert Meeting on Farm Management Indicators and the Environment, 8-12 March 2004, New Zealand.

[18] Häni, F., Pintér, L. and Herren, H. (2006). Sustainable Agriculture. From Common Principles to Common Practice, Proceedings of the first Symposium of the International Forum on Assessing Sustainability in Agriculture (INFASA), March 16, 2006, Bern, Switzerland.

[19] Hansen, J. (1996). Is Agricultural Sustainability a Useful Concept, *Agricultural Systems*, 50: 117-143. http://dx.doi.org/10.1016/0308-521X(95)00011-S

[20] Hayati, D., Ranjbar, Z. and Karami, E. (2010). Measuring Agricultural Sustainability, in E. Lichtfouse (ed.), *Biodiversity, Biofuels, Agroforestry and Conservation Agriculture*, 73, Sustainable Agriculture Reviews 5, Springer Science+Business Media B.V., 73-100. http://dx.doi.org/10.1007/978-90-481-9513-8

[21] Hendricks, N. (2010). The Effect of Green Payments on the Diffusion of Conservation Technologies, https://www.researchgate.net/publication/254384150_The_Effect_of_Green_Payments_on_the_Diffusion_of_Conservation_Technologies .

[22] Ikerd J. (2015). On Defining Sustainable Agriculture, SARE.

[23] Котева, N. and Bachev, H. (2010). Framework for Assessing Competitiveness of Agricultural Farms, *Agricultural Economics and Management*, 1: 32-43.

[24] Lowrance, R., Hendrix, P. and Odum, E. (2086). A hierarchical approach to sustainable agriculture, *American Journal of Alternative Agriculture*, 1(4): 169 – 173, http://dx.doi.org/10.1017/S0889189300001260

[25] Lopez-Ridaura, S., Masera, O. and Astier, M. (2002). Evaluating the Sustainability of Complex Socio-environmental Systems. MESMIS Framework, Ecological Indicators.

[26] Mirovitskaya, N. and Ascher, W. (2001). *Guide to Sustainable Development and Environmental Policy*, Duke University Press, London.

[27] Raman, S. (2006). *Agricultural Sustainability. Principles, Processes and Prospect*, New York: The Haworth Press Inc.

[28] Rigby, D., Woodhouse, P., Young, T. and Burton M. (2001). Constructing a farm level indicator of sustainable agricultural practice, *Ecological Economics*, 39(3): 463–478. http://dx.doi.org/10.1016/S0921-8009(01)00245-2

[29] Sauvenier X., Valekx, J., Van Cauwenbergh, N., Wauters, E., Bachev, H., Biala, K., Bielders, C., Brouckaert, V., Garcia-Cidad, V., Goyens, S., Hermy, M., Mathijs, E., Muys, B., Vanclooster, M. and Peeters, A. (2005). Framework for Assessing Sustainability Levels in Belgium Agricultural Systems – SAFE, Belgium Science Policy, Brussels.

[30] VanLoon, G., Patil, S., and Hugar, L. (2005). *Agricultural Sustainability: Strategies for Assessment*. London: SAGE Publications.

*** COST (2009). COST Foresight 2030 – Proceedings of the Parallel Workshops on Energy, Food Security, Life Enhancement and Natural Resources Management, 30 June - 02 July 2009, Brugge.

*** EC (2001). A Framework for Indicators for the Economic and Social Dimensions of Sustainable Agriculture and Rural Development, European Commission.

*** FAO (2013). SAFA. Sustainability Assessment of Food and Agriculture systems indicators, FAO.

*** OECD, 2001. Environmental indicators for agriculture. Volume 3: Methods and Results. OECD, Paris.

*** UN (1992). Report of the United Nations Conference on Environment and Development, 3-14 June 1992, Rio de Janeiro: United Nation.

*** UN (2015). Paris Climate Change Conference – November-December 2015

*** http://unfccc.int/meetings/paris_nov_2015/meeting/8926.php

*** http://www.sustainable-ag.ncsu.edu/onsustaibableag.htm

Examination of the Crisis Effects on Macroeconomic Development and Convergence in the New European Monetary Union Member States

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Abstract:

Even after more than a decade, a position of certain countries, especially of so-called former transition economies, can be still described as lagging. The project of the European Union took away a significant degree of sovereignty from member states and the common currency eliminated the possibility of using exchange rates as offsetting tools in case of serious economic fluctuations. This paper focuses on the comparison of macroeconomic indicators across new EMU states and Germany over the period of 15 years including crisis. We wanted to verify whether we could still talk about similar convergence trends among "new" members or if these countries are rather "drifting apart" in their economic development due to the crisis.

Keywords: stabilisation policy, EMU countries, crisis, labour market, macroeconomic development.

JEL Classification: E60, E66, E61.

1. Introduction

A project of the monetary union among European countries took away a significant degree of sovereignty from member states and the common currency eliminated the possibility of using exchange rates as offsetting tools in case of serious economic fluctuations. What is more, the countries are also partially restricted in the domain of fiscal policy and should respect the limits set for budget deficit and government debt set by the Stability and Growth Pact. All of this limits the extent to what these policies can be used in case of macroeconomic destabilisations and various problems. Measures chosen for stabilisation highly depend on the type of occurring shocks or crisis, on the degree of similarity of the shocks in various member countries and the speed with which countries are able to adjust. (Frenkel, Nickel, Schmidt 1999)

This paper will be focused on the comparison of macroeconomic indicators across new EMU states over the period of 15 years including crisis. We wanted to verify whether we could still talk about similar convergence trends among "new" members or if these countries are rather "drifting apart" in their economic development due to the crisis. Firstly, the paper presents overall macroeconomic situation of these countries with deeper focus on current situation of labour markets and the last section looks on the effects of demand shocks on macroeconomic variables.

2. Overview of literature

Recent circumstances in Eurozone clearly pointed out that the interest of study should be increased in the area of adaptation mechanisms to asymmetric manifestation of shocks. (Gambetti, Musso, 2012) The shocks may be shifts in consumption coming from changes in consumer confidence, shifts in investment, shifts in the demand for money, etc. Or they may come from changes in policy, such as the introduction of a new tax law, a new program of infrastructure investment, a decision by the central bank to fight inflation by tightening the money supply. Each shock has dynamic effects on output and its components. These dynamic effects are called the propagation mechanism of the shock and they differ for various shocks. The effects of a shock on activity may build up over time, affecting output in the medium run. Or the effects may build up for a while and then decrease and disappear. What we call economic fluctuations are the result of these shocks and their dynamic effects on output.

The analysis of the shocks in aggregate demand and aggregate supply should be made using the basic models. The basic AS-AD model is based on assumption that there is a difference between a short-run and a long-run aggregate supply what can be explained by the sticky character of prices in economy. (Fidrmuc 2003) In the short run, movements in output come from shifts in either aggregate demand or aggregate supply. In the medium run, output returns to its natural level, which is determined by equilibrium in the labour market. (Blanchard, Johnson 2013) Therefore the effects for example of demand shock (i.e. sudden change in aggregate demand) will lead to fluctuation in output as well as prices in the short-run, depending on the reactions of both, supply and demand sides of the economy. However, in the long run, the long run-supply must be considered. (Fidrmuc 2003) In the long run, wages respond to changing prices. (Frenkel 1999) The output effects of the demand shocks are usually only temporary and pass away with the time. As a result, it is only a shock in the aggregate supply that can permanently affect the economy. The effects of an

expansionary supply innovation usually lead to an increase in the economy's short-term supply, gradual rise in wages, and the economy's adjustment to its long-run equilibrium. This means that a supply shocks lead to positive output and negative price effects both in the short and in the long run. We can also say that positive shocks in AD tend to have inflationary effects while positive shocks in AS tend to act inversely and thus reduce price levels. Contrary to output effects, impact of shocks on the price level has a lasting character. (Fidrmuc 2003, Frenkel 1999)

Krugman and Wells (2009) explain how a positive demand shock leads to higher short-run equilibrium aggregate output and a higher short-run equilibrium aggregate price level (aggregate output and the aggregate price level to move in the same direction). In the opposite case of low aggregate output and falling prices, the government could intervene to avoid a temporary fall in aggregate output associated with high unemployment by using policy measures to increase aggregate demand. The temporary fall in aggregate output that would happen without policy intervention is not viewed as a favourable development as it is always associated with high unemployment. Some policy measures aimed at aggregate demand stimulation, especially those that increase budget deficits, may have long-term costs in terms of lower long-run growth. On the other hand there is also price stability, generally regarded as a desirable goal. Most economists now believe that any short-run gains from an inflationary gap must be paid back later. So policy makers today usually try to offset both types of output gaps – those issued from the negative as well as those issued from the positive demand shocks. However, the elimination of inflationary gaps usually relies on measures of monetary policy rather than fiscal policy.

The similarity of countries' responses to shocks is studied by numerous authors. They focus on the synchronisation of economic evolution that can be measured by the correlation between macroeconomic shocks. (Boone 1997) The analysis made by Pentecôte and Huchet- Bourdon (2012) showed that new EMU member countries remain at the EMU periphery with stronger shock asymmetries than either the founder members or the three Opt-Out countries. The similar results were also obtained by Fidrmuc and Korhonen (2003) by using vector autoregressive methods. They assessed the correlation of supply and demand shocks between the euro area and EU accession during the 1990s. The goal was to assess whether the accession countries belong to the same optimum currency area as the other existing EMU members. Countries of central and Eastern Europe (CEE) have strong foreign trade cooperation with EU countries. Therefore it would be expected that a shock in western EU country would be highly correlated to a shock in the newest members, i.e. the shock would be transmitted via business bonds. The authors analysed following countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Their findings suggest that the correlation of supply shocks differs considerably from country to country but remains usually stronger that the correlation of demand shocks calculated for accession countries and EMU. The force of the shocks was lower for the newer EMU members. What is more, demand shocks were rather different in CEE countries what these two authors explain by the countries' different policies and priorities during 1990, i.e. transition period toward market economies. Results indicated that even among accession countries there are some differences in the symmetry of their business cycles. Higher level of symmetry for newer members was also confirmed by the analysis of e.g. Arfa (2009).

We can also find older analyses, e.g. by Blanchard and Quah (1989) who presented a restricted VAR method according to which the observed country is hit simultaneously by demand and supply shocks or the one by Bayoumi and Eichengreen (1993). They tried to identify and evaluate supply and demand shocks from 1960 to 1988 in different countries in Europe (with Germany as a benchmark country) using a structural vector autoregression model. The correlation of demand shocks in European periphery countries with demand shocks of Germany was very low. The obtained results for convergence of business cycles are not very evident for the beginning of the observed period. However, after the introduction of the economic reforms in the transitions countries, the similarities in business cycles between EU or Germany and the CEE countries grew more significant. It may be explained by the fact that once these countries recovered from the transitional depression, they oriented their exports mainly to EU countries that helped to some extent with a synchronisation of business cycles. The authors state that the continuing integration of European countries (single market and later on monetary union) enabled to "bring" periphery countries closer to the EMU core. According to results, the higher correlation of demand shocks indicates which countries adjusted their macroeconomic policies to EMU core to a higher extent. Other authors also analysed the similarity of particular aggregate demand components within the various European Union countries (e.g. Masson 1999 or Frenkel and Nickel 2002). Frenkel (1999) used similar methods but he analysed the problem of business cycle correlation. He found out that the correlation between shocks in the EMU members and non-members is rather high. The group of the analysed countries was rather heterogeneous. However this study covers only a short period of time (authors used quarterly data for period of 1992-1998). The results may be influenced by the fact that accession countries were still in their transition period, many of them suffering from the transformational depression or undergoing various structural changes what subsequently impacted the availability of quality data for most of the CEE countries.

The comparison of business cycles of western EU countries to business cycles of those of central and eastern European countries is also a relatively common topic. (Boone and Maurel 1998 or 1999) Boone and Maurel (1999) tried

to assess the similarities in business cycles and their correlations but using different methodology. They found out that German shocks have strong impact on the accession countries with the strongest bonds for Hungary and Slovakia. Korhonen (2001) analysed monthly data for industrial production for EMU countries as well as for the accession countries in Central and Eastern Europe. He focused on the similarity of impulse response functions calculated via VAR models in order to evaluate the (as)symmetry and correlations in business cycles of these countries. He found out that the most advanced from the group of accessing countries exhibited also the highest correlations with the EMU's business cycle. As for the accessing countries, there were significant differences in the degree of correlation. For example, in case of Slovenia, shocks coming from the EMU explained to a large extent the variation in industrial production. However it was not confirmed in other countries. Generally the influence of EMU business cycle can be considered more important in smaller countries. He suggested that these asymmetric shocks were absorbed via flexible labour or other markets.

3. Comparison of macro economical development and crisis manifestation in new European Monetary Union member states

After year 2000 almost all EMU economies had a rather successful decade accompanied by a growth of the selected variables as well as by the overall economic growth. However, despite generally increasing trend in EMU members, there are certain common, as well as distinctive features. These countries can be divided into several groups based on their response to crisis and the subsequent recovery and the speed or extent of the resuming of the growing trend. The evolution of basic macroeconomic variables such as private consumption and investment, aggregate demand, as well as gross domestic product, unemployment and inflation over the period 2000-2015 for all monitored countries is depicted on next figures. All variables are represented as indices with the base in 2010. The unemployment and inflation rates are expressed in %.

Firstly, we compare the evolution of countries' gross domestic product represented on Figure 1. Generally, growth in the GDP of all EMU countries slowed substantially in 2008 and GDP contracted considerably in 2009. There was a recovery in the level of overall EMU's GDP in 2010 and this development continued in 2011–2013, before growth started to accelerate again in 2014.

When we look at the new EMU members, we can see, that the lowest "starting level" can be attributed to Slovakia with its GDP starting at the approximately 55% of the 2010 level of GDP. This favourable development was stopped by the crisis and afterwards we can see the evolution resembling an economic stagnation or rather slow economic growth. Economic stagnation or weak growth in the years after the crisis was also typical for Slovenia. Three Baltic countries, Latvia, Lithuania and Estonia are examples of countries with strong economic growth over the observed period. Their GDP increased from approximately 60 % of 2010 levels of GDP to almost 120 % of their 2010's GDP. These countries also marked a rather pronounced dip of GDP growth caused by the crisis but resumed their growth rates rather quickly. Germany, one of the original members of the Eurozone, was marked with the slow but steady increase of its gross domestic product. The impact of the crisis is not very visible and can be thus considered almost negligible.

Within the new EMU countries, real GDP growth varied considerably, both over the time and between member states. The highest growth rates in 2014 were recorded in Slovakia (3.8 %), Malta and Latvia (3.5 %); high above the EU average (1.3 %). The product's contraction in 2014 was the most prominent in Cyprus, with GDP falling by 2.3 %. As for the average GDP per capita in PPS within the EU, it reached 26.6 thousand in 2013. The most significant improvement of the position from below the EU average at the beginning of 2000s to EU average has been made by Lithuania, Estonia, Slovakia and Latvia. Cyprus fell further below the EU average. Slovenia experienced similar evolution but to a much lesser extent. Germany moved further ahead of the EU average in the period after 2000. (Eurostat, 2015)

Source: Eurostat database
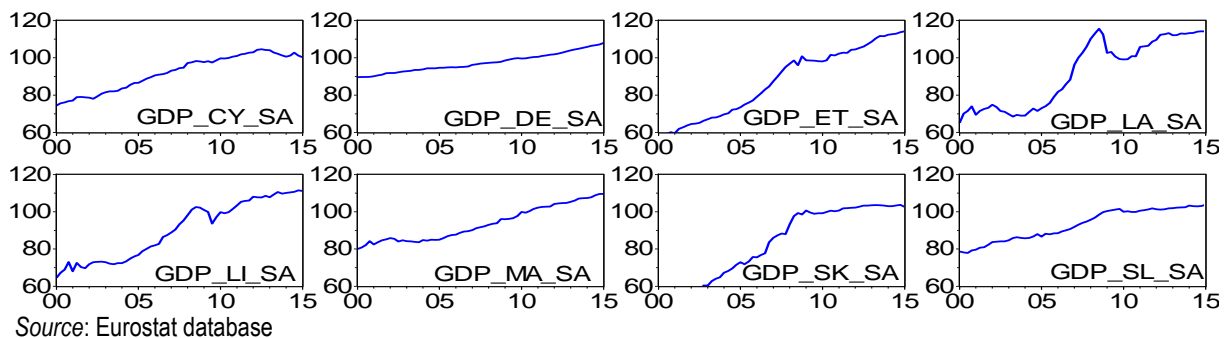
Figure 1 - Evolution of GDP (index 2010 =100)

Figure 2 depicts the evolution of aggregate demand. Generally, we can see a common characteristic, i.e. an increasing trend with a less or more pronounced dip around 2009 caused by the global crisis. In some cases, the

aggregate demand was growing with only minimal fluctuations, such as in Germany or in Slovenia. In Latvia and Lithuania the periods of ups and downs were the most significant and the evolution of aggregate demand can be marked with the highest fluctuations due to crisis. These countries, together with Slovakia and Estonia, also present the strongest or the fastest growth, especially in the pre- crisis period. After sharp movements during the period 2008–2014, the rate at which prices were rising slowed to 0.6 % in 2014, the lowest point since records began. Moreover, during several months of 2014 negative inflation rates (indicating deflation) were recorded. (Eurostat 2015)

Source: Eurostat database
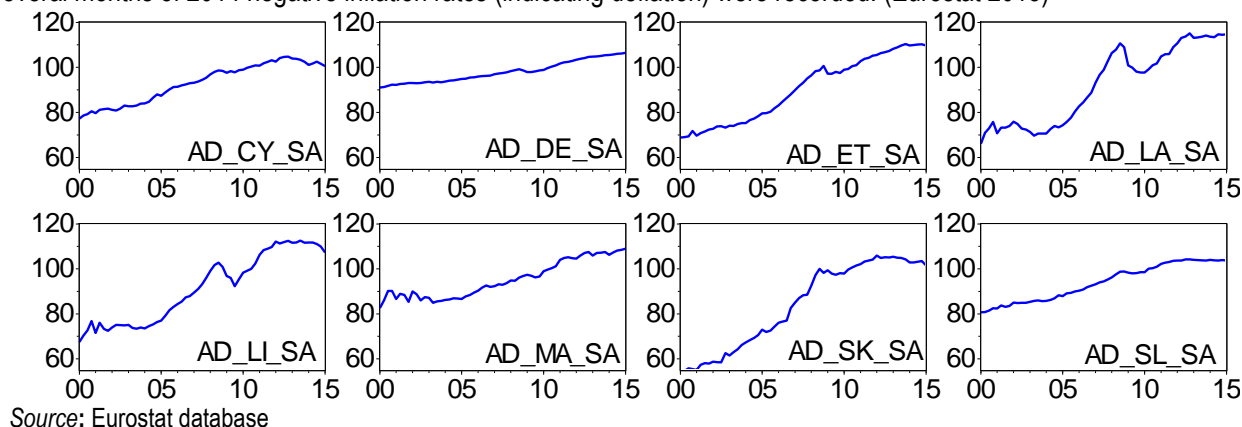
Figure 2 - Evolution of AD (index 2010 =100)

Next, the interest is focused on the main GDP aggregates such as consumption and investments. The Figure 3 presents the evolution of the domestic consumption, or consumption of households, a variable that usually represents the most important part of the domestic aggregate demand. As we can see, the evolution of household consumptions shows again a definitely growing trend. Here again, the fluctuations are less pronounced and only present for certain countries. It can be explained by the fact that aggregate demand comprises equally other types of domestic expenditures, such as investment expenditures of domestic firms (or gross fixed capital formation), government expenditures and net exports.

As well as in the case of aggregate demand, the more pronounced decrease due to crisis is clearly visible on the graphs of Latvia and Lithuania. In case of Germany or also Slovenia and Malta, the increase of household consumption is almost a straightforward line with an increasing slope. It is also interesting to note that the growing trend was reversed only in Cyprus; in other countries it either picked up its pace or seems to be stagnating at the same level (Lithuania, Latvia and Slovakia). The consumption expenditure of households accounted for at least half of the GDP in the majority of EMU member states in 2014; this share was highest in Cyprus (68.7%) and Lithuania (63.7%). (Eurostat 2015)
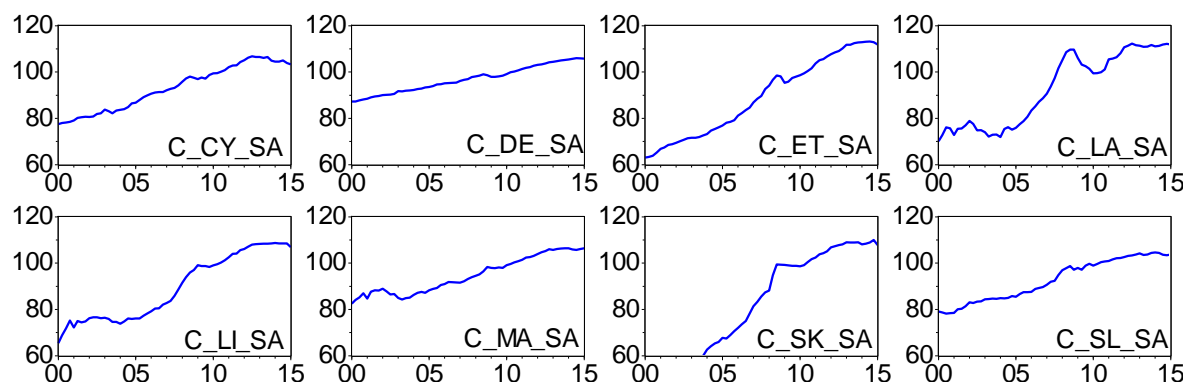
Source: Eurostat database

Figure 3 - Evolution of C (index 2010 =100)

Figure 4 depicts the evolution of investments for selected EMU member countries. In general, we can say that the evolution of investment expenditures of domestic firms was slightly less straightforward than the evolution of consumption of households. We can also observe a bit more pronounced fluctuations. The lowest "starting level" can be again attributed to Slovakia with its investment starting at approximately 55% of the 2010 level of investment expenditures. This favourable development was stopped by the crisis and afterwards we can see the evolution resembling a stagnating expenditures or rather a slow growth. For other countries, the decade starting in 2000, was marked by investment expenditures that were representing approximately 80% of their 2010 level. Germany is the only case with investment expenditures almost at their 2010 level.

Baltic countries, namely Latvia and Lithuania, are also examples of countries with the most pronounced growth in investment expenditures over the observed period. Their investments increased from approximately 80% of 2010 levels of investment to almost 120% of their 2010's investment. These countries experienced a rather pronounced dip in the growth of this variable which was caused by the crisis but they resumed the growth rates rather quickly. As for the growth of investment in the Germany or Slovenia, it was marked with the slow but steady increase of their investments. The impact of the crisis is not very visible and can be thus considered almost negligible. In case of Cyprus and Slovakia, the after-crisis period can be characterised mainly by stagnation in investment expenditures, sometimes at the levels, lower to pre-crisis period.

In 2014, gross fixed capital formation accounted to 19.3% of the EU's and 19.5% of the EMU's GDP. The highest shares among monitored countries were in case of Estonia (25.8%) and Latvia (23.0%), the lowest share in Cyprus (10.8%). The vast majority of investment was made by the private sector. In 2013, investment by businesses and households accounted for 16.7% of the EU's GDP whereas the equivalent for public sector investment was 3.0%. In relative terms, Estonia had the highest public investment (5.5% of GDP) and investment by the business sector (17.8%) The share of household investment on GDP decreased over observed period in Cyprus. A similar comparison shows a relatively large fall in Estonia, Slovenia and Slovakia for business investment. (Eurostat 2015)

Source: Eurostat database
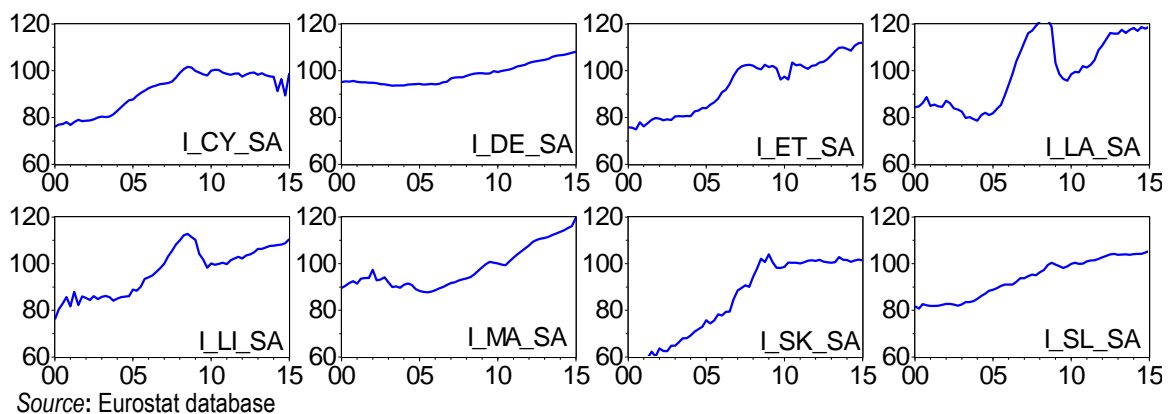
Figure 4 - Evolution of I (index 2010 =100)

Only in the environment with stable purchasing power of the national currency, it is possible to build the conditions for sustainable economic growth. Therefore, the main objective of the ECB's single monetary policy is to maintain price stability in the medium term. This target was initially difficult to achieve in the new member countries where economic transformation activities did not contribute to its stabilisation. In reality, inflation rates should converge across EMU member states. However, price levels diverged somewhat within the EU while in the euro area there was no notable convergence or divergence.

Compared with historical trends, consumer price indices rose at a relatively modest pace during the last years. The annual inflation rate of the EU settled within the range of 1.2% to 2.3% during the period from 2000 to 2007. Since 2008, higher volatility in food and especially in energy prices has led to broad changes in inflation rates. In the EMU, average annual inflation reached 3.7% in 2008. The highest increase of inflation was reported in Baltic countries (Figure 6). The annual average of inflation in 2008 reached 15.3% in Latvia, 11.1% in Lithuania and 10.6% in Estonia.

Source: Eurostat database
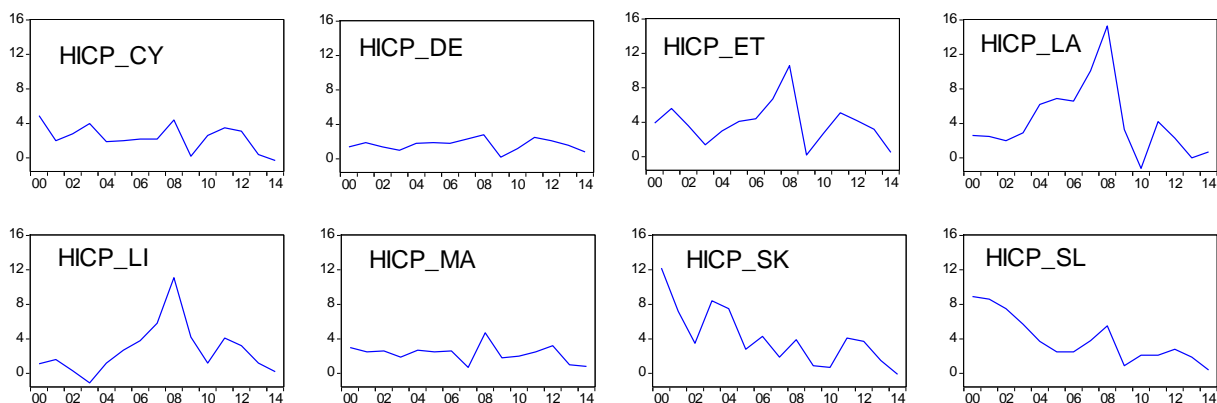
Figure 6 - Evolution of inflation (HICP annual average rate of change)

Over the last years, inflation was low mainly as a result of low imported inflationary pressures and the ongoing weakness in economic activity. The price stability thus takes into account the fact that common shocks (stemming, for example, from global commodity prices) can temporarily drive inflation away from levels compatible with price stability. During a period of robust economic growth before 2008, inflation accelerated in most of the countries, before declining substantially in 2009 as a result of the negative global commodity price shock and the significant downturn in economic activity. However, inflation rose from 2010 to 2012 in spite of persistently weak domestic demand, largely owing to external factors and administered prices. During 2013, the sharp disinflation process was largely induced by decreases in global oil and non-oil commodity prices and good harvests. It was also supported by still negative output gaps in most countries and the absence of inflationary pressures stemming from exchange rate developments. (ECB 2014)

At the beginning of 2000, 9.2% of the total labour force in the EU was unemployed. The unemployment rate followed a downward path and by the first quarter of 2001 the number of unemployed persons had dropped. The unemployment rate in the EMU followed roughly the same development as in the EU. However, between 2000 and the beginning of 2004 the unemployment rate in the euro area was below that recorded in the EU. This pattern was subsequently reversed as, between 2005 and the beginning of 2008, unemployment declined more rapidly in those member states which did not have the euro. During the financial and economic crisis euro area unemployment increased at a considerable pace, with the exception of the period between mid-2010 and mid-2011 when it temporarily declined. The following graphs for evolution of unemployment rates (Figure 5) also show that we can divide selected Eurozone countries into several groups: firstly, there are countries such Germany where the unemployment rates seem to be rather stable and at the relatively lower levels than in other countries. Then there are countries such as Slovakia, Lithuania, Latvia or Estonia with a strong decreasing trend of the unemployment, reversed by the crisis. In these countries, unemployment rates plummeted to the almost 20% levels but resumed its descent again in a short time. In case of Slovakia this favourable development was postponed by several years of stagnation at around 14 % level of unemployment rate.

In the period after 2010, euro area unemployment level peaked at 19.2 million in the second quarter of 2013, before falling modestly in the second half of the year. The largest decreases in the annual average unemployment rates between 2012 and 2013 were recorded in Latvia (-3.1%) and Lithuania (-1.6%). The unemployment rate also fell in Estonia and Germany. The highest increases in unemployment rates among the EMU states between 2012 and 2013 were reported in Cyprus (up to 4.0%) and Slovenia (1.2%). The unemployment rate has increased by less than 1% in Malta and Slovakia. The dispersion of unemployment rates across the EMU continued to increase during 2013, following a pattern that started in 2008. (Eurostat 2015)

Source: Eurostat database
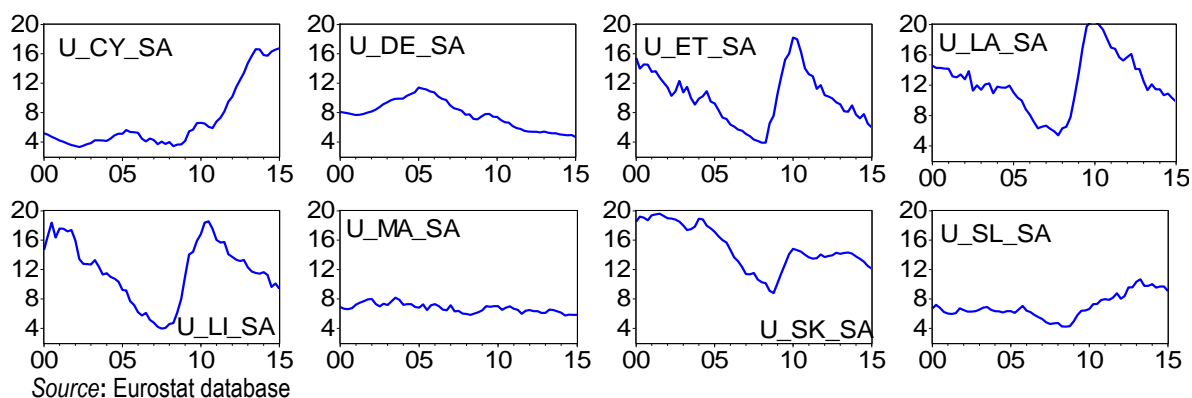
Figure 5 - Evolution of U (in %)

European integration and creation of monetary union caused that exchange rates and foreign trade policy have lost their significance as instruments of economic flexibility. As a result, the importance of flexible labour markets has been reinforced. Over the last decade, EMU countries have been becoming more and more alike in many areas, yet it certainly cannot be said about their labour markets. This domain is one of those where the differences are the most accentuated and persistent. The recent economic crisis as well as the following debt crisis deepened the unfavourable conditions in many European countries and revealed others problems. (Nosáľová 2011)

In various analyses, European labour markets are often compared to those of United States. (Nickell 1997) While US markets are viewed as flexible and with a favourable labour environment (and thus low unemployment), European labour markets suffer from many inflexibilities. As a result, problems of high (and persisting) unemployment and shortages of skilled labour in certain domains exist simultaneously. In general, labour markets can be characterised by wide range of indicators, such as unemployment and employment rates, free job vacancies or labour shortages, level of employment protection, level of labour mobility within and between countries, educational attainment of workers, their

language skills and various other particularities in national legislations. Specific features of national markets may significantly improve overall country's economic environment.

High unemployment rates represent one of the most serious current issues in many European countries. As assumed by the OCA theory, the mobility of labour force together with high level of labour market integration are likely to help in solving this problem and to offset differences between countries. That is why flexible labour market and high mobility of labour force present an important absorption mechanism especially in case of economies hit by asymmetric shocks. As mentioned before, EMU labour markets can be characterised by significant differences in national rates of unemployment.
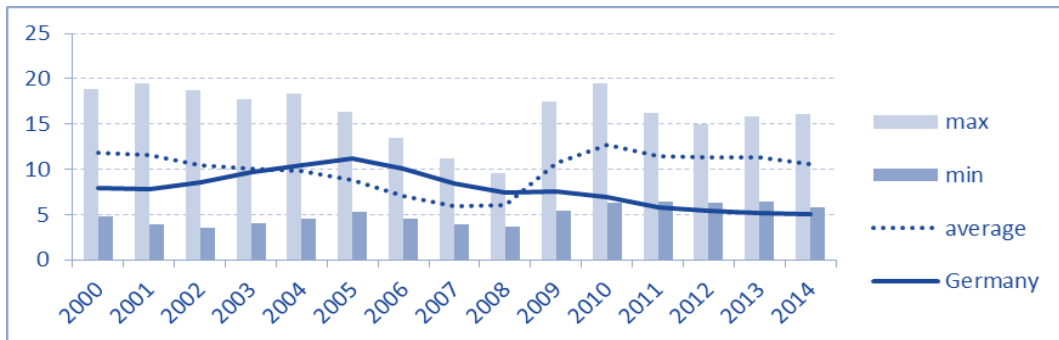
Source: Eurostat database, own calculations

Figure 7 - EMU new members + DE / labour markets – unemployment rate (%)

As can be seen on the Figure 7, covering the period of 2000-2014, the maximum unemployment rate in EMU new member countries was slowly decreasing until 2007-2008 when the maximum rates dipped under 10% level. The highest value of maximum unemployment for these countries stayed below 20%. Even though the crisis of 2009 cause unemployment rates to increase, the following period has been marked with a certain stabilisation in evolution of unemployment for these countries. The maximum values decreased to levels around 15% while minimum values stayed slightly above 5% level. This is also reflected in the average unemployment rate that decreased gradually until crisis, than it picked up sharply.

On the other hand, evolution of unemployment rate in Germany showed different trends. There was a visible increase of rate during the period 2000-2005 that is during the period when new members' recorded lower numbers of unemployed people. The turnabout in the trend came sooner than the crisis. The rate started to descent after 2005. However, the last four years show the same stabilisation tendencies as in the case of new EMU members.

It is obvious, that existing differences deepened over the surveyed period with the highest values accounted around the economic crisis of 2009. That is why we looked more closely at the extent of this variation. Following graph (Figure 8) shows the differences in unemployment rate in particular country in comparison to Germany. Firstly, we can see that differentials in unemployment rates were significant and they were not stable but rather fluctuated within the range of -6% to +12.5% (depending on the particular country and the year).

Until 2008-2010, certain countries recorded negative values, meaning their unemployment rates were much lower than those of Germany – e.g. Czech Republic, Slovenia, and Malta. Baltic countries were in this category during the period 2004-2008. However, they were also three countries with the unemployment rate most prominently surpassing Germany's unemployment rate in the second half of the period.
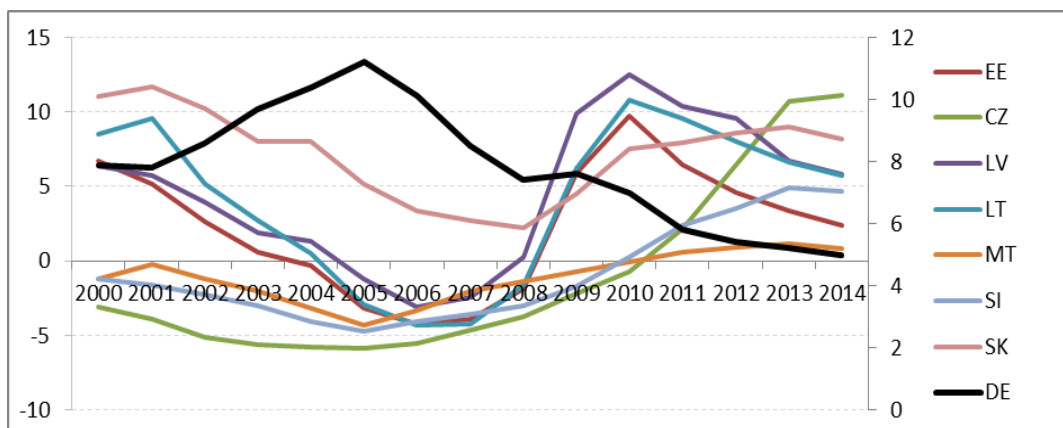
Source: Own Calculations, Eurostat

Figure 8 - Unemployment Rate Differences – EMU new members and Germany (%)

Based on the observed differences in unemployment rates, it is also interesting to look at employment possibilities for surveyed countries. One of the possible indicators is a job vacancy rate (JVR) that measures the percentage of job vacancies (free positions) over total number of posts in economy (number of occupied posts together with the number of job vacancies). Next graph illustrate quarterly evolution of this indicator for new EMU members and Germany over the period 2008-2014 (no data available before 2008).

The evolution of this indicator in countries that joined EMU later on (Figure 9) indicates relatively stable values that stayed mostly in the range 0.5-1.5%. The highest percentage was recorded for Estonia, at the beginning of 2008 as well as for the most of this period, with the short period around 2009. Germany experienced more visible volatility of this indicator and also higher percentage from the interval 1.5-3.5%. Contrary to new members with relatively stable values (with the exception of Cyprus), indicator for Germany can be characterised by an increasing trend, especially toward the end of the period.
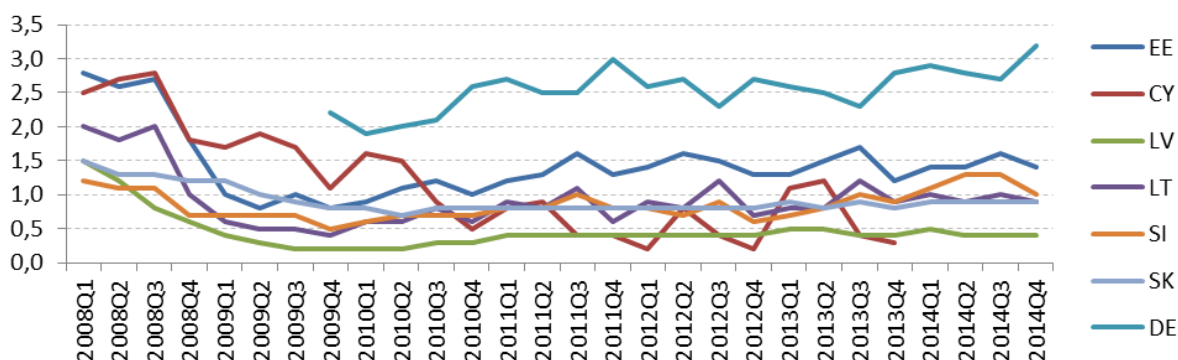
Source: Eurostat database

Figure 9 - Job vacancy rate (%) in new EMU members (MT data were NA) and Germany

When we compare total stocks of unemployed (U) for new EMU countries and Germany with stocks of free job vacancies (V), we obtain an Unemployed - Vacancies Ratio (UVR), i.e. a number of unemployed persons corresponding to single job vacancy. Table 1 compares UVR with unemployment rates for 2013. This year was chosen with regards to data availability as well as the results obtained in previous comparisons. It is evident, that overall national markets show no shortages of free labour force. New members also indicate much higher values for the UV ratio in comparison to Germany. With the exception of Cyprus (the highest value) and Estonia (the lowest value, countries' UV ratio stayed with the range of 20-30. Nevertheless, comparisons across sectors would certainly present different results with simultaneous lack of skilled workers in certain domains and surpluses in the others.

Table 1 - UV Ratio and Unemployment Rate, 2013

	CY	DE	EE	MT	SI	SK
UVR	47.0	**2.3**	11.0	21.9	23.0	28.6
UR %	11.9	**5.5**	10.2	6.4	8.9	14.0

Source: Own Calculations, Eurostat, Ameco

As expected, Table 1 also confirms that countries with the highest unemployment-vacancies ratio tend to have also high unemployment rate percentages. However, there are significant differences between these countries. They can be probably explained by imbalances between supply and demand sides of labour market. Different skills offered by unemployed and demanded by potential employers point out to structural nature of unemployment in some countries. More detailed statistics of job vacancies by sectors confirm there are important cross-countries differences for some professions. (European Vacancy Monitor 2013) High values of these indicators might indicate more profound labour market imbalances or overall less favourable economic situation.

4. The examination of the demand shock on macroeconomic development

We decided to verify the response of economic variables to demand shock. In order to analyse the transmission of the shock in the demand to the real economy we used the model based on vector autoregression approach. This approach is still commonly used for modelling the effects of various macroeconomic policies especially in case of shocks.

For this analysis we estimated a simplified following model:

$$CY_t = A(L)Y_{t-1} + u_t$$

In this case, Y_t represents a N x 1 vector of the following endogenous variables: AD_t - aggregate demand, C_t-household consumption, I_t -private investment, U_t- unemployment. C corresponds to an N x N matrix. It describes the simultaneous relations among endogenous variables of the model. A(L) corresponds to a N x N polynomial with coefficients representing relationships among endogenous variables on lagged values. Lastly, u_t, a N x 1 normalized vector of shocks to the model, is used to represent shocks.

If there are at least two endogenous variables integrated of order 1 (I (1)) mutually cointegrated, then the initial VAR model must be adjusted to VEC model. This transformation is possible if we multiply the equation (1) by 1/ Y_{t-1}:

$$\Delta Y_t = \mu + \Pi Y_{t-p} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$$

ΔY_t corresponds to an N x 1 vector of stochastic variables Y_t expressed at the level of first difference, I represent an N x N matrix. After the transformation, this model is able to capture short-and long-term adaptation to changes. Once estimated, the VEC model allows determining courses of impulse-response functions for all variables. It is also possible to monitor the decomposition of variance for selected analysed variables.

However, a VEC model requires that there is at least one long-term cointegration relationship between the variables. That is why the testing of the model should start with the verification whether the standard conditions were met, i.e. testing the variables for stationarity, cointegration, residual autocorrelation, heteroscedasticity and normality.

Before estimating an econometric auto-regressive model it is important to verify whether the time series of selected economic indicators satisfy several conditions. Therefore we tested these variables for stationarity and cointegration. However, with respect to the scope of the paper, the next sections present only selected results of the analysis. The overall results are available upon request from the authors

In order to verify the stationarity of time series we used unit roots test - Augmented Dickey-Fuller Test (ADF) and Phillips – Perron (PP). Both test showed that some of the time series were stationary at the values. Testing on the first values indicated the stationarity of time series. We assumed these time series to be I. As not all of the variables were stationary on the value and therefore had a unit root, it was necessary to verify also the presence of the cointegration. The existence of the cointegration between variables was tested by Johansen cointegration test (with 2 lags as recommended by the Akaike Information Criterion and Schwarz Information Criterion). Both Trace and Maximum Eigenvalue statistics indicated the existence at most 2 cointegrating equations for France and at most 1 equation in case of Slovak Republic.

The stability of the model was verified by AR roots test that confirmed that both estimated VEC models can be considered stable.

We would like to study the impact of the demand shock on selected macroeconomic variables in these countries in order to analyse the strength of their individual responses. Such a comparison would show whether a common European policy has the same impact on macroeconomic variables in such diverse economies and whether it might be suitable in tackling the fundamental problems of high unemployment and weak economic growth.

Based on the estimated model, it was possible to make a variance decomposition of endogenous variables. This method informs about how a particular variable contributes to the evolution of other variables in the autoregression and determines how many the variables (in our case C, I, U) can be explained by exogenous shocks. Table 2 shows the contributions of changing aggregate demand to variability of consumption, investment and unemployment rate in case of individual EMU countries.

Table 2 - Decomposition of endogenous variables (2000Q1-2015Q4)

CY	C	I	U	DE	C	I	U
1	64.12773	11.29978	11.98950	1	47.45280	22.03383	16.85045
3	85.03338	29.46126	4.873498	3	67.38904	32.14860	35.67856
6	**86.62310**	44.32457	2.760222	6	**73.81936**	34.12472	42.13737
12	82.75086	21.12083	0.973271	12	80.77287	40.81841	**43.69273**
EE	C	I	U	LA	C	I	U
1	26.40669	29.61578	5.109660	1	73.34320	**67.20638**	3.462727
3	29.68750	28.60091	17.67003	3	**79.82028**	60.30243	10.27313
6	35.95912	32.24118	19.74550	6	77.08495	48.36769	10.01215
12	39.75614	34.14251	11.45230	12	71.90528	38.52657	6.276438
LI	C	I	U	MA	C	I	U
1	48.55467	22.57576	15.32154	1	46.85277	37.69651	3.565762
3	68.80009	44.64964	11.03740	3	41.15593	27.88468	8.115003
6	**74.67855**	**53.53240**	4.67993	6	43.22696	35.88306	5.782697
12	75.57741	49.67623	16.03050	12	42.72748	38.60849	3.820529
SI	C	I	U	SK	C	I	U

1	46.35992	18.07197	0.801409	1	59.48117	57.38627	12.04137
3	41.55376	43.85819	3.476084	3	**72.08346**	**66.56581**	**28.30915**
6	39.81040	54.16747	1.781864	6	62.53839	62.28485	26.92664
12	40.22728	**56.68661**	0.821210	12	51.38727	54.44365	26.34803

*Source***:** own calculations

Note: Cholesky Ordering: AD_SA C_SA I_SA U_SA

   CY - Cyprus, DE - Germany, EE - Estonia, LA - Latvia, LI – Lithuania, MA - Malta, SK – Slovakia, SI - Slovenia

The decomposition of variance for monitored countries showed certain differences in the reactions. The exogenous shock in form of sudden aggregate demand stimulation contributes to the evolution of monitored macroeconomic variables across EMU countries in different manner. The strong reaction is reported in the case of household consumption variability in the case of Cyprus (86.6%), Latvia (79.8%), Lithuania (74.6%) and Slovakia (72.0%) where the effect of shock manifests after three quarters. On the opposite side, in the countries such as Estonia (39.7%) Malta (46.8%) and Slovenia (46.3%), a variability of consumption reaction is lower.

The importance of aggregate demand on investment variability at the begging of the observed period is strong in the case of Latvia (67.2%) and Slovakia (66.5%). Considerable influence of aggregate demand on investment is also reported in case of Slovenia (56.6%) and Lithuania (53.5%). Reactions of other monitored countries are significant but to a lesser extent as it were in previous cases.

The last observed variable, the unemployment rate, shows also very different results. The variability of unemployment, influenced by changes in aggregate demand, is significant in case of Germany (43.6%) and Slovakia (28.3%). The weak influence on unemployment variability show the results in case of Slovenia (3.4%) and Malta (8.11%). The rest of monitored countries showed low contribution (max 20%) of demand shock to unemployment rate variability.

The positive demand shock had rather significant impact on evolution of observed variables in "new" member counties as well as in Germany, representing "old" EMU member state. The most significant differences are observed in the case of unemployment reactions. Here, the evolution of this variable in Germany (43.6%) and Slovakia (28.3%) is much more influenced by aggregate demand change as in Slovenia (3.4%) or Malta (8.11%). From this point of view we can conclude that the unified fiscal policies or a coordination of national fiscal policies with the goal of similar macroeconomic stimulation would not lead to same results.

Conclusion

The fact that future EMU countries were far from being the optimum currency area were well known. Even after more than a decade, a position of certain countries, especially of so-called former transition economies, can be still described as lagging. The project of the European Union took away a significant degree of sovereignty from member states and the common currency eliminated the possibility of using exchange rates as an offsetting tool in case of serious economic fluctuations. That is why a persisting unequal position of individual member countries at the current rate of globalisation and interdependence, together with a restricted scope of country's economic policy, is still feeding debates of maintaining or improving national competitiveness or managing country's responses to various shocks. Strict fiscal stance and subsequent forced consolidation of budgets together with reduction of deficits also raise questions. These issues show the limits of these measures when applied in times of high unemployment and the associated risks of launching a deflationary spiral and worsening the overall macroeconomic situation.

This paper was focused on the comparison of selected macroeconomic indicators across of new EMU member states and Germany in order to verify whether we could still talk about similar convergence trends among EMU countries in their economic development due to the crisis. The crisis period clearly revealed the asymmetries between countries. Especially the current situation on labour markets shows that national labour markets remain different. Unfavourable current situation tells us that countries should be more interested in eliminating existing imbalances and deficiencies that nowadays characterise labour markets in most new EMU members. It would also mean that EMU countries would get more close to a goal of being an optimal currency area.

The vector autoregression analysis verified the similarity of the countries' response to demand shock. The similar significant reaction was reported in the case of household consumption and investments in monitored countries. Contrary to unemployment reactions, we observed considerable differences among countries. It can imply that the unified fiscal policies or a coordination of national fiscal policies with the goal of similar macroeconomic stimulation would not lead to same results.

Acknowledgement

References

[1] Arfa, N.B. (2009). Analysis of shocks affecting Europe: EMU and some Central and Eastern acceding countries, *Panoeconomicus*, 1(2009): 21-38. DOI: 10.2298/PAN0901021B

[2] Bayoumi, T. and Eichengreen, B. (1993). *Shocking aspects of European monetary unification, adjustment and growth In the European monetary union.* Cambridge Univ. Press, Cambridge/New York, Pp. 193–229.

[3] Blanchard, O., Johnson, D.R. (2013). *Macroeconomics*, Sixth edition, Pearson education Inc.

[4] Blanchard, O., Quah, D. (1989). The Dynamic effects of aggregate demand and supply disturbances, *American Economic Review*, 79(1989): 655-673.

[5] Boone, L. (1997). Symmetry and asymmetry of supply and demand shocks In European Union. [Cepii N°1997: 3].

[6] Boone, L., Maurel, M. (1998). Economic convergence of the CEECs with the EU, (Centre for economic policy discussion paper N°1998: 2180).

[7] Boone, L. and Maurel, M. (1999). An Optimal currency area perspective of the EU enlargement to the CEECs. (Centre For economic policy discussion paper N°1999: 2199)

[8] Fidrmuc, J. and Korhonen, I. (2003). Similarity of supply and demand shocks between the Euro Area and the CEECs, *Economic systems*, 27: 313-334. DOI: 10.1016/j.ecosys.2003.05.002

[9] Frenkel, M., Nickel, Ch. and Schmidt, G. (1999). Some shocking aspects of EMU enlargement.

[10] Gambetti, L. and Musso, A. (2012). Loan supply shocks and the business cycle, (ECB Working paper series, N°2012: 1469).

[11] Korhonen, I. (2001). Some empirical tests on the integration of economic activity between the Euro Area and the accession countries, *The Economics of Transition*, 1: 17-196. DOI: 10.1111/1468-0351.00144

[12] Krugman, P. and Wells, R. (2009). *Economics*, Second Edition, Worth Publisher, ISBN-13: 978-0-7167-7158-6.

[13] Masson, P.R. (1999). Monetary and exchange rate policy of transition economies of Central and European countries after the launch of EMU (IMF Policy Discussion Paper N°1999: 5).

[14] Nosáľová, O. (2011). Dopad krízy na štruktúrne zmeny v SR podľa zamestnanosti – pohľad na hospodárske sektory s dôrazom na odvetvia sekundárneho sektora, *Transfer inovácií*. 21:110 - 115.

[15] Pentecôte, J.-S., Huchet-Bourdon, M. (2012). Revisiting the core – periphery view of EMU, *Economic Modelling*, 29(2012): 2382-2391. DOI: 10.1016/j.econmod.2012.06.036

*** ECB (2014). Convergence Report. Available at: https://www.ecb.europa.eu/pub/pdf/conrep/cr201406en.Pdf?C759d9 b132af38d2cde1900f23c35ce9, accessed December, 10, 2015.

*** European Commission (2013). Ameco Database. Stock of Total Unemployed. Available At: http://ec.europa.eu/ economy_finance/ameco/user/serie/selectserie.cfm, accessed December, 2, 2015.

*** Eurostat database (2015). Quarterly data for GDP, consumption, investments, HICP and unemployment. Available at: http://ec.europa.eu/eurostat/data/database, accessed December, 11, 2015.

*** Eurostat database (2015). Annual data for unemployment rates, quarterly data for job vacancy rates. Available at: http://ec.europa.eu/eurostat/data/database, accessed December, 11, 2015.

*** Eurostat (2015). Statistics explained, national accounts and GDP. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/national_accounts_and_gdp#developments_in_gdp, accessed December, 10, 2015.

*** Eurostat (2015). Statistics explained, unemployment and beyond. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/unemployment_and_beyond, accessed December, 2, 2015.

The Impact of Entrepreneurial Financial Activities on Financial Indicators: Evidence from All Companies Listed in Muscat Security Market

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Abstract

This paper aims to analysis the impact of entrepreneurial financial activities on financial indicators of all sectors as industrial, financial and services listed in Muscat Security Market from 2008 to 2014. The sample of 109 firms has been selected from a total population of 115 firms. The model of study consist of five main financial activities related to entrepreneurial activities as independent variables, which include output of employment and prices, oil and gas, public finance, money, banking and financial institutions, foreign trade and balance of payments wherein every activity is measured by three variables. The dependent variable is financial indictors consisting of market and profitability indicators. The results show there is a statistical significant impact of three entrepreneurial activities of output of employment and prices, money, banking and financial institutions, foreign trade and balance of payments on market indicator and in all entrepreneurial activities on profitability indicator. Researchers strongly recommends to adoption of entrepreneurship in the government's planning and long term strategy at the country level and special attention for all economic activities that contribute to the promotion of entrepreneurial concept directly or indirectly through the influence in all economic sectors and this interaction could add effective economic value that will reflect positively on economic growth.

Keywords: entrepreneurial activity, financial indicators, Muscat security market.

JEL Classification: L26, L25, D53.

1. Introduction

The evolution of the global financial markets and the increasing competition between markets and economies of the countries lead to the phenomenon of globalization, which indicated benefit from the expertise and knowledge to improve the performance of economic activities and when increasing the intensity of competition between economic markets lead to the need for attention to the so-called entrepreneurial activities. Review of the previous literature Rajshekhar *et al.* (2012) and Acs (2004) has established that the entrepreneurial activities are an important focus area in any country's economy as it contributes to economic growth both internally and externally by creating new jobs and new markets. This also results the entry of new firms in the market which is an indicator that entrepreneurial concept is work efficiently and effectively in the economy. When we think of new products, markets, technology, management techniques and strategy, effective production, and employment optimization are all manifestation of innovation and entrepreneurial activities that contribute to the competition on the performance of firms. Entrepreneurial activities also contribute to increased domestic and foreign investment and increase of foreign capital in the country. (Carree 2002)

The modification and improvement in the entrepreneurial environment of the country's economy must be synchronized with the development of legislation and economic policies and the removal of obstacles in the development process to fit into the economic policy and that branch of fiscal and monetary policy in the country, Lundström and Stevenson (2005). The entrepreneurial activities is also referred to as social economy, which contributes to seize the investment opportunities in the community and in the development of new projects in the market to solve the economic problems, therefore entrepreneurs are persons that creates new ideas and develop them into the possibility of investment opportunity which tolerate manifestations of creativity in light of the current economy, Simsek *et al.* (2009). They create value in the firms reflected in the entrepreneurial concept which can be expressed in various economic activities that contribute to the strengthening of the leading performance, as the integrity of the federation of economic activities with each other to create the concept of entrepreneurship which may be one of the economic activities that exercise the greatest role in this concept. Many economies of the countries are working on removing obstacles to

entrepreneurial activities which contribute to raising the awareness of entrepreneurship leading to better employment and resource productivity in the economy, Caselli and Gennaioli (2013).

This study aims to explain the impact of five of entrepreneurial financial and economic activities on financial indicators listed in Muscat security market in sultanate of Oman. These economic activities form the basic composition of entrepreneurial Activities at the community level leading to the creation of new jobs and the creation of new firms operating under the umbrella of the concept of entrepreneurial and contribute to the improvement of financial indicators for the firms. The good performance in the activities of the country's economy may be reflected on the financial indicators for firms that operate in the competitive market. This study is organized as follow: Theoretical Framework, research method, research findings and conclusion.

2. Theoretical framework

This section discusses the entrepreneurship and financial indicators and literature review.

2.1. Entrepreneurship and financial indicator

In Bloom *et al.* (2013) it is found that entrepreneurs are those individuals who own business and they think about how to create value though new ideas, markets and processes under economic activity or entrepreneurial activity referred to the human resources work to create or expansion of value and economic activity and exploiting new products, processes or markets. The entrepreneurship comes from the application of the concept of creativity in the economic activities and economic growth in the country that is evidenced by the fact that the implementation of entrepreneurial concept on all forms of economic activities. Entrepreneurial mean the behavior of competition in the market, entrepreneurial contribute to the development of existing firms and entry of new firms and think how to produce product and have a competitive advantage in the market competition, Kirzner (1973). Entrepreneurial mean the use of technology contributes to reduction in costs and that contributes to the increased profitability of firms and checks the concept of customer satisfaction, which is one of the standards important in the evaluation the performance of firms Carree, and Thurik (2003).The entrepreneurial express the ability to build an integrated team which can be expressed of entrepreneurial to seek out opportunities to set up firms on competition in the market and avoid risks and refer to entrepreneurial in four dimensions as knowledge, motivation, capabilities and characteristics that interact with each contributing of production process to provide effective economic activity that enhances organizational performance, Brinkman (2000).

The entrepreneurial is the internal behavior of individuals in firms that contribute to achieving positive results in performance and regardless of the size of the firms also referring to it the quality of management and flexibility in the implementation of strategies that contribute to the creation of new firms, Antoncic and Hisrich (2004). The concept of entrepreneurial includes four concepts such as innovation, risk taking, proactive and competitive aggression dimension and autonomy. Innovation, risk-taking and proactive refer by Dess and, Lumpkin (2005) that pointed to the existence of new ideas, experiences and authenticity in the knowledge that contribute to the increase competition and working to hedge risks and increased performance led to transfer of resources between economic units in the country. Proactive firms enhances their opportunities in the market to be leaders as they base their work on futuristic desires and needs to take advantage against competitors. Competitive aggressiveness explains the intensity level of firms' in the market but autonomy provides flexibility and freedom to the individualistic or team action to develop the entrepreneurial spirit, Lumpkin *et al.* (2009).

2.2. Literature review

In Hoffmann (2005) the focus was to examine the entrepreneurship risk on market share and the results indicated that the pilot variable expresses consumer wealth and there was a significant relationship between income and consumption which is attributed to the adoption of the concept of entrepreneurship in the market. Fox (2008) it is pointed that the relationship between organizational entrepreneurship and organizational performance through the adoption of the research and development system based on the accumulation of knowledge in the organization, where this study measures the entrepreneurship management through financial standard performance and non-financial terms and found that organizations evaluates entrepreneurship performance through the integration of these standards concurrently with the use of technology to maintain the performance in organizations. While other study measuring the entrepreneurial activity at the local level by measuring entrepreneurial behavior as well as the use of social network information to present the social entrepreneurship and found that entrepreneurial behavior is expressed in social activities Justo *et al.* (2008).

The study of Amorós *et al.* (2001) focused on the importance of entrepreneurial dynamics at the state level in the achievement of competition between companies and examined countries that are following the entrepreneurial concept and found that the economic growth rate increased when these countries adopted advance entrepreneurial system to

make markets more creative and powerful at the local and international level. Gree (2011), examined the relationship between entrepreneurship and returns of stock owners by knowing abnormal returns that can occur in companies that adopt entrepreneurship concept and he found that there is no abnormal returns among companies that adopt entrepreneurial concept or that do not adopt this concept. Njeru *et al.* (2012) aims to measure the relationship of the size of companies and that the specific choice of the source of financial entrepreneurship for small and medium-sized enterprises, and the results show there is no relationship between the size of the company and financial entrepreneurship where focus was on the use of optimal resources to achieve the greatest value in the company's activity and enhance profitability which in turn will contribute to attracting investors. Other study focused on adopting the concept of entrepreneurship in the light of globalization imposed on the companies that strongly compete for their stay in the market and show that there is factors interest rate and inflation rate have an effect on the share price in the market. This calls for a review of the policy and the extent of price stability in the market and the way that positively affects the entrepreneurship concept, Dennis and Andrew (2012).

Karacaoglu *et al.* (2013) aims to clarify the interactive relationship between the financial performance of institution and entrepreneurialism, which can be described in all products, services, markets and technology, where this study was applied in industrial companies and found that innovation, risk taking, proactiveness as factors of entrepreneurialism have a positive relationship with financial performance. While study of Özdemirci (2014) indicated the positive relationship between institutional entrepreneurial efforts and the company's performance through the enterprise culture and environment factors where he found that the nature of the organizational structure helps to adopt a positive entrepreneurial behavior in institutions which effectively contribute to their performance, and also found that the positive institution contribute to increase sales and improve the level of institutional performance culture. Scholmana *et al.* (2014) examined the relationship between entrepreneurial activity and the business cycle and the unemployment rate in the economy, where he found that the entrepreneurial activity influenced business cycle sector so much that if the business cycle is positive at certain time reflected positive effects on the entrepreneurial concept and contribute to creating jobs that contribute to reducing the unemployment rate and this will be available in an open economy system. The study of Mrabet and Ellouze (2014), analyze the impact of entrepreneurship on economic growth in different countries and in different time of periods based on different standards for measuring entrepreneurial activity and found that efficiency of entrepreneurship is different between countries because of differences in the measures of entrepreneurship. Buera *et al.* (2015) indicated that positive, effective and efficient interaction between economic variables at the micro and macroeconomic level contribute to the adoption of the concept of entrepreneurship and has positive influence on economic growth rate**.**

3. Research method

3.1. Two models of regression

This study developed two equations. The first equation utilizes market capitalization (MC) as market performance indicator. The second equation utilizes return on assets (ROA) as profitability indicator. This study used Pearson correlation and multiple regression analysis to test two equations .These equations are tested in the current paper and are formally presented below:

Market Capitalization $(MC_{it}) = \alpha_0 + \beta_1 E_{it} + \beta_2 OG_{it} + \beta_3 PF_{it} + \beta_4 MBI_{it} + \beta_5 FTBP_{it} + \epsilon_{it}$ (1)

Return on Assets $(ROA_{it}) = \alpha_0 + \beta_1 E_{it} + \beta_2 OG_{it} + \beta_3 PF_{it} + \beta_4 MBI_{it} + \beta_5 FTBP_{it} + \epsilon_{it}$ (2)

Notes: Independent variables related to five entrepreneurial financial activities:

E= output of employment and price measured by Annual growth of GDP of current market prices (E1), General price index CPI (E2) and Broad Money (M2) growth (E3);

OG = Oil and Gas Output measured by % change of production (OG1), % change of exports (OG2) and average Oman's oil prices (OG3);

PF = Public Finance measured by fiscal balance as % of GDP(PE1), Investment expenditures as % of GDP (PE2) and Debt to GDP ratio % (PE3);

MBI = Money, Banking and Financial Institutions measured by Bank credit to GDP % (MBI1), Bank credit to non oil GDP% (MBI2) and Money Multiplier (MBI3);

FTBP = Foreign Trade and Balance Payment measured by (Export - import) as % of GDP (FTBP1), Trade balance as % of GDP (FTBP2) , Total non oil exports as % of GDP (FTBP3).

3.2. Sample selection and data collection

This study tested the relationships between the Entrepreneurship Financial Activities (EFAs) and financial and market performance. The population is all sectors of Omani companies listed on MSM and includes 115 firms, 47 firms in

industrial sector, 36 firms in financial sector and 32 firms in services sector listed on Muscat Securities Market (MSM) in Sultanate of Oman over the period 2008 - 2014. The sample selected is only 109 firms because 4 firms from services sector and 2 firms from finance sector did not have complete data that is needed. Also only seven years (2008-2014) were analyzed in this study because no data available on firms listed on the MSM annual reports. At the same time, the disclosure of market capitalization by companies is very limited.

4. Research findings

4.1. Correlation Matrix

In Table 1 shows the relationship between dependent and independent variables analyzed by the two regression models mentioned earlier. In the model one, the result shows there is a significant relationship between output of employment and price measured by broad money (M2) growth and market capitalization on financial sector and between output of employment and price indicator measured by annual growth of GDP of current market prices and between money, banking and financial institutions indicator measured by bank credit to GDP%, bank credit to non oil GDP% and between foreign trade and balance payment indicator measured by total non oil exports as % of GDP and market capitalization on service sector. Note through results that entrepreneurial financial activities and measurement through the money supply control in the market is important in the country's economy, which have monetary instruments impact on the banking system's stability and thus contribute to increased market capitalization in the financial sector, while the improvement in credit growth in the banking helps to improve GDP growth reflected positively on improving the balance of payments through non-oil exports and increase the market capitalization in the service sector.

In the model two, there is a significant relationship between output of employment and price indicator measured by annual growth of GDP of current market prices, broad money (M2) growth and between money, banking and financial institutions indicator measured by bank credit to GDP%, bank credit to non oil GDP% and between foreign trade and balance payment indicator measured by total non oil exports as % of GDP and profitability on financial sector and between output of employment and price measured by broad money (M2) growth and between public finance indicator measured by debt to GDP ratio % and profitability on industrial sector and between oil and gas output indicator measured by average Oman's oil prices and public finance indicator measured by investment expenditures as % of GDP and profitability on service sector. We note that the financial sector have a number of variables contribute in a positive or negative of profitability in the financial and industrial sector, which may explain that there are other factors intertwined in the country's economy affect linked differently from time to time, in addition to trying to support the industry sector from banking and financial sector, also the increase of investment expenses accounted burden on government expenses, which reduced the profitability.

Table 1 - Correlation matrix for variables of study

Variables	Model One - Market Capitalization (MC)			Model Two - Profitability (ROA)		
	Finance Sector	Industrial Sector	Services Sector	Finance Sector	Industrial Sector	Services Sector
E1	.611	.563	-.952**	.844*	-.701	.304
E2	-.101	-.206	-.425	.144	-.125	.621
E3	.870*	.651	-.512	.782*	-.894**	-.502
OG1	.161	.288	-.736	.523	-.109	.701
OG2	-.338	-.126	.187	-.186	.689	.710
OG3	.338	.176	.150	.105	-.435	-.982**
PF1	-.238	-.110	.218	-.348	.281	.434
PF2	-.526	-.367	.108	-.427	.511	.869*
PF3	-.753	-.561	.435	-.682	.822*	.727
MBI1	-.546	-.432	.816*	-.761*	.704	.047
MBI2	-.468	-.484	.919**	-.765*	.515	-.461
MBI3	-.688	-.548	.174	-.649	.390	.469

FTBP1	.083	.111	.397	-.169	-.006	-.687
FTBP2	-.310	-.557	.393	-.360	.043	-.618
FBTP3	-.536	-.451	.910**	-.777*	.683	-.258

Note: ** Correlation is significant at the 0.01 level (2-tailed);*. Correlation is significant at the 0.05 level (2-tailed).

Through the annual report of the Central Bank (2014) noted that economic growth increased by 4.5% during 2014 and inflation rate decreased to 1% compared to the previous year, which was 1.1%. In spite of a decrease in oil prices, but oil production has increased by 2% over the year 2014 compared to previous year and keep equilibrium of balance of payments and monetary policy. This equilibrium reflect the power of the central bank on control of commercial banks and the role of government in the follow-up performance of the banks so that maintained a moderate liquidity and increased the proportion of credit and the money supply increased by 15% in 2014. Also Islamic banks contributed of the growth financial sector in 2012, which led to the diversification of banking services offered and contributed in supporting the national economy, where the government cooperation with the financial sector to support of small enterprises, which also led to creation an effective demand that contributed to creation of entrepreneurial opportunities in the market by increasing jobs opportunities, opening new firms and expansion in existing products and markets

4.2. Regression results

This study tested five entrepreneurial activities and under each activity there are three independent variables and one dependent variable. The result of testing; correlations and regression for each model is as follows:

4.2.1. Market capitalization analysis in the financial sector

Table 2 shows the model tests of relationship and regression between the independent variables and market capitalization as dependent variable.

Table 2 - Results market capitalization in the financial sector

Model	I.V	R	R-Square	F- value	Sig.	Coefficients			
						V	B	T-Value	Sig.
1	E1	0.864ᵃ	0.747	14.780	0.012ᵇ	E1	.014	3.844	.012
	E2					E2	.049	.079	.659
	E3					E3	-.183	-.364	1.000
2	OG1	0.049ᵇ	0.049ᵇ	0.520	0.698ᵇ	OG1	.020	.944	.415
	OG2					OG2	-.001	-.036	.974
	OG3					OG3	.003	.846	.460
3	PF1	0.808ᵃ	0.653	1.878	0.309ᵇ	PF1	.012	.398	.717
	PF2					PF2	.019	.355	.746
	PF3					PF3	-.236	-1.517	.227
4	MBI1	0.769ᵃ	0.592	1.452	0.383ᵇ	MBI1	-.002	-.145	.894
	MBI2					MBI2	-.003	-.268	.806
	MB13					MB13	-.082	-1.630	.202
5	FTBP1	0.814ᵃ	0.663	1.965	0.297ᵇ	FTBP1	.010	1.911	.152
	FTBP2					FTBP2	-.008	-1.134	.339
	FTBP3					FTBP3	-.028	-2.125	.124

Table 3 indicated that only the significant relationship and regression is between output of employment and price (E) and market capitalization at 5%. The F-value of this model is 14.780 and Sig. is 0.012., where, R is 0.864; R- Square is supporting the results of this model at 0.747. In this model, the annual growth of GDP of current market prices has effect on the market capitalization were the t- value is (3.844) and Sig. is (0.012). All other relationships and regressions are insignificant at 5%. Note that when investment increases within the country, this leads to increased foreign investment and contribute to the increase of consumption in GDP and also the demand for goods and services. Hence, this development helps to create real opportunities for their entrepreneurial concept, through the opening of new firms and expanding the market share of the firm during this period and that real economic growth is considered as evidence of the creation of new markets and firms contribute to reduce unemployment and reduce labor turnover. From another angle, the increased demand will lead to increased supply and private demand reflects on economic growth in the gross domestic product, and in this way we can say that there are entrepreneurial opportunities in the market as a result of this

growth. This growth has a significant positive impact in the financial sector, which exercised an active role in economic growth in general and in GDP growth in particular.

4.2.2. Market capitalization analysis in the industrial sector

Table 3 showed the results of this model in the industrial sector and indicated that only significant relationship and regression is between foreign trade & balance of payment and market capitalization (FTBP) at 10%. The F-value of this model is 6.324 and Sig. is 0.082., where R is 0.929, R- Square is supporting the results were 92.9% of variance in this model are explained by variables of foreign trade & balance of payment.

Table 3 - Results Market Capitalization in the Industrial Sector

Model	I.V	R	R-Square	F-value	Sig.	Coefficients			
						V	B	T-Value	Sig.
1	E1	0.847[a]	0.718	2.544	0.232[b]	E1	.008	1.733	.182
	E2					E2	-.006	-1.931	.149
	E3					E3	.001	.141	.897
2	OG1	0.520[a]	0.271	0.372	0.781[b]	OG1	.029	.988	.396
	OG2					OG2	.006	.314	.774
	OG3					OG3	.005	.828	.468
3	PF1	0.590[a]	0.348	0.533	0.691[b]	PF1	.025	.454	.681
	PF2					PF2	.012	.122	.911
	PF3					PF3	-.223	-.782	.491
4	MBI1	0.673[a]	0.453	0.828	0.560[b]	MBI1	.009	.521	.639
	MBI2					MBI2	-.016	-.831	.467
	MB13					MB13	-.098	-1.260	.297
5	FTBP1	0.929[a]	0.863	6.324	0.082[b]	FTBP1	.014	3.088	.054
	FTBP2					FTBP2	-.021	-3.374	.043
	FTBP3					FTBP3	-.031	-2.738	.071

In this test, all three independent variables have effect on the market capitalization were the t- value and Sigs are significant at 10%. According to above results, export-import percentage of GDP has a positive effect on the market capitalization, but trade balance percentage of GDP and non oil experts' percentage of GDP have negative effect on the market capitalization. All other associations and regressions are insignificant. These result can express on growth of the balance of payments and trade balance contributes to increase effective demand in the domestic economy and therefore are covered internal domestic consumption efficiently and also exported goods and thus increase GDP and have a multiplier positive impact on the economic environment, which is seeking many of the firms in these circumstances to open new markets or expansion of products and current markets for old firms and thus positively reflected on entrepreneurial opportunities because of the growth in economic situation , this will increase productivity in the industrial sector, which contributes to increased sales and this result is clear in the industrial sector, which entrepreneurial activity has positive moral contributed to it on increase market share for firms in the market.

4.2.3. Market capitalization analysis in the service sector

Table 4 showed the results of this model in the service sector. According to the correlation and regression analysis, three entrepreneurial activities output of employment and price in variable E1 and money, banking and financial institutions in variable MB2 are significant in 5% of. But the foreign trade & balance of payment (FTBP) is significant at 1% in all three variables.

Table 4 - Results market capitalization in the service sector

Model	I.V	R	R-Square	F- value	Sig.	Coefficients			
						V	B	T-Value	Sig.
1	E1	0.975[a]	0.950	18.944	0.019[b]	E1	-.016	-4.993	.015
	E2					E2	.003	1.572	.214
	E3					E3	.000	-.053	.961
2	OG1	0.902[a]	0.814	4.389	0.128[b]	OG1	-.078	-3.095	.053
	OG2					OG2	.027	1.568	.215
	OG3					OG3	-.002	-.315	.773
3	PF1	0.886[a]	0.785	3.657	0.158[b]	PF1	.066	1.222	.309
	PF2					PF2	-.242	-2.552	.084
	PF3					PF3	.884	3.196	.049

Model	I.V	R	R-Square	F- value	Sig.	V	B	T-Value	Sig.
4	MBI1	0.872a	0.760	15.820	0.011b	MBI1	.268b	.300	.301
	MBI2					MBI2	.035	3.977	.011
	MB13					MB13	.153b	.307	.968
5	FTBP1	0.996a	0.992	128.265	0.001b	FTBP1	-.014	-7.480	.005
	FTBP2					FTBP2	.014	5.822	.010
	FTBP3					FTBP3	.080	17.620	.000

Note that the services sector was a positive significant effect and strong in most entrepreneurial activities variables where it can be explained by the fact that the government interest in the service sector, which reflects the basic needs of the members of the community, so that in recent years the government increase investment in this sector, and industry sector and as a result of lower oil prices revenues, which form a burden on the country budget and this service investments increase consumption among individuals, which contributed to an increase of gross domestic product and increased demand and thus create opportunities for market entrepreneurial to meet these obligations. The government's also interest in stability of monetary policy and focused on the quality and size of bank credit and increased lending to investors to increased production contributed positive effect on exports and improve the balance of payments, which led to increased market share for firms in the market.

4.2.4. Return on assets analysis in the financial sector

Table 5 showed the results of regression to identify the relationship between independent variables and return on assets in the finance sector. There are three entrepreneurial activities output of employment and price in variable E1 and money, banking and financial institutions in variables MB2 and MB3 and foreign trade & balance of payment in FTBP3 are significant at 5% .

Table 5 - Results ROA in the Financial Sector

Model	I.V	R	R-Square	F- value	Sig.	Coefficients			
						V	B	T-Value	Sig.
1	E1	0.954a	0.910	10.074	0.045b	E1	.000	3.051	.051
	E2					E2	.000	-1.536	.222
	E3					E3	.000	1.061	.366
2	OG1	0.794a	0.631	1.710	0.335b	OG1	1.022	2.195	.116
	OG2					OG2	-.140	-.250	.819
	OG3					OG3	.665	1.013	.386
3	PF1	0.821a	0.674	2.068	0.283b	PF1	-.365	-.703	.532
	PF2					PF2	1.269	1.374	.263
	PF3					PF3	-1.597	-2.123	.124
4	MBI1	0.765a	0.585	7.034	0.045b	MBI1	-.405b	-.735	.503
	MBI2					MBI2	-.765	-2.652	.045
	MB13					MB13	-.530b	-2.748	.051
5	FTBP1	0.777a	0.604	7.635	0.040b	FTBP1	.540b	1.777	.150
	FTBP2					FTBP2	-.196b	-.636	.559
	FTBP3					FTBP3	-.777	-2.763	.040

We note that the financial sector through its entrepreneurial activities, which in turn effectively led to positively reflect on earnings measured by return on assets ratio and this explain the efficiency of investment activity of the financial sector, strength, durability of procedures and controls which led to the emergence of competition and that express form of financial entrepreneurial for the purposes of survival and continuity in the market that also contributed to the increase in gross domestic product and increased consumption and create entrepreneurial opportunities on a strong competitive basis.

4.2.5. Return on assets analysis in the industrial sector

Table 6 showed the results of regression to identify the relationship between independent variables and return on assets in the industrial sector and pointed two entrepreneurial activities output of employment and price in variable E3 is significant at 1%, that is broad money growth were the significant is 0.007 which is less than 0.01. This variable has negative effect on ROA which means that if the broad money growth is increase the ROA will be decrease and vice versa. Public finance in PF2 and PF3 variables are significant at 5%. In model 3, public finance in PF2, and PF3 variables are significant at 5% and have positive effect on ROA, investment expenditures as percentage of GDP and debt to GDP ratio.

Table 6 - Results of ROA in the Industrial Sector

Model	I.V	R	R-Square	F- value	Sig.	Coefficients			
						V	B	T-Value	Sig.
1	E1	0.894a	0.800	19.941	0.007b	E1	-.270b	-.490	.659
	E2					E2	-.116b	-.260	1.000
	E3					E3	-.003	-4.465	.007
2	OG1	0.847a	0.718	2.543	0.232b	OG1	-.620	-1.522	.225
	OG2					OG2	.809	1.655	.197
	OG3					OG3	-.212	-.370	.736
3	PF1	0.822a	0.676	10.455	0.023b	PF1	-.306b	-.970	.387
	PF2					PF2	1.064	3.255	.031
	PF3					PF3	1.769	5.415	.006
4	MBI1	0.729a	0.532	1.136	0.460b	MBI1	.814	1.058	.368
	MBI2					MBI2	-.192	-.261	.811
	MB13					MB13	.148	.345	.753
5	FTBP1	0.889a	0.789	3.750	0.153b	FTBP1	-.756	-2.105	.126
	FTBP2					FTBP2	.067	.234	.830
	FTBP3					FTBP3	1.146b	3.349	.044

We note that the industrial sector is also try to increasing its profits through the activation of entrepreneurial activities, where the government has the support of this sector and increase investment expenditures and this has contributed to increase domestic investment and increased consumption and thus reflected on GDP growth and improving the numbers of public finance specially debt ratio .This economic growth encourages to open new markets and firms based on entrepreneurial concept.

4.2.6. Return on assets analysis in the service sector

Table 7 showed the results of regression to identify the association between independent variables and return on assets in the services sector. Three entrepreneurial activities are significant, activity model two at 1%, but models three and four at 5%. In model 2, Oil and Gas Output measured by OG3 have negative effect on ROA while in model 3 of public finance in PF2 have positive effect on ROA. Finally, the model 4 of money, banking and financial institutions is significant in variables MB1 and MB2.

Table 7 - Results of ROA in the Services Sector

Model	I.V	R	R-Square	F- value	Sig.	Coefficients			
						V	B	T-Value	Sig.
1	E1	0.906a	0.821	4.572	0.122b	E1	.001	1.718	.184
	E2					E2	.000	.666	.553
	E3					E3	-.002	-2.686	.075
2	OG1	0.988a	0.977	41.674	0.006b	OG1	.093	.796	.484
	OG2					OG2	-.122	-.866	.450
	OG3					OG3	-1.016	-6.142	.009
3	PF1	0.869a	0.754	15.361	0.011b	PF1	.146	-.669	.436
	PF2					PF2	.869	3.919	.011
	PF3					PF3	.694	-.207	.208
4	MBI1	0.961a	0.924	12.214	0.035b	MBI1	3.240	3.975	.028
	MBI2					MBI2	-5.232	-5.232	.014
	MB13					MB13	1.896	.154	1.896
5	FTBP1	0.821a	0.675	2.075	0.282b	FTBP1	-.714	-1.600	.208
	FTBP2					FTBP2	-.419	-1.181	.323
	FTBP3					FTBP3	.288	.677	.547

Note that the service sector try to increase profits through the entrepreneurial activities of oil and gas sector to increase production, investment and support this trend in the stability of money market through banks to increase granting of credit and increased attention rate of debt to enhance the gross domestic product to create an entrepreneurial opportunities which in turn contribute up firms in the market and the expansion of production to try to create demand activities to meet the existing supply.

Conclusion

This paper aims to investigate the impact of entrepreneurial financial activities on financial indicators in all sectors listed in Muscat Security Market. The model of study consist of five main financial activities related to entrepreneurial as independent variables include output of employment and prices, oil and gas, public finance, money, banking and financial institutions, foreign trade and balance of payments every activity measured by three variables. The dependent variable is financial indictors consisting of market indicators and profitability indicators. The entire population of this study consists of 115 firms from all sectors out of which a sample of 109 firms was selected with the exception of only 6 firms whose data was not available for the period of 2008-2014. The study used correlation and regression matrix to test the hypotheses. The results show there is a statistical significant impact of entrepreneurial financial activities on market capitalization on the following: output of employment and prices variable of financial sector, foreign trade and balance of payments variable of industrial sector and output of employment and prices, banking and financial institutions and foreign trade and balance of payments variables of service sector. Also, there is a significant impact of entrepreneurial financial activities on return on assets on the following: output of employment and prices variable, money, banking and financial institutions variable and foreign trade and balance of payments variable of financial sector, output of employment and prices variable and public finance variable of industrial sector, oil and gas variable, public finance variable, money, banking and financial institutions variable of service sector. Researchers strongly recommends to adoption of entrepreneurship in the government's planning and long term strategy at the country level and special attention for all economic activities that contribute to the promotion of entrepreneurial concept directly or indirectly through the influence in all economic sectors and this interaction could add effective economic value that will reflect positively on economic growth. Review is also recommended of all the financial polices to promote and increase investment and competitiveness in the market and that can be the reference for the creation of effective entrepreneurial opportunities in the market. Therefore, further research is required. For example, other variables testing financial and market performance in Oman could be done, as this issue has not been researched in depth. Another study area of interest would be exploring the possible reasons explaining the differences between sectors concerning the relationship between entrepreneurial activities and financial and market performance.

References

[1] Acs, Z., Audretsch, P., Braunerhjel, Carlsson, B. (2004). The Knowledge Filter and Entrepreneurship in Endogenous Growth. Discussion paper on Entrepreneurship growth and Public Policy. 0805, Max Planck Institute, Jena.

[2] Antoncic, B. and Hisrich, R. (2004). Corporate Entrepreneurship Contingencies and Organizational Wealth Creation. *Journal of Management Development*, 23(6): 518-550.

[3] Amorós, J., Cristóbal, F., Juan, T. (2011). Quantifying the relationship between entrepreneurship and competitiveness development stages in Latin America, *International Entrepreneurship and Management Journal, 8(3), 249-270*. DOI 10.1007/s11365-010-0165-9

[4] Bloom, N., Eifert, B., Mahajan, A., McKenzie, D. and Roberts, J. (2013). Does Management Matter? Evidence from India, *The Quarterly Journal of Economics*, 128: 1-51.

[5] Brinkman, E. (2000). Research about Success and Fail Factors of Starters, Master Thesis, RUG.

[6] Buera, F., Joseph, P., Yongseok, S. (2015). Entrepreneurship and Financial Frictions: A Macro-Development Perspective, working paper, *Federal Reserve Bank of Chicago*, 1-39.

[7] Carree, M., Van Stel, A., Thurik, R., Wennekers, S. (2002). Economic Development and Business Ownership: An Analysis Using Data of 23 OECD countries in the period 1976–1996. *Small Business Economics*, 19(3): 271–290.

[8] Caselli, F., Gennaioli, N. (2013). Dynastic Management, *Economic Inquiry*, 51: 971- 996.

[9] Carree, M. and Thurik, R. (2003). The Impact of Entrepreneurship on Economic Growth, In D. Audretsch and Z. J. Acs (eds). Handbook of Entrepreneurship Research. Dordrecht: Kluwer-Academic Publishers, 437–471.

[10] Dess, G. and Lumpkin, G. (2005). The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship, *Academy of Management Executive*, 19(1): 147-156.

[11] Dennis, J. and Andrew, W., (2012). Entrepreneurial Impact of Turbulence in Interest Rates, Inflation Rates, and Exchange Rates, *Quarterly Review of Entrepreneurship*, 2 (12): 71-82.

[12] Fox J. (2008). Organizational Entrepreneurship and the Organizational Performance, Linkage in University Extension, USASBE Proceedings - Page 0429, 1-31

[13] Gree, K. (2011). Corporate Entrepreneurship and Value Creation for Stockholders, *Frontiers of Entrepreneurship Research*, 31(17): 582-591.

[14] Hoffmann, M. (2005). Proprietary Income, Entrepreneurial Risk, and the Predictability of U.S. Stock Returns, University of Dortmund & CESifo, 475: 1-41.

[15] Javalgi, R.R.G., Todd, P. R., Johnston, W.J., Granot, E. (2012). Entrepreneurship, muddling through, and Indian Internet-enabled SMEs. *Journal of Business Research*, 65(6): 740-744.

[16] Justo, R., Julio, O., De Castro (2008). Indicators of Entrepreneurship Activity: Some Methodological Contributions, *International Journal Entrepreneurship and Small Business*, 6(4): 604- 621.

[17] Karacaoglu, K., Ali, B., Firat, B. (2013). The Impact of Corporate Entrepreneurship on Firms' Financial Performance: Evidence from Istanbul Stock Exchange Firms, *International Business Research*, 6 (1): 163-175.

[18] Kirzner, I. (1973). *Competition and Entrepreneurship*. University of Chicago Press.

[19] Lundström, A., Stevenson, L. (2005). Entrepreneurship Policy – Theory and Practices, ISEN International Studies in Entrepreneurship, Springer.

[20] Lumpkin, G., Cogliser, C., Schneider, D. (2009). Understanding and Measuring Autonomy: An Entrepreneurial Orientation Perspective. *Entrepreneurship Theory and Practice*, 33(1): 47-69. http://dx.doi.org/10.1111/j.1540-6520.2008.00280.x

[21] Mrabet, A., Ellouze, A. (2014). Entrepreneurship and Economic Growth: Meta -Analysis International Journal of Research in Humanities, *Arts and Literature*, 2 (5): 57-72.

[22] Njeru, A., Gregory, S. and Namusonge, J. (2012). Size as a Determinant of Choice of Source of Entrepreneurial Finance for Small and Medium Sized Enterprises in Thika District, *International Journal of Business and Social Science,* 3 (16): 53-64.

[23] Özdemirci, N., (2014). The Empirical Link between Environmental Conditions, Organizational Culture, Corporate Entrepreneurship and Performance: The Mediating Role of Corporate Entrepreneurship, *International Journal of Business and Social Science,* 5 (2): 264-276.

[24] Rajshekhar, G., Todd, P., Johnston, W. and Granot, E. (2012). Entrepreneurship, Muddling through, and Indian Internet-enabled SMEs, *Journal of Business Research*, 65 (6): 740-744.

[25] Scholmana, G., André, V. and Roy, T. (2014). The Relationship Between Entrepreneurial Activity, the Business Cycle and Economic Openness, Working Paper, reference H201218, Analysis of Entrepreneurship and SMEs www.entrepreneurship-sme.eu

[26] Simsek, Z., Lubatkin, M., Veiga, J., Dino R. (2009). The Role of an Entrepreneurially Alert Information System in Promoting Corporate Entrepreneurship, *Journal of Business Research*, 62: 810-817. http://dx.doi.org/10.1016/j.jbusres.2008.03.002

*** Annul Statistical Bulletin (2014). Central Bank of Oman, Retrieved 16-09-2014, AM 11:00 from http://www.cbo-oman.org/

Relevance of Outcomes Implementation of Specific Economic and Social Analyses of Mortality for Modification of Avoidable Mortality Concepts

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Abstract:

Health disparities in a country can severely affect the overall health situation of its inhabitants. Many programs of the European Union appeal at reducing these disparities as well as disparities between the individual countries. As a result, mortality is the commonly used as a demographic indicator concerning health, as it provides, coupled with morbidity, an overview of significant factors affecting population health. Our study focuses on studying mortality and avoidable mortality using data provided by relevant health institution in the form of anonymized death certificates to assess the overall health status of the Slovak population and the quality of healthcare available. The main aim of this study is to provide an overview of the current situation concerning mortality in individual regions and the comparison of these results with the relevant international avoidable mortality methodology. Thus we attempt to identify the specifics of the local situation, facilitating a future attempt at formulating a region specific methodology, required to form effective health policies to help eliminate the existing disparities, provide a basis for evaluating the effectiveness of various social programs and activities and enabling relevant international comparisons.

1. Introduction

Experts in the field of demography predict that by 2025 a third of Europeans will belong to the 60 or over age group and projections for 2050 suggest a further increase up to 50% (Phellas 2013). Population ageing is a serious consequence of the current demographic trends in our country as well. The ageing index (number of persons aged 65 years or over per one hundred persons under 15 years old) in Slovakia increased from 60.80 to 85.51 between years 2001 and 2012. 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. As global assessment, the level of health in the EU has been constantly improving over the last decade (Zelený and Bencko 2015). If we look closely at the relevant indicators, results from many analyses show an increase in life expectancy in the EU countries, however constantly increasing disparities between and within individual countries are emerging (Spoerri *et al.* 2014, Gavurová and Šoltés 2013, Gavurová and Vagašová 2015). One of the key demographic indicators is mortality. Along with fertility, it constitutes an essential part of demographic reproduction of the population (Hoffmann 2013). Mortality and morbidity provide significant information about the health situation of a country's population. Therefore, the focus of this study will primarily be the analysis of general mortality and its selected causal paths.

2. Background

The characteristic health level indicator in the EU - life expectancy varies considerably between the EU countries, with a clear and growing disparity between national life expectancy and the EU average. Even the "Healthy Life Years" indicator is presenting striking differences between countries (up to 20 years). Similar differences can be found in the case of indicators such as infant mortality, premature mortality, avoidable mortality, as well as in the own perception of overall health (many subjective indicators of health). Life expectancy mainly is influenced by high mortality and morbidity, as a result of cardiovascular diseases (special category within avoidable mortality), cancers, acts of violence, diseases caused by alcoholism, smoking, etc. Countries with shorter life expectancy show a clearly significant presence of underlying risk factors affecting health, such as subpar working and living conditions, increased proportion of smoking and alcohol consumption to name a few. When interpreting these facts on the health status of the population, it is essential to take into account the presence of the social gradient, as it is a significant determinant of health status (Charafeddine *et al.* 2014).

Numerous studies point to the fact that people with lower education, lower occupational class and respectively with lower income, tend to die younger and the presence of most forms of morbidity is typical for them (Charafeddine *et al.* 2014, Valkonen 2001, Meslé and Vallin 2002, Meslé 2004). Differences in life expectancy at birth between the highest

and lowest socio-economic groups are striking: 2-7 years for women, 4-10 years for men. Correlation between the lowest socio-economic groups and increase in infant mortality has also been proven, recognizably relating to the aforementioned living and working conditions (Kinge and Kornstad 2014). This negative phenomenon in the context of lower socio-economic groups is not uncommon, numerous researches found demonstrable causality between people living in disadvantaged areas with high concentration of poverty, unemployment, disabled people, chronically ill, homeless people, the elderly with low pensions and lonely people and a higher rate of morbidity, as well as higher rate of premature mortality (Kalwij 2014, Määttänen and Alho 2014, Seabrook and Avison 2012, Christ *et al.* 2012). This is partly due to access to health care, which affect an individual's health. Although this effect is only secondary, in the case of diseases it is very significant. Therefore, a higher rate of morbidity is has to be interpreted in the context of health care access. Its absence significantly contributes to the higher rate of amenable mortality, and within it particularly to its component – amenable mortality. Health inequalities within a country strongly affect the overall health assessment of the population, along with the deepening health inequalities between EU Member States (Meslé and Vallin 2002, Meslé 2004, Gavurová *et al.* 2013). It is therefore a challenge for the EU countries to seek to mitigate these health inequalities within countries, and thus the inequality between Member States (Della Bella *et al.* 2011). Despite the efforts of many experts a concept of a single health indicator has not yet been created, because of the high heterogeneity of metrics, as well as the complexity of the system. While summary indicators of health are used at the aggregate level, they have a strong global aspect with many interpretations risks. The concept is simple, but it is biased by a high degree of subjectivity.

3. Determinants affecting health and mortality

Despite the availability of numerous scientific studies and relevant evidence from analyses about effects of various determinants of the development of population health, morbidity and mortality, there is still no study that would present a systematic and full-fledged list of factors affecting health and mortality. Death is the end of the process of life, affected by various factors that have a long term effect. In order to realize studies of the effects of factors on morbidity and mortality, it is necessary to simplify the impacts of a number of factors, to realize the selection analysis of risk factors determined by research aims, where in most cases is the effect of selected socio-cultural and bio-social characteristics is analyzed. These factors are often the only available variables, but nevertheless theoretical and empirical considerations should exist, which would spell out the selection of the risk factors and their influence on the development of mortality, as well as limitations of this choice. Since the causes of death are interrelated, it can be hypothesized that removing a single cause can lead to an increase in the effect of the other causes. If we want to aggregate and simplify listings of different effects on mortality, we have to consider these five basic groups of effects:

- Genetic constitution: it is difficult and ethically problematic to say and claim that socio-economic status has a genetic background. However, it can be assumed that genes at least to some extent contribute the socio-economic status of an individual (Adler Nancy 2001, Caselli and Alan 1996, Carreras *et al.* 2010).
- Natural/physical environment: there are physical and chemical environmental factors that affect mortality, e.g., healthy climate, or the existence of healthy foods (e.g., Clarke and Latham 2014, Muller 1992).
- Structural and material conditions: material conditions, such as income and occupation are less biologically determined, than age and gender. Age and gender are considered as parameters of the social structure.
- Behavioural and cultural factors: health behaviour, attitudes, habits, etc., are usually linked to material resources, but it is possible to specify different levels of health disparities of population groups based on them. The most frequently analyzed factors in epidemiology are smoking, alcohol consumption, obesity, and level of physical activity (Winfried and Muller 2002).
- Psychosocial determinants: factors, the effect of which on mortality is difficult to quantify, are gaining on importance, such as relative social status, integration, stress and control. Their explanatory power is often higher than conventional determinants of mortality (smoking, alcohol, obesity, etc. Smith *et al.* 1990, Baraniak and Sheffield 2011, Balsa *et al.* 2014).

Throughout the whole development of thinking about the relationship between socio-economic factors and health and mortality, the direction of the gradient between socio-economic status and health has been discussed (Smith 1999). As is clear from the results of our own scientific studies, higher morbidity rate is determined by the poorer socio-economic conditions (Gavurová and Šoltés 2013, Gavurová *et al.* 2013, Smith 1998). This means that for people with higher socio-economic status healthcare is also more accessible, but at the same time the population with higher socio-economic status has more responsible behaviour to their own health. Socio-economic inequalities in health exist at every age. Even babies are immediately affected by the socio-economic position of their parents. Children of women from lower social classes are often born with lower birth weight and birth defects, which are a consequence of the higher fetal exposure to risk factors, such as smoking, inadequate nutrition, lack of activity. Many research studies have shown a link between the socio-economic status in childhood and adult mortality, where this causality is largely caused by the

transmission of social position from childhood to adulthood. These facts are typical, especially for lower social groups, where the low social status passed on from generation to generation and in which there is no long term prognosis for improving the unfavourable social situation, elimination of social inclusion and health inequalities. These are specific problems of a number of countries and in the case of Slovakia we see a very difficult situation concerning health of inhabitants of marginalized and segregated communities. This issue will be addressed in later chapters, which focus not only on the development of mortality in Slovakia, but also on our own analytical platform in assessing the development of mortality in the context of the drafting methodology of avoidable mortality. We would therefore like to emphasize the significance of a quality analytical platform of morbidity and mortality, not only for state health policy, but also for the national registry (National Centre of Health Information), as well as for international institutions.

4. Methods

Amenable mortality rates were computed from data on deaths by cause, gender and five – year age groups from the World Health Organization (WHO) database. As for Slovakia, National Health Information Center provided data on deaths as recent as 2013. Data on mid-year population for the given age groups and gender in every year were provided by the Statistical Database of the United Nations Economic Commission for Europe. Mortality rates for all conditions were age-standardized according to the European Standard Population to allow international comparison in future research. European Standard Population data by age groups were extracted from the EUROSTAT web site.

The rates of amenable mortality are expressed as age–standardized death rates (ASDR) per 100,000 inhabitants. We applied the method of direct standardization using the European Standard Population. The purpose of the standardisation is to remove any effect of variations in the age structure across countries or over time. ASDR are computed by the following mathematic expression.

$$ASDR = \frac{\sum_x m_x \cdot P_x^*}{\sum_x P_x^*} \tag{1}$$

where:

x - age/sex group 0-4, 5-9, ..., 70-74

m_x - observed mortality rate (deaths per 100,000 persons) in sex/age group

P_x^*- European Standard Population in sex/age group x

Age-standardized death rates by sex were calculated for all causes of death considered amenable and the relevant age groups by direct standardisation to the European standard population.

Mortality data was provided by the National Health Information Center and the Statistical Office of the Slovak Republic in the form of a database containing individual anonymised death certificates for the selected period. These death certificates were then sorted according to individual causes of death (according to ICD-10), country regions (according to ISO 3166-2), year of death, gender and age groups. For each region, the causes of death were sorted by the number of deaths on a yearly basis as well as for the entire studied period as a whole, in order to identify the most prominent causes of death for each studied region.

Analyses and graphical outputs were performed using The R Project for Statistical Computing software, Microsoft Access and Excel and were carried out for the period of 2002-2013 for Slovakia.

Mortality in the concept of avoidable mortality

General rate of mortality´ is currently the least used criterion to measure the health of population. Proportional expression of this indicator (e.g., number of deaths per 1,000 inhabitants) is compromised by the general form of reporting which contains no information about the cause of death. Therefore, analysis and evaluation of the health status of the population should prefer the use of specific mortality rates defined by types of diseases, as well as by the age structure of population (Meszaros and Burcin 2008). Many countries have started to measure avoidable mortality. The concept of avoidable mortality is a result of ´American Working Group on Preventable and Manageable Diseases´ managed by Rutstein (1976).

Harvard researchers, led by Rutstein (1976), were the first who introduced the concept of amenable mortality, distinguishing between causes that are sensitive to the medical interventions and therapeutic procedures (e.g., cancer, diabetes mellitus, etc.), and causes that respond to the activities outside health care (preventable diseases, e.g., liver cirrhosis, lung cancer, and so on). The original list contained up to 80 causes of death, marked as amendable (e.g., diabetes, which can be treated with insulin; appendicitis treatable by surgical procedures; lung cancer, that can be eliminated by reducing smoking, etc.). Subsequently, concept of amenable mortality was developed in the 80s and 90s of the last century by other European research teams (Mackenbach *et al.* 1990, Holland *et al.* 1997, Westerling 2001). Significant modification of the concept was implemented a decade later by the researchers (Nolte and McKee 2008,

Tobias and Yeh 2009, Newey *et al.* 2004), who updated the list of diseases (already containing only 34 causes of death) according to the latest knowledge and technological progress in medical development. In 2004, a research study by a group of experts (Plug *et al.* 2011) providing the results of the comparison of 20 EU countries utilizing the concept of avoidable mortality containing 37 causes of death or groups according to ICD-10th. Avoidable causes of death were divided into three groups:

- diseases treated by health care intervention, respectively by secondary health care (treatable diseases): for example, certain types of cancer, diseases accompanied by high blood pressure, appendicitis, and so on
- diseases avoided by preventable measures (preventable diseases): for example, lung cancer avoided by limited smoking, cirrhosis avoided by restricted alcohol consumption, traffic accidents, etc.
- ischemic heart disease – separate category, since the contribution rate of health care and prevention is not possible to set explicitly.

The world universities dealt with this concept later, e.g., Erasmus Medical University a London School of Hygiene and Tropical Medicine. Project 'Avoidable Mortality in the European Union: towards better Indicators for the Effectiveness of Health Systems' (AMIEHS (Plug *et al.* 2011)) was financed by the EU and has currently been the most recent concept in the methodology of avoidable mortality development. Therefore, we followed this concept in our analytical part.

If we look at the use of the concept of avoidable mortality in Slovakia, in 2008 Mészáros and Burcin (2008) used this concept based on a platform by Newey *et al.* (2004) for the period 1991-2006. Their results showed a decrease in the intensity of avoidable mortality in Slovakia for men by 33% and for women by 34%. During the whole period, the overall intensity of avoidable mortality among women was significantly lower than among men according to all researched categories of causes of death. The development of amenable mortality of men was influenced the most by deaths from cerebrovascular diseases (decrease to 46.3% of the original level), hypertensive disease (2.6-times increase of intensity), colorectal cancer (increase by 5%), and deaths from inflammation of lungs (decrease to 53.7% of the original intensity). Development of avoidable mortality of women was also influenced by deaths from cerebrovascular diseases (decrease to 43% of the original intensity), hypertensive diseases (an increase by 70%), colorectal cancers (an increase by 1.3%), pneumonia (decrease to 43% of the initial intensity) and breast cancer (intensity of mortality was 75.6% in 2006 compared to 1991) in the period 1991-2006. In the case of hypertensive diseases, the growth can be attributed to changes in disease coding. (Mészáros and Burcin 2008)

In Slovakia, there are clear differences in the development of avoidable mortality not only in the pattern of causes of death, but also in the structure by sex and region. The claim is strengthened by the results of the research study of Mészáros and Burcin (2008), which followed the development of avoidable mortality in regions of Slovakia and assessed existing significant regional disparities in health care.

Development of avoidable mortality in the years 2003 - 2007 was due to a decrease in amendable mortality in 1998 - 2002. The intensity of amendable mortality was significantly higher among men in the districts: Bytča, Krupina, Lučenec, Revúca Rožňava, Sobrance, Trebišov and Veľký Krtíš. These districts are also characterized by high general mortality (Mészáros and Burcin 2008). Districts with the lowest avoidable mortality were: Bratislava, Košice, Považie, Prešov and Bardejov. Deeper analyses of presented facts pointed out time and territorial differentiation of avoidable mortality. Significant spatial differences especially between the south-eastern part of Slovakia and other parts of country also highlight the social aspect of health care with regard to the status of the region, presenting opportunities for improving the general mortality in Slovakia. (Šoltés and Gavurová 2014)

In our analyses we used the most recent definition of amendable mortality by Office for National Statistics in UK (2013), which has already explicitly distinguished between amenable and preventable mortality. Amenable mortality is defined as "a death when in the light of medical knowledge and technology at the time of death, all or most deaths from that cause (subject to age limits if appropriate) could avoided through good quality health care." Preventable mortality is defined as: "a death when in the light of understanding of the determinants of health at time of death, all or most deaths from that cause (subject to age limits if appropriate) could be avoided by public health interventions in the broadest sense." As for methodology, we focused on the latest concepts by researchers (Nolte and McKee 2008, Tobias and Yeh 2009) and the concept of the project AMIEHS (Plug *et al.* 2011). We carried out an in-depth study of the amendable mortality development in the years 2002 - 2013, and in addition to development in Slovakia, we implemented the international comparison of amenable mortality in 20 EU countries (Gavurová and Vagašová 2015). In our analysis, we have showed significant structural discrepancies in the most recent reported methodology, as well as the caution that needs to be applied when interpreting the results of international comparisons. It seems that a systematic problem lies in the lack of cooperation in specific research teams solving the given problem. Separate research teams are focused on the issue of their country or selected countries and fail to implant consensual outcomes without the cooperation and participation of a broader range of countries of the given region, or continent. As is apparent from the results of our studies (Gavurová and Šoltés 2013, Gavurová and Vagašová 2015), amenable mortality, despite indicating predictive

advantages, has many methodological limitations arising both from the relevance and comparability of the available resource base, as well as from its structure. Various results for assessed countries were caused by the heterogeneous structure of the lists of the methodologies used. As mentioned in the previous subsection, regional differences in avoidable mortality are dominant in our country, and gender is a very important research and interpretative component of our analysis. In the main methodologies of amenable mortality, gender is not strictly distinguished, what is more, in the calculations the same age limit is considered for both genders. In our analyses, we have demonstrated higher avoidable mortality of men than women regardless of the concept (Gavurová and Šoltés 2013, Gavurová and Vagašová 2015).

We also found that the differences between men and women are much higher in countries with higher avoidable mortality than in countries with a lower value. The disparities between male and female premature mortality are partly determined by the form and availability of health care, so the social aspect and regional disparities come into play. It is very important for international comparisons and interpretations of amenable mortality to also take into account the overall differences in the frequency of causes of deaths in a given year. Significant deviations in avoidable mortality development are often determined by a complementary increase in the number of diseases for a given diagnosis in a region or country, while each country may also have different resources available for the effective treatment of the diagnosis. Creating lists of diagnosis in the concepts of avoidable mortality also includes assessing medical interventions for the prevention of premature deaths. It is a component in which it is difficult to quantify their effectiveness, as well as required skill or medical technology availability in different countries. There are also differences between countries in health expenditure, both in the EU and in the OECD. Availability of financial resources significantly affects the development of medical technology, medical practices, etc. The unavailability of health care, the lack of technological equipment, low quality of health care and other negative factors and their combinations represent important causes of negative values of avoidable mortality which have to be analysed in-depth. In the overall evaluation of positions of countries, it is necessary to assess individual diagnosis, as countries with high levels of amendable mortality generally have a high level of mortality in individual cases. Regarding the significance of this fact, aim of the next part of our article is to clarify the significance of many aspects, affecting the structure of amendable mortality concepts in international methodologies, and thus to point out the need for strong cooperation of countries and their experts in modifying these concepts. Without a detailed overview of the structure of the methodologies and individual testing processes the presented concepts can be in useless in terms of international comparisons, respectively producing misleading conclusions.

5. The analyses of general mortality in Slovakia

Following on the many explored limitations of the amendable mortality methodologies in the previous chapter, we will focus on the analyses of individual causes of death in Slovakia in 2002 - 2013, which will be assessed compared to our previous own research studies of amendable mortality in the interpretation section of paper. Our secondary aim is to highlight the importance of development and procedural aspects in the process of developing the methodologies, as well as a high specificity and individuality of health systems in individual countries.

Table 1 – The most common causes of death by diagnosis in the years 2002-2013

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
1	I25	I25	I25	I25	I25	I25	I25	I25	I25	I25	I25	I25	I25
2	I60_I69	I60_I69	I60_I69	I60_I69	I70	I60_I69	I60_I69	I60_I69	I60_I69	I60_I69	I60_I69	I60_I69	I60_I69
3	I10_I15	I10_I15	I10_I15	I70	I60_I69	I70	I21	I21	I21	I21	I30_I52	I30_I52	I21
4	I70	C33_C34	C33_C34	I10_I15	I10_I15	I21	I30_I52	I30_I52	I30_I52	I30_I52	I21	I21	I30_I52
5	C33_C34	I21	I70	C33_C34	C33_C34	I30_I52	C33_C34	C33_C34	C33_C34	C33_C34	C33_C34	J12_J18	C33_C34
6	I21	I70	I21	J12_J18	J12_J18	C33_C34	k2o	J12_J18	J12_J18	J12_J18	J12_J18	C33_C34	J12_J18
7	k2o	J12_J18	k2o	k2o	k2o	J12_J18	J12_J18	k2o	k2o	k2o	I50	I50	I10_I15
8	J12_J18	k2o	J12_J18	I21	K70_K76	k2o	K70_K76	K70_K76	I50	I50	k2o	K70_K76	I70
9	K70_K76	K70_K76	K70_K76	K70_K76	I21	K70_K76	I50	I50	K70_K76	K70_K76	K70_K76	C18	k2o
10	I30_I52	I30_I52	I30_I52	I30_I52	I30_I52	I10_I15	k11o	k11o	k11o	k11o	C18	k20o	K70_K76

Source: own processing, according to the National Health Information Centre

By assessing the frequency of different causes of death in the analyzed period 2002 - 2013, we have found the following facts. Within the causes of death in Slovakia, there is a dominance of diagnosis I25 - Ischemic heart disease whose frequency is very significant. I60 - I69 - Cerebrovascular diseases are regularly in the second place, except in 2006 (in third place). The third most frequent diagnosis was I21 - Acute myocardial infarction, followed by I30-I52 - Other forms of heart disease and C33-34 - Malignant neoplasm of trachea and Malignant neoplasm of bronchus and lung. Colour highlighting of diagnoses in the matrix (Table 1) shows the extreme changes in the order of the causes of death in some years. If we look at category I10 - I15 - Hypertensive diseases, they occupy leading positions in the frequency of death up until the year 2007, while significant decrease occurs from 2007 onwards. Also, there are distinct variations in the diagnosis I70 - Atherosclerosis. By analysing regions, we have found the extreme deviations of this diagnosis, for example Trnava region (position 6), Prešov region (position 3) of Nitra and Bratislava (position 4) and Banská Bystrica (position 10).

In these regions extreme deviations of causes of death values were observed for this diagnosis, while the trend was also similar, extremely increasing between 2004 and 2006, and strongly decreasing from 2006 to 2008. Since 2008, the development of this cause of death was regular, or with minimal variation. As mentioned above, the extreme deviations in this cause of death - increase by 70% were due to changes in the coding of diseases. Groups of diagnoses C33 - C34 recorded nearly regular development in the reporting period, as well as K70 - K76. A significant increase from the long term 10th position for the period 2002 - 2006 was recorded in diagnosis I30-I52 - Other forms of heart disease, which was one of the five most numerous diagnoses from the year 2007 and then belonged to the three most common diagnoses for the last two analyzed years. Individual frequencies are given in Table 2. These facts require a more detailed analysis of the evolution of mortality in the eight regions of Slovakia, where different development determines the results of the general level of mortality development.

Table 2 – The most countable causes of death in the Slovak regions for the period 2002 – 2013

Region/ Rank	Žilina	Trnava	Trenčín	Prešov	Nitra	Košice	Bratislava	Banská Bystrica
1	I25	I25	I25	I25	I25	I25	I25	I25
2	I60-I69	I60–I69	I60–I69	I60–I69	I60–I69	I60–I69	I60–I69	I60–I69
3	I30 - 52	I21	I21	I70	I21	I21	I21	I21
4	C33–C34	C33–C34	I30-I52	I30-I52	I70	C33-C34	I70	C33-C34
5	I21	J12–J18	C33–C34	I10-I15	C33–C34	I30-I52	J12-J18	I10-I15
6	I50	I70	I10-I15	I21	I10-I15	I10-I15	C33-C34	I30-I52
7	J12 – J18	I30 - I52	J12-J18	C33-C34	J12-J18	J12-J18	I30-I52	J12-J18
8	K70 – K76	K20	K20	J12-J18	K70-K76	K70-K76	K70-K76	K70-K76
9	K20	I10 – I15	K70-K76	K20	K20	K20	K20	K20
10	I70	K70 – K76	I26-I28	K70-K76	I30-I52	K20o	I10-I15	I70

Source: own processing, according to the National Health Information Centre

As is shown by the analysis of the regional mortality development, in all regions of Slovakia the leading diagnoses are I25 - Ischemic heart disease, and I60-I69 - Cerebrovascular disease. The third most numerous diagnose in six regions of Slovakia is I21 - Acute myocardial infarction. Among the more common diagnoses we can also include the C33-34 - Malignant neoplasm of trachea and malignant neoplasm of bronchus and lung, and I30-I52 - Other forms of heart disease in many regions, whose incidence is significantly heterogeneous in the regions of Slovakia (e.g., Žilina Region - third position, Nitra Region - tenth position). A similar development is also recorded in the case of group I10-I15 - Hypertensive diseases that are for examples in Žilina region on 12th position, while in regions of Slovakia are on 5th to 6th position. Relatively the same positions can be seen for the diagnosis K20 - Oesophagitis (8-9th position, as well as the diagnosis of K70-K76 - Liver Disease (8-10th position) in all regions. In these evaluations, it is necessary to further analyze mortality development by gender and age, in the context of lifestyles analysis of population in a given region considering the risk factors affecting this negative phenomenon, and so on. For example, in particular the K70-K76 diagnosis is more frequently the cause of death among men than women, while for younger aged it is more likely to be associated with infectious liver disease, and for older aged with drug-induced liver damage. As for gender, there is an apparent association with a specific group of liver diseases, e.g., autoimmune hepatitis for younger women, while primary biliary cirrhosis occurs more frequently in mature and old age, primary sclerosing cholangitis can be recorded among young men. An important determining factor is also obesity and improper lifestyle (irregular diet, stress and lack of exercise often resulted in non-alcoholic fatty liver disease) (Kužela 2013). On the whole, in Slovakia the most numerous causes of death are in particular cardiovascular diseases (ICD-10, Chapter IX) and tumours (ICD-10, Chapter

II), dominated by C33- C34 - Malignant neoplasm of trachea and malignant neoplasm of bronchus and lung and C18 - Malignant neoplasm of colon which recorded noticeable increase in the last two years. Malignant neoplasm of colon hold the 12th position in the years 2002-2007, with an annual growth since 2008. If we look at the most numerous cause of death in all the analyzed years and regions, I25 - Ischemic heart disease represents the first position. More than three-quarters of deaths caused by this disease are found in people older than 65 years, while the majority of population suffering from this disease has age exceeding 65 years. Attention should be paid to risk factors that are both uncontrollable (genetic factors, age, sex), as well as controllable (high LDL - cholesterol, hypertriglyceridemia, low proportion of HDL cholesterol, smoking, diabetes mellitus, obesity, inactivity, psychological stress, etc.). Another important cause of death in the explored years on a national level as well as within each region is group I60-I69 - Cerebrovascular disease (CVD). They belong to a group of diseases of the circulatory system and are the leading cause of hospitalization of adult population in Slovakia. The incidence of acute CVD is difficult to determine, but increases with age, and its occurrence has increased in younger age groups (even under 45 years of age) in recent years (Brozman 2006). If we look at the results of our analyses of the amenable mortality in the context of the three available methodologies (Figure 1), according to all three international methodologies most people in Slovakia died of ischemic heart disease, cerebrovascular diseases and colorectal cancer.
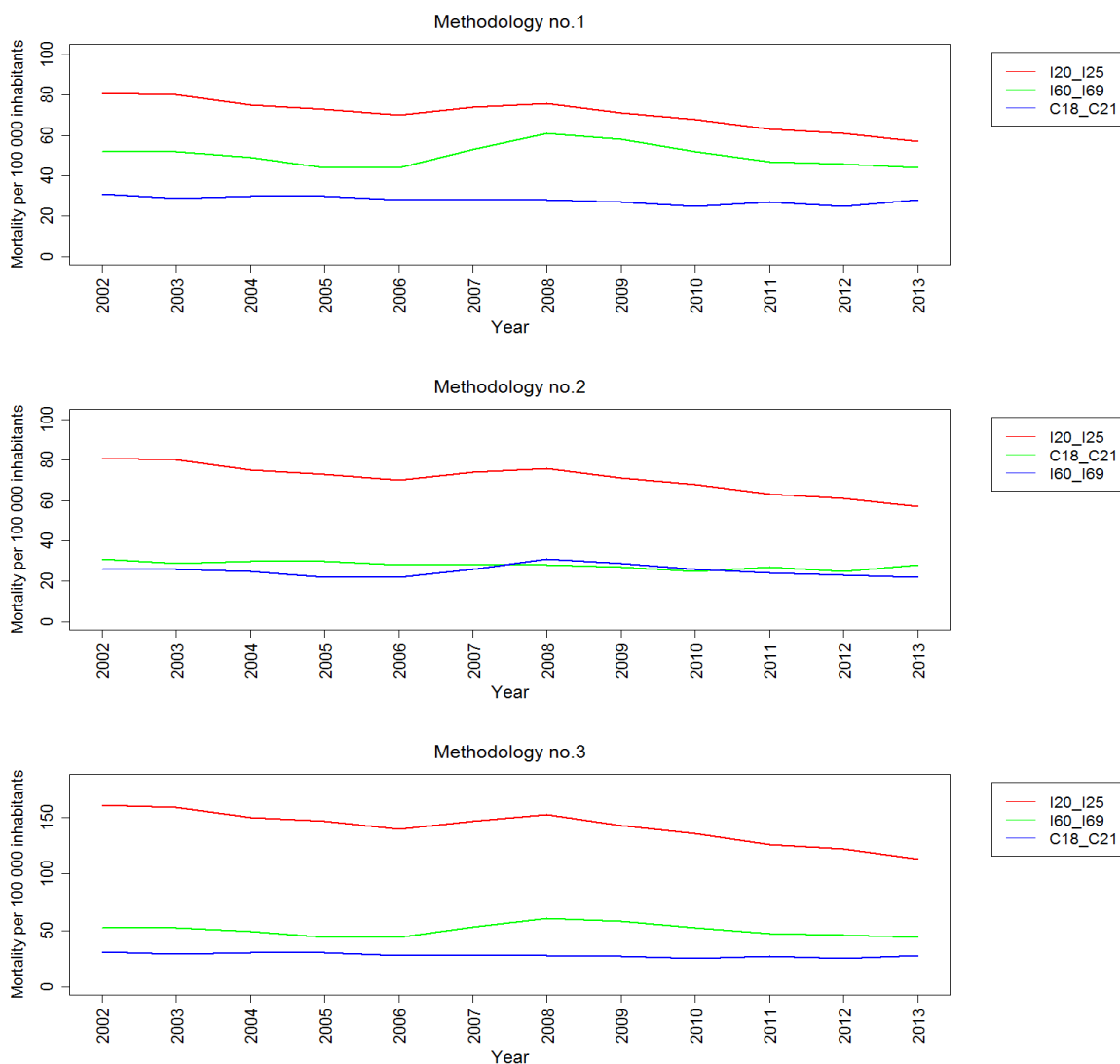
Source: own processing

Figure 1 - The highest rate of mortality in Slovakia and its development according to three international methodologies

Assessing the development of amenable mortality in the three major causes of death, we can state a slight decline, except for the Colorectal cancer diagnosis. However, there are differences among methodologies, for example cerebrovascular disease in the second methodology shows twice lower values comparing to the first methodology. It is because the calculations are counted only for 50% of the dead, while in the first methodology, all deaths caused by this diagnosis have been taken into account. Similarly, in the case of ischemic heart disease in the third methodology

presents double the values compared to the second and first methodology. The first and second methodology included only 50% of the deaths, while the third methodology for this diagnosis counts with all the dead. Diagnosis C18 - Malignant neoplasm of colon appears only in the last two years in our analysis of general mortality, in the tenth and subsequently in the ninth place.

The dominant diagnoses with the most numerous deaths in the whole of Slovakia are mainly I21, I30 - I52, C33 - C34, I12 - I18 (Table 1). Figure 2 reflects regional differences in the three major causes of death in amenable mortality. The highest number of deaths due to the I20-I25 diagnosis is presented by the Banská Bystrica Region, and in the case of the I60-I69 diagnosis by the Trenčín Region. Considering these two diagnoses there is an evident decline (except the Žilina Region in the diagnosis I20-I25) specifically in 2006 for both groups of diagnosis, which can be caused by a pre-announced change in the methodology of reporting causes of death. In diagnosis C18-C21 this phenomenon is not observable.

In view of the above presented facts, when shaping strategic frameworks in the health care system, prevention programs, operational plans, reports, as well as a variety of specifically oriented international comparison, the use of results from available international methodologies can be very questionable when assessing the quality and effectiveness of health care system of the country.
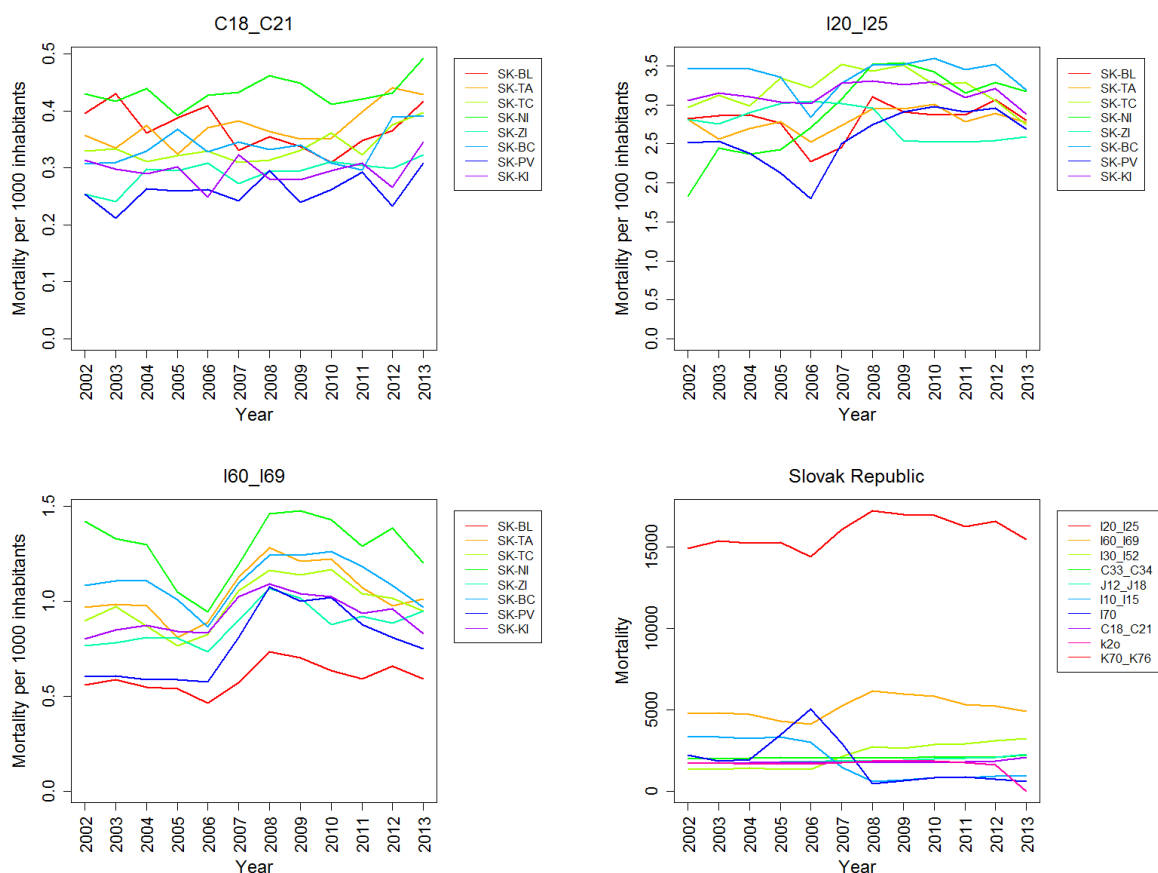
Source: own processing

Figure 2 - Regional differences in three major causes of death in amenable mortality

If we look at the structure of the most recent methodology - AMIEHS (Plug *et al.* 2011), in assessing the presence of 10 most numerous causes of death in Slovakia from 2002 to 2013, we can see their representation is very low (see Table 3). The reason is that the latest methodology of avoidable mortality AMIEHS contains a considerable reduction of the causes of death resulting from the specifics of its creation process. Development of the methodologies is clear. Thanks to the effectiveness and quality of health care, development of medical technology, improving the healing and prevention processes and so on, many diseases are being treatable, while differences between countries can be very significant. The original concept by Rutstein (1976) contained 80 causes of death. Other concepts were limited: Newey *et al.* (2004) - a list of 37 causes, Nolte and McKee (2008) and Tobias and Yeh (2009) - a list of 34 causes. Consequently, the experts developing the methodology AMIEHS in 2011 focused selection of diagnoses according to two basic criteria:

▪ Mortality from causes - diagnosis, which declined by over 30% in England and Wales since 1970.
▪ Significant health innovation with proven effectiveness, introduced after 1970.

Table 3 – Diagnoses in the concept AMIEHS

CAUSE OF DEATH CONSIDERED AMENABLE TO HEALTH CARE	AMIEHS [50] ICD-10, (3. CONCEPT)	POSITION IN THE TOP 10 CAUSES OF DEATH IN SR
Tuberculosis	Non-classified	-
Selected invasive infections:	Non-classified	-
HIV	B20-24	-
Colorectal cancer	C18-21	10
Malignant neoplasms of skin	Non-classified	-
Breast cancer (females only)	C50	-
Cervical cancer	C53	-
Uterine cancer	Non-classified	-
Testis cancer	C62	-
Bladder cancer	Non-classified	-
Thyroid cancer	Non-classified	-
Hodgkin's disease	C81	-
Leukaemia	C91	-
Benign tumours	Non-classified	-
Diabetes (type 2)	Non-classified	
Ischemic heart disease	I20-25	1
Rheumatic & other valvular heart disease	I00-09	-
Hypertensive heart disease	I10-13	3-4
Heart failure	I50-51	3-10
Cerebrovascular disease	I60-69	2-3
Respiratory diseases (excl. pneumonia, influenza) (age 1-14)	Non-classified	
Chronic obstructive pulmonary disease	Non-classified	-
Asthma	Non-classified	-
Peptic ulcer disease	K25-26	K20
Nephritis & nephrosis	N17-N19	-
Obstructive uropathy & prostatic hyperplasia	Non-classified	-
Misadventures to patients during surgical & medical care	Non-classified	-
Maternal deaths	Non-classified	-
Perinatal deaths, all causes (excl. stillbirths)	P00-96	-
Congenital malformations	Q20-24	-
Thyroid disorders	Non-classified	-
Epilepsy	Non-classified	-

Source: own processing according to AMIEHS (Plug *et al.* 2011)

From the initial list of all cause, those were selected that had one or more deaths in 2000. Subsequently, they selected those that presented a reduction in mortality rates from 1970 to 2000 by 30% or more. Strength of evidence about intervention effectiveness concerning the decrease in mortality by 30% or more was evaluated on a 4-point scale. Benefits of health care concerning the decline of mortality by 30% or more were evaluated at 3-point scale. For the resulting number of 16 diagnoses evidence of the importance of health interventions (drugs, surgery, etc.) was available, applied after 1970 on the effectiveness of health care system (Newey *et al.* 2004). It is questionable to what extent the 16 selected causes of death in the latest concept reflect the actual condition of the mortality situation in each country. Therefore, separate regional analyses are necessary and implementation of expert evaluation not only at national but also at international level is also required.

6. Discussion

Detecting the level of amendable mortality, and the included treatable mortality, provides space for assessing the quality of health care. By linking the results of amenable mortality with success of the diagnosis treatment and active preventive measures may results in a useful tool for the creation of a strategy of development and improvement of the health care system, not only at national but also at regional level. The regional level represents a basic platform for setting causal relationships in the development of mortality, as well as the impact of socio-economic status on morbidity and mortality. The issue of regional health inequalities must be seen also in terms of the structure of the population. Slovakia is one of the countries that significantly suffer from health inequalities relating to the particular minority groups of the population living in areas of concentrated poverty. These areas are largely represented by Roma communities, where the measurement of health represents a major problem in Slovakia. According to the results of available studies,

an alarming trend of deteriorating state of health of the Roma population is recorded (Popper *et al.* 2007; Popper *et al.* 2009; Matlovičová *et al.* 2012). According to the Atlas of Roma Communities (Ministry of the Interior of the Slovak Republic 2014), the number of Roma living in Slovakia is 402,840, who present 7.45% of Slovak population (about 80,000 more than in 2004). 46.5% of Slovak Roma (187,000) lives integrated with the majority population and 17% (69,000) in segregated areas (separate settlements). In our research studies based on our own primary research in Roma settlements (Gavurová *et al.* 2014, Šoltés *et al.* 2014) we have showed significant differentiation of Roma mortality in the analyzed districts of Slovakia. Reasons for significant differentiation of Roma mortality arise from differences of lifestyle within the communities, the impact of bio-social and socio-cultural determinants of health, the availability of health care, to health behaviour, and many other factors (Rusnáková 2011, Rusnáková and Pollák 2012, Rusnáková and Rochovská 2014). Roma settlements are characterized by a high degree of individuality while significant differences are evident not only between settlements, but also between families in within the settlement. The decisive factor is the degree of integration of the Roma. Residents of non-integrated Roma communities have a life expectancy shorter by almost a third. The average age at death, about 40 years, proves fatal impact of environmental, social and economic environment on health, as well as on the health of their offspring. Although we abstract from the detailed analysis of the causal link of morbidity with mortality (morbidity almost always precedes mortality), high intensity and diverse nature of its impact on the mortality of the population is undeniable in settlements. For this reason, the selection of individual factors of impact of morbidity on mortality of the population in Roma settlements is impossible, and any partial analysis could produce misleading and erroneous interpretations. Therefore, it is necessary to analyze this issue solely in terms of each individual settlements and communities within them, including the causal links between several related factors. These facts point to the logical necessity of considering all social aspects when assessing developments in mortality with respect to the characteristics of individual regions. Our health care system urgently needs to create its own concept of avoidable mortality (amenable and preventable) regarding deaths of the general Slovak population, as well as of the population of segregated and marginalized communities, which are significantly influenced by the issue of health inequalities. This separation of the two lines of concepts has its scientific merits - this enables to highlight the strict difference of structure of avoidable mortality in the population of segregated and marginalized communities compared to the overall population of Slovakia. If we look at the international concepts of avoidable mortality, which are used by the OECD (Project AMIEHS (Plug *et al.* 2011)), respectively the international concept of authors Nolte and McKee (2008) and Tobias and Yeh (2009), various specifications arise not only of structural and methodological nature, but also many limitations arising from the conditions of the concept authors´ country. For example, only 50% of deaths from ischemic heart disease are regarded as treatable by the authors of the concept (Gay *et al.* 2001), the age limit of premature death in the concepts is set at 75 years for both genders, what represents the average life expectancy in developed countries (from our analysis, the average life expectancy of the Roma population according to the degree of integration is much less, influenced by differentiated structure of morbidity and mortality). Therefore, in our complementary scientific examination, we have focused on the comparison of the international methodologies and specifying differences which allows us to understand the process of including and excluding diagnoses in the list of the avoidable mortality concept. The urgent need of creating our own concept of avoidable mortality arises from the analysis. Creating of your own concept of avoidable mortality would accurately reflect the actual condition of the causes of death in Slovakia in the detailed structure according to ICD-10, and it would help the discovery of specific determinants affecting the development. For some selected causes of death, authors Nolte and McKee (2008) respect the lower age limit (e.g., diabetes mellitus under the age of 50 years, while avoidability of deaths in old age for this disease remains controversial; infectious intestinal disease, whooping cough, measles, and children's respiratory diseases under 15 years and leukemia under 45 years). Latest methodology of avoidable mortality (AMIEHS (Plug *et al.* 2011)) has completely excluded the whole group of infectious diseases from the list of causes of death, which include tuberculosis and a large group of selected invasive infections. These diseases are however still dominant in areas of concentrated poverty. It is related to the lack of prevention, underestimating the clinical signs of disease, inappropriate health behaviour and to living in unacceptable conditions for health. Excluded causes of death that are significant in Slovakia (based on the outputs of specific analyses) may distort the interpretation of the actual development of avoidable mortality. Therefore, it is appropriate to support the results of comparisons of international methodologies of amenable mortality by performing complementary analyses of diagnoses and mortality in Slovakia (Soltes and Gavurova 2015). These facts very closely relate to the specifics of the health care systems of European countries. Each country has its own health policy, organization of the health care system, system of public and private health insurance, access to health care provision. This is related to the resource allocation in health care system, as well as the form and cost of interventions, and supported research and development.

Conclusion

EU has been constantly stressing the urgency of addressing the issues focused on reducing inequalities in health area in the recent decades. The issue is too complex and the current status indicates many system failures. Also numerous EU programs appeal to the necessity of solving problems focused on reducing inequalities in the health area. Elimination of disparities requires coordinated actions between the public health care system and other policies that affect health, including social protection, education and environment. With the results of our analyses we would like to point out that the informative value of important indicator - the mortality rate, is being increased by taking into account demographic characteristics and indicators of use of health care services, as declared in major foreign scientific studies. The significance of mortality analyses lies also in the causal evaluation of morbidity development, because morbidity can be connected to effective prevention programs. Relevant information for these programs can be supplied by multidimensional analyses of mortality. The economic burden of care for patients with diagnoses that have the highest rates of amenable mortality is huge, annually representing several tens of billions of dollars (e.g., in the US treatment of patients with CVD). There is still an absence of quality economic analyses of treatment and after-care of patients with those diagnoses in the case of Slovakia. Many negative social consequences are incalculable, especially the problems of families with immobilized disabled. Many developed countries declare in their scientific studies significant effectiveness of investments in the prevention of acute health care, improving population health compared to the costs of treating insufficiently or late-treated population. As such, countries face a big challenge to find a way of using various policy tools to increase the effectiveness of their health care system while eliminating health inequalities. Therefore, it is necessary to constantly reflect on the analysis of the current state of development of mortality in a global, European, as well as national context and to evaluate the efficiency and effectiveness of all supporting activities of our society.

Acknowledgements

References

[1] Adler, Nancy, E.A. (2001). Consideration of Multiple Pathways from Socioeconomic Status to Health. Income, Socioeconomic Status and Health: Exploring the Relationship. James A. Auerbach and Barbara K. Krimgold (eds). Washington, DC, National Policy Association *et al.*, pp. 56–66.

[2] Balsa, A.I. *et al.* (2014). Relative Deprivation and Risky Behaviors, *Journal of Human Resources*, 49(2):446-471. http://dx.doi.org/10.1353/jhr.2014.0011

[3] Baraniak, A. and Sheffield, D. (2011). The efficacy of psychological based interventions to improve anxiety, depression and quality of life, in COPD: A systematic review and meta-analysis. *Patient Education and Counseling*, 83(1): 29-36. http://dx.doi.org/10.1016/j.pec.2010.04.010

[4] Brozman, M. (2006). Úvod do problematiky cievnych mozgových ochorení, *Via practica,* 5: 222 – 228.

[5] Carreras, M. *et al.* (2010). Estimates of patient costs related with population morbidity: can indirect costs affect the results? *European Journal of Health Economics*, 12(4): 289-95. http://dx.doi.org/10.1007/s10198-010-0227-5

[6] Caselli, G., and Lopez, A.D. (1996). Health and Mortality among Elderly Populations, *International Studies in Demography*, Oxford: Clarendon Press, pp. 87–111.

[7] Clarke, P., Latham, K. (2014). Life course health and socioeconomic profiles of Americans aging with disability, *Disability and Health Journal*, 7(1): 15-23. http://dx.doi.org/10.1016/j.dhjo.2013.08.008

[8] Della Bella S., *et al.* (2011). A Comparative Analysis of Inequality in Health across Europe, *Sociological Research Online*, 16(4): 7-18. http://dx.doi.org/10.5153/sro.2492

[9] Gavurová, B. and Šoltés, V. (2013). Slovak Healthcare Effectiveness - Analysis of Comparative Aspects and Identification of Development Opportunities, Košice: Technical University of Košice, Slovakia.

[10] Gavurová, B., Šoltés, V., Kafková, K., Černý, Ľ. (2013). Vybrané aspekty efektívnosti slovenského zdravotníctva. Jednodňová zdravotná starostlivosť a jej rozvoj v podmienkach Slovenskej republiky. Košice: EkF TUKE.

[11] Gavurová, B., Šoltés, V. and Šoltés, M. (2014). Meranie zdravia a zdravotných rizík vo vybraných rómskych osadách na Slovensku – fakty a reflexive, in: Nerovnosť a chudoba v Európskej únii a na Slovensku 2: Zborník statí z 2. medzinárodnej vedeckej konferencie: Košice, 22.-24 Októbra 2014. Košice: TU, pp. 188-201.

[12] Gay, J.G. *et al.* (2011). Mortality Amenable to Health Care in 31 OECD Countries: Estimates and Methodological Issues, OECD Health Working Papers, No. 55, OECD Publishing. http://dx.doi.org/10.1787/5kgj35f9f8s2-en

[13] Gavurová, B., Vagašová, T. (2015). The Significance of Amenable Mortality Quantification for Financing the Health System in Slovakia, *Procedia Economics and Finance*, 32: 77-86. http://dx.doi.org/10.1016/s2212-5671(15)01367-2

[14] Hoffmann, R. (2013). Socioeconomic Differences in Old Age Mortality, The Springer Series on Demographic Methods and Population Analysis, Springer.

[15] Holland, W. *et al.* (1997). European Community atlas of 'avoidable death' 1985-89. Oxford: Oxford University Press.

[16] Charafeddine, R, *et al.* (2014) Using mortality follow-up of surveys to estimate social inequalities in healthy life years, *Population Health Metrics*, 12(1): 13. http://dx.doi.org/10.1186/1478-7954-12-13

[17] Christ, S.L. *et al.* (2012). The effects of a psychosocial dimension of socioeconomic position on survival: occupational prestige and mortality among US working adults, *Sociology of Health & Illness*, 34(7): 1103-17. http://dx.doi.org/10.1111/j.1467-9566.2012.01456.x

[18] Kalwij, A.S. (2014). An empirical analysis of the importance of controlling for unobserved heterogeneity when estimating the income-mortality gradient, *Demografic Research*, 31(30): 913-39. http://dx.doi.org/10.4054/demres.2014.31.30

[19] Kinge, J. M. and Kornstad, T. (2014). Assimilation effects on infant mortality among immigrants in Norway: Does maternal source country matter? *Demografic Research*, 31: 779-812. http://dx.doi.org/10.4054/demres.2014.31.26

[20] Kužela, L. (2013). Choroby pečene. Univerzita Komenského. https://www.fmed.uniba.sk/fileadmin/user_upload/editors/akademicka_kniznica/dokumenty_PDF/Elektronicke_knihy_LF/Choroby_pecene.pdf.

[21] Määttänen, N. and Alho, J. (2014). Response to updated mortality forecasts in life cycle saving and labor supply, *International Journal of Forecasting*, 30(4): 1120-1127. http://dx.doi.org/10.1016/j.ijforecast.2014.02.010

[22] Mackenbach, J.P., Bouvier-Colle, M.H. and Jougla, E. Avoidable" mortality and health services: a review of aggregate data studies, *Journal of Epidemiology and Community Health*, 44(2): 106-11. http://dx.doi.org/10.1136/jech.44.2.106

[23] Matlovičová, K., Matlovič, R., Mušinka, A. and Židová, A. (2012). The Roma population in Slovakia. Basic characteristics of the Roma population with emphasis on the spatial aspects of its differentiation In: Penczes, J., Radics, Z. (Eds.): Roma popuation on the peripheries of the Visegrad countries. Spatial trends and social challenges. Debrecen; pp. 77-104.

[24] Mészáros, J. and Burcin, B. (2008). Vývoj odvrátiteľnej úmrtnosti na Slovensku. *Slovenská štatistika a demografia*, 18(2-3): 24-39.

[25] Meslé, F. and Vallin, J. (2002). Mortality in Europe: the Divergence between East and West. Population, 57(1): 157–197. http://dx.doi.org/10.3917/pope.201.0157

[26] Meslé, F. (2004). Mortality in Central and Eastern Europe: long-term trends and recent upturns, *Demographic research Special Collection,* pp. 45–70. http://dx.doi.org/10.4054/DemRes.2004.S2.3

[27] Muller, H.P. (1992) Sozialstruktur und Lebensstile. Der neuere theoretische Diskurs uber soziale Ungleichheit. Frankfurt am Main: Suhrkamp.

[28] Newey, C.E., Nolte, M., McKee, M. and Mossialos, E. (2004). Avoidable Mortality in the Enlarged European Union. Paris: Institut des Sciences de la Santé.

[29] Nolte, E., McKee, M. (2008). Measuring the Health of Nations: Updating an Earlier Analysis, *Health Affairs*, 27(1): 58-71. http://dx.doi.org/10.1377/hlthaff.27.1.58

[30] Phellas, C. (2013). Aging in European Societies Healthy Aging in Europe. Springer.

[31] Plug, I., Hoffman, R. and Mackenbach, J. (2011). AMIEHS. Avoidable mortality in the European Union: Towards better indicators for the effectiveness of health systems, EU Public Health Program 2007206.

[32] Popper, M., Szeghy, P., Šarkozy, Š. (2007) Zdravotná starostlivosť v sociálne vylúčených rómskych komunitách. Madrid: Fundación Secretariado Gitano (FSG), Ahijones, s/n – 28018; 2007.

[33] Popper, *et al.* (2009) Rómska populácia a zdravie: Analýza situácie na Slovensku. 1. vyd. Partners for Democratic Change Slovakia.

[34] Rusnáková, J. (2011) Voľby životných stratégií obyvateľov chudobných a sociálne vylúčených rómskych osídlení, Životné stratégie obyvateľov rómskych osídlení. Nitra: UKF, 2011, pp. 41-95.

[35] Rusnáková, J., Rochovská, A. 2014. Segregácia obyvateľov marginalizovaných rómskych komunít, chudoba a znevýhodnenia súvisiace s priestorovým vylúčením, *Geographia Cassoviensis*, 8(2): 162-172.

[36] Rusnáková, J., Pollák, P. (2012) Sociálna práca v marginalizovaných rómskych komunitách. In: Metódy sociálnej práce v praxi. Bratislava: Vysoká škola zdravotníctva a sociálnej práce sv. Alžbety, pp. 250-285.

[37] Rutstein, D.D. *et al.* (1976). Measuring the quality of medical care, *New England Journal of Medicine*, 294 (11): 582-588.

[38] Seabrook, J. A., Avison, W.R. (2012). Socioeconomic Status and Cumulative Disadvantage Processes across the Life Course: Implications for Health Outcomes, *Canadian of Sociology-Revue Canadienne de Sociologie*, 49 (1): 50-68. http://dx.doi.org/10.1111/j.1755-618x.2011.01280.x

[39] Smith, J.P. (1998). Socioeconomic Status and Health 98–07. Labor & Population Reprint Series. 1998.

[40] Smith, J.P. (1999). Healthy Bodies and Thick Wallets: the Dual Relation between Health and Economic Status, *Journal of Economic Perspectives*, 13(2):145–66.

[41] Smith, G. D., Shipley, M.J. and Rose, G. (1990). Magnitude and Causes of Socioeconomic Differentials in Mortality: Further Evidence from the Whitehall Study, *Journal of Epidemiology and Community Health*, 44 (4): 265–70.

[42] Spoerri, A. *et al.* (2014). Individual and spousal education, mortality and life expectancy in Switzerland: a national cohort study, *Journal of Epidemiology and Community Health*, 68 (9): 804-10. http://dx.doi.org/10.1136/jech-2013-203714

[43] Šoltés, V., Gavurová, B. (2014). The Functionality Comparison of the Health Care Systems by the Analytical Hierarchy Process Method, *E+M Ekonomie a Management*, 17(3):100-118. http://dx.doi.org/10.15240/tul/ 001/2014-3-009

[44] Soltes, M., Gavurova, B. (2015). Quantification and comparison of avoidable mortality – causal relations and modification of concepts, *Technological and Economic Development of Economy*, 21(6): 917-938. http://dx.doi.org/10.3846/20294913.2015.1106421

[45] Šoltés, V., Šoltés, M. and Gavurová, B. (2014=. Vývoj mortality v regiónoch s vysokou koncentráciou rómskeho obyvateľstva. In: Nerovnosť a chudoba v Európskej únii a na Slovensku 2: Zborník statí z 2. medzinárodnej vedeckej konferencie: Košice, 22.-24. Októbra 2014, TU, pp. 202-214.

[46] Tobias, M. and Yeh, L. (2009). How much does health care contribute to health gain and to health inequality? Trends in amenable mortality in New Zealand 1981-2004, *Australia and NZ Public Health*, 33(1):70-78. http://dx.doi.org/10.1111/j.1753-6405.2009.00342.x

[47] Valkonen, T. (2001). Life Expectancy and Adult Mortality in Industrialized Countries, *International Encyclopedia of the Social & Behavioral Sciences*, 8822–27. http://dx.doi.org/10.1016/b0-08-043076-7/02124-0

[48] Winfried, H. and Muller, H. (2002). Regionale Mortalität in Rheinland-Pfalz unter besonderer Berucksichtigung soziostruktureller Indikatoren. Regionale Sterblichkeit in Deutschland. Augsburg, Gottingen: WiSoMed.

[49] Westerling, R. (2001). Commentary: Evaluating avoidable mortality in developing countries – an important issue for public health. *International Journal of Epidemiology,* 30(5): 973-75. http://dx.doi.org/10.1093/ije/30.5.973

[50] Zelený, T., Bencko, V. (2015). Healthcare System Financing and Profits: All That Glitters is Not Gold, *Central European Journal of Public Health*, 23(1): 3-7.

Peculiarities of Improving Internal Financial Control in the Russian Corporations

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Abstract

The problem of the need for internal financial control is common to businesses of all types and volumes, but is especially acute in corporations due to the fact that in our time they were able to achieve such a scale in which the collapse of a corporate system may have an impact on the economy of many countries. In addition, at the moment the relevance of the chosen topic is determined by the transition to the reporting tool that is new for Russian economic agents – International Financial Reporting Standards (IFRS), as well as Russia's accession to the World Trade Organization (WTO) and intensification of globalization processes.

Together, this makes it possible to integrate the Russian economy into the new systems, including international experience in their practice, taking into account national specificities. However, scientific research pays not enough attention to the disclosure of the principles and mechanisms of internal corporate financial control in a market economy, which is capable of operating in the management system of Russian corporations. In addition, the lack of systematization of existing knowledge and methodological approaches is observed, which determined the choice of the topic, goal and objectives of the study, its logic and structure. The article examines the methods and elements of financial control, financial fraud and ways to identify and prevent it. The article also discloses principles of financial control systems and proposes measures aimed at creating an effective system of internal financial control in the Russian corporations.

Keywords: internal financial control, corporation, financial fraud, effective management system.

JEL Classification: M.

1. Introduction

Level of bookkeeping, fiscal and tax accounting established in the country plays one of the most important roles in ensuring the quality of financial control. Accounting documentation can be called the main object of financial control. Level of organization and types of control, as well as its forms and methods, depend on how successful and effective the financial control will be. But ignoring evidence of the need for an adequate system of corporate management, it is often created in the companies only in cases where the interests of the shareholders disagree (thus creating a mechanism that allows each shareholder to track the real state of affairs in the corporation and leaves no possibility of misinformation of the interested persons with false data), or when the organization needs to attract investment. The key to success of any business is access to investment capital, but investors are unlikely to invest heavily in the corporation that lacks an effective management system and control over its activities. Before making an investment decision, any investor requires to provide for review the complete information about the state of affairs in the company. (Pike and Neale 2006)

Before increasing their contributions to the Russian companies, domestic and foreign investors raise the question of substantial improvement of corporate management. They are ready to buy stocks in the companies that are able to create an effective corporate management system, understandable to investors, because it is seen as a competitive advantage in business, as the company can establish clear guidelines for the development, and a sense of responsibility is formed through the entire management chain. There are always two equally important objectives in the course of the financial activities of any corporation (Brealey 2008). It is necessary to attract resources or have sufficient own funds to carry out economic activities. It is necessary to properly allocate resources received.

Various experts, when evaluating Russian companies, make forecasts that companies can raise their share price by at least 20% exclusively by improving the system of corporate management. In other words, an effective and well thought-out system makes it possible not only to use the funds of existing shareholders with maximum efficiency, but also to attract new investors and resources they possess (Adizes 2012).

Over the past decade, the importance of daily economics control (the one aimed at operations within the corporation from individual entrepreneurs and owners) has been objectively increasing in the Russian Federation. But despite such a significant change in the system of financial control, it can be concluded that, unfortunately, a common understanding of the financial control system is yet to be developed, and its basic principles of construction are yet to be formed. There are no common organizational and methodological foundations of control or common concept of its reforming in Russia either. The concept of external financial control is settled at the legislative level in one way or another, while the internal control is only briefly covered by individual legislation norms and its regulation is by and large remains at the local level. (Belobzhetskiy 1999)

2. Method

2.1. Methods of financial control

The methods of financial control are techniques applied by the officials of the audit bodies and agencies aimed at the study of records in order to obtain evidence, the purpose of which is to identify evidentiary information (Nekrasov 2015). There are no clear boundaries between the various methods of financial control, because most of them are interrelated and include elements of other methods. Most often, the establishment of the true facts is only possible using complex methods. Moreover, the choice of control methods that are applied in a particular case depends entirely on what powers the auditing bodies or agencies have. For example, the auditor can only use documentary techniques in the course of the audit, while the tax inspection can only check documents concerning accrual or transfer of taxes to the budget. Often, the agencies that implement a higher (internal) control have the most extensive powers, because the powers of these agencies are limited solely by the local normative acts (Binkevich 2009).

2.2. Methodological support of internal control

Methodological support of internal control can be represented as follows:
- Legislation acts regulating the internal control procedures adopted at the state level and documents developed on their basis and regulating internal control procedures developed by the organization, taking into account the specifics of its activities.
- Guidance materials for the design and implementation of internal control in organizations: provisions, instructions, regulations, normative references, reporting forms of control procedures, as well as the rules of internal control as a basic document that combines the requirements for alignment of the control environment, the implementation of control procedures, the implementation of risk management measures and the definition of areas of responsibility (Pavlov 2010). Some of the guidance materials include, for example, programs developed in accordance with the Decree of the Government of the Russian Federation dated June 30, 2012 # 667 "On approval of requirements for internal control rules developed by the organizations conducting transactions with cash or other property (except for credit institutions), and repeal of certain acts of the Government of the Russian Federation."

2.3. Elements of financial control

Financial control can be divided into the following elements based on its methods (Makarenko 2007):
- Inspection. It can be carried out on various issues of financial and economic activities and be based on the statements of account and balance sheet documents. The inspection can identify violations of financial discipline and identify measures to address them.
- Survey. It covers various aspects of the activities of the organization. The control measurements in relation to the works performed, consumption of materials, fuel and energy can be carried out in the survey process. The survey can also be conducted through interviews, observation, inspection and so on.
- Supervision. It is produced by the controlling bodies in relation to economic entities that have received a license for a particular type of financial activities (insurance, investment, banking, etc.). Supervision also defines control in order to ensure that the rules and regulations are respected and their violation results in a revocation of the license.
- Economic analysis. As a peculiar kind of financial control, its purpose is to study the periodic and annual financial statements and accounting for the formation of an overall assessment of the economic performance of the organization and its financial condition. Also, economic analysis can help found the effective use of these results.
- Revision. It represents one of the most common forms of financial control, which is a set of checks aimed at the financial and economic activities of the organization undertaken by a variety of techniques of documentary and actual control. The revisions are intended to be able to set the level of appropriateness and reasonableness (economic efficiency) of the transactions in the organization. Verification of the financial

discipline (as well as the reliability of the reporting and accounting data) allows identifying violations and shortcomings of the activities of the facility subject to revision (Danilenko 2015). Revisions are divided into:- documentary and actual (the financial documents are checked in the former, existence of securities or money is checked in the latter);- planned and unplanned; - front and optional (the former is full, the latter checks data for a certain period of time); - complex and subject.

- Observation. Forming a common understanding of the state of the financial activities of the facility.

- Inventory. Its conduct helps identify unjustified reduction in the company's capital invested in different types of property (assets).

- Standardization. This method is based on the development of common standards for assessing the potential risks in the implementation of key business processes of the organization, including financial reporting processes, which introduces a mandatory set of indicators allowing controlling the quality of assets.

- There are also a number of methods to identify and reduce risks of fraudulent transactions, including the legalization (laundering) of proceeds from crime, transferring the capital of the organization abroad or tax evasion.

3. Results

3.1. Financial fraud in corporations

No organization can be quite sure that it controls every ruble. In corporations, everything is much more complicated. The Board of Directors cannot be completely sure of the reliability of the data provided by the Chief Financial Officer or the Chief Accountant. Thus, financial fraud can occur at local levels, while remaining unnoticed by senior management (Adizes 2008).

Quite often, business owners do not fully understand that only the existence of a transparent system of financial accounting, cost management of the company, a single treasury and automation can reduce the risks of unauthorized spending and help discover many schemes to withdraw money from the company (Karmanova 2002).

Any violations that may be revealed during internal financial control may be due to several reasons, which can be structured in the following way: mistakes, violation (intentional/unintended), bad practice.

The most popular financial fraud in the company is "kickbacks", misuse of company funds and financial mistakes of employees that can cost companies millions, so we need to consider their essence (Bolshov 2010).

In many companies, so-called "kickbacks" are popular – the phenomenon where employees procuring inventory items can earn a percentage of the total order. It is difficult for the manager to avoid this independently, because he or she does not have the ability to handle all the necessary data and time to delve into the essence of each payment in order to determine whether the purchase is beneficial for the organization or for the individual employee.

To determine the possibility of eradicating kickbacks, the activities were analyzed carried out in this field in companies engaged in oil, tourism and construction business that carry out the introduction of the system of internal financial control. To avoid kickbacks, the treasury system was established in which applications for payment were promptly formed, the limits and the availability of funds in the budget were checked, and submitted applications were approved at the various levels of management. One of the mandatory elements of the system was to create the internal audit department, whose task was to participate in the application approval process. For each filed application for payment (the purchase of certain inventory items), each applicant had to attach an agreement and an invoice, as well as two alternative invoices for purchase of the same item in other companies, thus proving that he or she had made the most beneficial choice for the company. This visual documentary substantiation significantly reduces the likelihood of the kickbacks.

Another discussed problem was the misuse of funds. How can we check whether the budgetary funds are spent only for purchasing items that the company needs?

This question was asked by the management of the enterprise with the state property, which is engaged in the provision of services to multiple facilities. Examination of the company with the purpose to introduce an automated financial management system showed that the company had no account in the context of individual projects and financing programs. In other words, the funds were accounted by programs, projects and sources. But the expenses were not accounted. This leads to the fact that there is always the possibility of transferring funds from one project to another, which makes it possible to carry out financial fraud.

Financial mistakes are one of the most unpredictable factors that may affect the company's finances. There are unauthorized losses of funds that are caused not by malice but rather by unprofessionalism of the CFO. For example, the CFO can combine the three "purses" of the company – finances of the operating, financing and investing activities.

3.2. Role of the system of internal financial control in detection and prevention of financial fraud

Financial fraud cannot happen in the presence of the company's management accounting system with the necessary reports, cuts, and analytics for management (Kulikov and Satdarova 2015). The accounting system should be as detailed as it can in order to make all cash flows completely transparent. First of all, it is necessary to prescribe the detailed rules of accounting – the so-called accounting policies. Next you need to develop the structure of revenues and expenditures, cash flow articles with the necessary degree of detail: not just "Payment for services", but "Legal fees", "Payment for market research", "Transportation costs", etc.

The value of internal financial control increases along with the complexity of industrial, economic, legal, economic conditions and business process management. The basic object of financial control is a set of multiple cash flows that are emerging in all their diversity into the inflow and outflow of corporate funds. Receivables are the special object of control in the inflow of funds, and payables are the special object of control in the outflows, respectively. This requires a highly professional team of financial controllers that have not only the knowledge of industry-specific business, financial management, accounting, tax accounting, etc., but also modern IT-technologies (Tolkacheva 2015).

The effectiveness of control procedures is often determined by the index of proportionality of costs for the organization of inspections and their results. In theory, an objectively needed compliance with the proportionality of the costs and benefits is elevated to the status of the principle of control. In practice, the completeness of the implementation of the principle of internal financial control depends on a set of conditions.

It should be borne in mind that the organization of the internal financial control leads to additional general production costs distributed between types of commercial product (work, service). These costs can be quite noticeable, since this agency must employ full-time highly skilled personnel who have the appropriate hardware and software at their disposal (Brovkina 2011).

Therefore, when modeling organizational and functional structure of the internal financial control, the degree of influence of this factor should be determined with the most accurate degree of calculation. The subsequent operation of the system of internal financial control will not require significant additional cost if figures on productivity of the preliminary calculations were confirmed at the stage of its implementation. It may only require the development of normative documents regulating the interaction between structural units and leaders in the field of control procedures, documentation of their results, as well as the preparation of decisions to eliminate shortcomings in managing cash flows (the cost of a timely skills development of the employees of the control system are not taken into account, as it is necessary for all employees in a variability of the economy).

To improve the effectiveness of the application of methods of internal financial control, the criteria of its activities should be reviewed periodically by the owners or the Board of Directors (Kidwell 2000). To this end, they revise the content of all documents establishing the strategy and policy of the financial institution in the field of internal control and table them at the general meeting of shareholders.

3.3. Principles of the system of internal financial control

Thus, the system of internal financial control should be based on the following principles:
- Continuity of operation;
- Responsibility of all subjects of the internal control for the proper execution of the control functions;
- Distribution of functional responsibilities in the implementation of parts of the organization's internal control;
- Integrated internal control of all areas of activity of the corporation;
- Unity of methodical and methodological framework of the internal control;
- Availability of information to stakeholders (Zhukov 2015);
- Ensuring the control functions by means and authority to implement them;
- Prioritizing the implementation of control procedures;
- Timely informing;
- Continuous development and improvement.

Since one of the objectives of the internal control is to minimize risks, i.e. to improve the quality of the corporation's operation, mathematical and statistical tools can be recommended for use as instruments of the internal control that give time to identify and display problems, determine the main productive factors, and allocate efforts to effectively address these issues (Fayantseva 2014).

4. Discussion

4.1. Measures aimed at creating an effective system of internal financial control

This study, aimed to review the internal financial control, in combination with developments on the classification of business volumes, allowed to develop a classification of the measures necessary to maintain control at the most efficient level with optimal losses, depending on the size of the business (Figure 1).

BUSINESS	**Micro**	Self-control
	Revenue not exceeding RUB 60 mln per year	
	Small	Control functions should be concentrated in the hands of the owner
	Revenue not exceeding RUB 400 mln per year	Control functions are concentrated in the hands of executives without having to create a department of internal control; effectiveness will be determined by the external auditor
	Medium	
	Revenue not exceeding RUB 1 bln per year	Control function is designed and allocated, but is not independent. To adjust the control department activities, it is necessary to invite independent experts that develop standards for the activities of the department on the basis of an analysis of its effectiveness
	Large	
	Revenue exceeding RUB 1 bln per year	

MACRO	
Revenue exceeding $100 mln per year	Maximum financial control system
Minimum share of foreign operations in the income or sales of the company: 25%	
Branches (production facilities) in at least 6 countries	International composition of the senior management
At least 25% of the value of the property is based on the territory of other countries	
Sales of a significant part of production outside the home country of the parent company	

Figure 1 - Classification of control measures, depending on the volume of business

Now, in the age of scientific and technological progress, it would be unwise to stick to outdated tenets of the organization of corporate management and control (Zueva 2010).

4.2. Justification of the need for a system of internal control in the company

Corporate executives can use the following formula to determine the need for a department of internal financial control:

$$X = \frac{((A>Z)+1)}{((Y>Z)+1)} \tag{1}$$

X – measure of the effectiveness of internal financial control;
A – amount of negative financial deviations detected by internal control bodies;
Y – amount of negative financial deviations detected by external control bodies;
Z – amount defined as the level of materiality for the company.

If at the retrospective analysis of the activities of the control departments the result is less than 1, the existing departments fail to cope with this task and can't meet the needs of the corporation at the appropriate level. Thus, it revealed the need for the creation of the internal financial control aimed to increase the efficiency rate of internal financial control.

It is necessary to establish the department of internal financial control, which will be separated from the main corporation. The current level of production automation enables to create a remote control system that can work just as effectively as if it were located in the head office of the corporation (Hurwicz and Reiter 2008). This will help depersonalize controllers for economists, and vice versa, reducing the process of exchanging information between them solely to the "conversation on the merits." Communication not with a specific person, but with the "Department of Financial Control," in which there is no possibility to influence the advance inherent order of the data will improve the

internal management responsibility of the corporation, which will organize the actions of the department in such a way that all the information necessary for the analysis of financial situation in the corporation is composed and framed in a timely manner. The department of internal financial control will hold the responsibility limited by the provisions of the Articles of Incorporation only before the Board of Directors, and accordingly, only the Board of Directors can influence it.

The task of the department of internal financial control is to identify and take measures to eliminate internal financial violations before the external auditors identify them. The detected current violations will have to be sent to managers responsible for the department in which violations have been fixed, and if the violation has a systemic nature, it will be directed to the Audit Department (which, in accordance with the Law "On Joint Stock Companies", is to be established in corporations).

4.3. Functions of the internal control system

The internal financial control service shall be capable of carrying out audits of all activities of the corporation, including the activities of individual structural units and employees, the opportunity to access all the materials required for inspections and remotely "enter any premises" of the corporation and its subsidiaries. Internal control should be able to give interim guidance on operations, transactions, including their suspension to verify the information about a client or transaction.

A system of triggers (validation) should be very important for internal financial control. In carrying out any financial transactions, all those responsible for its execution should mark their approval of the transaction (for example, using an electronic signature or simply by marking a tick in the system (available only to the password owner)). The system will track the chain of persons responsible for operations.

4.4. Disadvantages of establishing a system of internal control

It should be noted that the proposed methods of establishing internal financial control are not suitable for every corporation for at least two reasons:

- To enable this system to begin to function, a lot of time and money should be spent on its creation and adjustment, which are the core values for any business, while the value of the control is perceived objectively by far not all leaders.
- This system is a system of virtually total control, which many managers tend to avoid, because it will make financial flows transparent and reveal all weaknesses, show earlier mistakes in management and identify those responsible for these mistakes. It is not always welcomed by management, for which the main indicator is profit, regardless of how and at what cost it was received.

The introduction of additional control measures, especially so tough ones, will require funding, and, accordingly, increase administrative costs of the corporation. However, this system will cut off all the unnecessary (e.g., failed control departments). By saving, or rather redirecting the funds previously used unwisely (use of their opportunity cost), and preserving the budget from unreasonable expenses, the corporation will be able to recoup some of the costs of organizing the system. Due to the high cost of servicing the proposed department of internal financial control, it is reasonable to use only in macrobusiness where the cost of failure can be fatal for the corporation.

All proposals on the modernization of the system of internal financial control should be submitted to the Board of Directors in the presence of the manager offering a change and the controller who will present the attitude of the control department to the proposed changes.

4.5. Peculiarities of functioning of the internal control system in Russian corporations

The human factor always affects the management of the corporation. A so-called "emergency operation" has the most negative impact (in the behavior that is not consciously aimed to ensure that the corporation incurs losses). Emergencies arise either when the management incorrectly lays the labor effort in the plan or when the employees are not doing their job conscientiously. Thus, most of the mistakes and irregularities take place in the period of "emergency." Analyzing the period of increasing mistakes, it can be determined in which departments the planning (or integrity of work) is low. An emergency work style should be eliminated because it is inherent in the Russian style of work, but entails the most adverse effect on the corporation (Kokoreva *et al.* 2013).

The need for continuity of control is caused by the dynamic development of the internal and external environment of the corporation. Any changes, whether changes in the statutes or the law, lead to a gradual improvement of the management system, and any change is characterized by the appearance of the precedents atypical for the usual operation. Thus, for several years, the corporation can only learn to adapt to the new rules, which will certainly be accompanied by the emergence of new mistakes, the duty to find and fix which is assigned to the internal control system. This internal control allows integrate into the volatile external environment with the least loss of time and money for the corporation.

The most shocking for foreign investors may be the fact that some Russian corporations lack not just the established systems of control, but even basic Internet access for all employees. Young companies are becoming more attractive in this regard, as they were originally formed trying to meet the high standards of requirements, based on the experience and skill of mostly young professionals, and control in them often works much better. The corporate "titans" are not so flexible and mobile. If you do business based only on historic experience, you can achieve a high level of stability for the corporation, but "rapid progress" is impossible without innovation (although it may be either positive or negative). Thus, you can still meet corporation that partially keeps accounts "on paper". Managers, who do not take any action in the automation of these aspects of the corporation operation, justify their behavior by the fact that even without innovation the corporation is a powerful player in the market, but such an approach in the XXI century has no right to exist if the corporation is planning to continue its activities and grow. Of course, the control can be carried out even in these conditions, but its effectiveness and, most importantly, timeliness, are likely to be low without the automation.

Conclusion

Based on the shortcomings of domestic research in the field of financial control (focus on relatively small businesses, compilation of the Western experience without taking into account the specifics of Russian business), the authors made the following conclusions.

Internal financial control in the corporation, being a subinstitution of financial control, is one of the ways to smooth out the asymmetry of internal information and to deepen understanding of risk areas, identifying deviations related to mistakes, intentional and unintentional violations or ineffective approach to operation. As a result, owners and managers can adopt the most appropriate management decisions, thereby increasing comfort for potential investors who are concerned about the effectiveness of their own funds. Internal financial control allows to continuously verify and confirm or deny the authenticity and legality of business transactions, tax and accounting data, as well as to analyze the economic feasibility of the financial and economic activity of the enterprise in order to develop recommendations to improve its effectiveness.

The study of domestic legal requirements for the organization and implementation of internal corporate financial control led to the conclusion that the reformation of laws is required today, with the aim not only to oblige the corporations to carry out internal financial control, but also to identify the main requirements to the procedure and methods of its implementation.

Research of the organization of internal corporate financial control by Russian and foreign corporations helped compile the most effective methods of implementation of this type of control and form a list of provisions that could be considered «best practices» and become a point of comparison to determine the effectiveness of control activities.

Thus, the authors initiated a profound and detailed study of the internal control system in Russian corporations, which opens up opportunities for further research in this direction, based on domestic and foreign experience, given the specificity of Russian conditions and in accordance with the daily changing economic and political realities.

References

[1] Adizes, I.K. (2012). Styles of management. Effective and ineffective. Moscow: Alpina Publisher, pp: 200.

[2] Adizes, I.K. (2008). Managing the corporation lifecycle. St Petersburg: Peter, pp: 384.

[3] Belobzhetskiy, I.A. (1999). Financial control and new economic mechanism. Moscow: Finance and Statistics.

[4] Binkevich, T.V. (2009). Internal financial control in the group of small enterprises of the holding structure, thesis of Candidate of Economy: 08.00.10, Moscow.

[5] Bolshov, A.A. (2010). Improvement of the system of internal (corporate) financial control in enterprises, thesis of Candidate of Economy: 08.00.10, Moscow.

[6] Brealey, R. and Myers, S. (2008). Principles of Corporate Finance. Moscow: Olymp-Business.

[7] Brovkina, N.D. (2011). Basics of financial control: study guide. Moscow: Magister.

[8] Hurwicz, L. and Reiter S. (2008). Designing Economic Mechanisms. Cambridge: Cambridge University Press.

[9] Danilenko, N.I. (2015). Departmental (internal) financial control and audit: effective management tool. *Accounting in Budgetary and Noncommercial Organizations*, 18(378): 17-21.

[10] Zhukov, V.N. (2015). Information strategies in the internal financial control of corporations. *Accounting*, 9: 89-92.

[11] Zueva, I.A. (2010). Current development trends in the system of financial control in Russia. Financial Bulletin: Finance, Taxes, Insurance, *Accounting,* 2: 3-7.

[12] Karmanova, T.E. (2002). Corporation as a market institution, thesis of Candidate of Economic Sciences, Lomonosov Moscow State University (MGU), Moscow.

[13] Kidwell, D.S. (2000). Financial Institutions, Markets, and Money. St Petersburg: Peter.

[14] Kokoreva, M.S., Ivashkovskaya, I.V., Stepanova, A.N. and Grigorieva, S.A. (2013). Corporate financial solutions. Empirical analysis of Russian companies (corporate finance solutions in emerging capital markets): Monograph. Moscow: NIC INFRA-M.

[15] Kulikova, L.I. and Satdarova, D.R. (2015). Internal control as a tool to prevent the falsification of financial statements. In: Formation of economic potential of business entities: problems, prospects, accounting and analytical support. Proceedings of the V International Conference, pp. 448-455.

[16] Makarenko, A.A. (2007). Corporate financial policy as a tool of financial management, thesis of Candidate of Economic Sciences, Moscow.

[17] Nekrasov, A.S. (2015). Internal control as a basis for financial control system. *Financial Law*, 10: 8-12.

[18] Pavlova, Yu.A. (2010). Financial control, its forms and characteristics, main tasks of internal control. *Accounting and Statistics*, 17: 40-45.

[19] Pike, R. and Neale, B. (2006). Corporate Finance and Investment. Series: Academy of Finance. St. Petersburg: Piter.

[20] Tolkacheva, O.P. (2015). Internal financial control in the system of economic security of the business entity. *International Scientific Review*, 8(9): 37-38.

[21] Fayantseva, E.Yu. (2014). Internal control as a method of managing financial stability of the company in terms of economic instability. *Bulletin of the University of Finance*, 3(81): 48-56.

Status of Foreign Direct Investments and their Relationship to Selected Economic Indicator of the Sustainable Development in the Slovak Republic – Localization Factors of Foreign Direct Investment Allocation and their Spatial Differentiation

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Abstract:

The aim of this article is to evaluate the economic effects of management of FDI in correlation with regional development. A methodology was used to identify a complex relevant indicator of development that is the amount of foreign direct investments flowing to the region on the NUTS III level, was applied for the evaluation of the economic status of regions and their underdevelopment. Another part of the analysis was the identification of the correlation between the FDI in the region and the sustainability of the development expressed by the regional GDP per capita. In the majority of regions, the correlation between the amount of the FDI and the sustainability of the development expressed by the regional GDP per capita was confirmed. At the same time, it is possible to identify a significant economic divergence of regions.

Keywords: economic growth, foreign direct investment/s (FDI), regional GDP.

JEL Classification: O4, R5, M20.

1. Introduction

Most recent theories studying economic growth focus on the correlation between economic growth and the state of domestic technology in relation to the rest of the world. The degree of country's economic growth is explained as a "catch-up" process in the light of the technological level of the host country. The model of economic diffusion cites the degree of economic growth of the underdeveloped countries as depending on the degree of reception and implementation of new technologies already used by foreign companies. According to the neoclassical model of Trevor Swan and Robert Solow (authors of the theory of Absolute Convergence), the 1987 Nobel Prize laureates, underdeveloped countries should grow faster compared to the developed ones. This contrasts with Lenin's theory of imperialism stating that rich countries grow at the expense of poor countries. On the other hand, the Solow-Swan model (Solow 1956, Swan 1956) allows the explanation of the growing international differences conditioned by the convergence, in which economic growth is dependent on other parameters – like the amount of savings that is higher in rich countries when compared to the poorer ones. This means that rich countries converge to a different point than poor countries and thus are able to grow faster. The convergence should be valid within the country or among countries with approximately the same economic parameters, like the USA or OECD states (Adamišin 2008).

Other academic studies also claim that internal investment has made an important and significant impact on the economic growth in the recipient countries. For instance, Driffield (2001), Liu *et al.* (2000) and Cantwell *et al.* (2001) all found statistically significant spillovers in the United Kingdom, as did Chuang and Lin (1999), Dimelis and Louri (2002), Lipsey and Sjöholm (2001), Asaturov, Teplova and Hartwell (2015) in their studies of Greece, Taiwan, Indonesia and the Central and Eastern European region, respectively. Similar results are reported by Blomström and Wolff (1994), who aimed to determine the size of these effects by exploring whether the spillovers in the Mexican manufacturing sector were large enough to help Mexican firms converge toward US productivity levels during the period of 1965-1982. Their answer is affirmative: foreign presence seems to have had a significant positive impact on the rates of growth of local productivity (OECD 2002, Blomström, Fors and Lipsey 1997).

The aim of this article is to evaluate the economic effects of FDI management in correlation with regional development.

2. Literature review on the regional development in relation to foreign direct investments

Neoclassical theory on regional development stems from the idea that at the occurrence of the state of deficiency in the economy, price differences are formed and these create possibilities for a profitable trade or a beneficial regrouping of production factors and thus can attract investment. When monitoring development in one closed region, the basic model of neoclassical theory of regional development is reached, this model describes capital being accumulated through savings and investments while the amount of goods and services produced increases. The dynamics of accumulation gradually decreases and reaches stagnation in a certain point, at this point; investments are only able to reimburse depreciations. Through an extension of the neoclassical model of regional development taking into account the possibility of free flow of production factors among regions, it is possible to reach conclusions supporting the tendency to converge. The value of the marginal product of production factors determines their price (wage, interest and annuity). Taking into account mobile production factors, this result in their transfer from the region that is better equipped to the region which is experiencing scarcity. This results in a net influx of the scarce production factors and the deficiency is gradually eliminated. This process causes the compensation of differences in the capital equipment of the region and in renumeration. In case of this effect being accompanied by the above mentioned process of accumulation, the region with lower capital will grow even faster. If the mutual relations among regions are limited to the exchange of goods only, it can result in specialization of the production of goods the region is better equipped for based on different equipment among regions. Since every region utilises its comparative advantages, the national economy as a whole can produce more from existing resources. Trade is then prosperous for all regions concerned. The significance of the theory for regional policy lies in the fact that if all preconditions of the neoclassical model are met, the economy leads to a balanced development without economic-political interventions. The role of the regional policy should thus be to ensure the validity of preconditions of the neoclassical theory and to thus increase the mobility of labor and capital, elimination of administrative restrictions to access to regional markets, creation of conditions for a better mobility of goods and services and the improvement of the flow of information between regions and completion of infrastructural networks (Maier and Tödtling 1998).

According to Caglayan Akay and Sak (2015) FDI is the investment type foreign companies make in another country as necessitated by financial, political and social motives. FDI have been an important catalyst for the city-states industrialization process and have contributed to the economy in terms of employment generation, gross domestic product and international trade (Nyen Wong, Khoon Goh and Hooi Lean 2015). There are several types of foreign direct investment which can be differentiated on the basis of the method of entry into the country. One very attractive entrance for the investor is the "Green Field" method, in which the investor sets up a company in the country directly, this form of FDI is associated with many advantages which are provided by the economic policies of the home country. Another very popular method of entry is the "Joint Venture", which enagages two parties. On one of them is the home company with their experience and the other is the foreign company that has the strength of the capital, advanced technology and know-how. Both companies profit from the profit generated, they may also cover possible losses from it. Additional methods of entry include acquisitions, mergers and different kinds of management and licensing agreements (Hečková and Chapčáková 2011; Táncošová and Slaný 2004).

The Slovak Republic can be characterized as a small open economy. HTU budgets in the Slovak Republic are characterized generally by very low percentage of EU funding (around 1%). (Mura *et al.* 2014, Fiľa *et al.* 2015)

The globalization phenomenon resulted in the strengthening of the movement of the international capital in 1990's, which manifested in an intense inclusion of small open economies in the globalization process (Demel and Potužáková 2012, Matejková, Qineti and Serenčéš 2008).

The international movement of the capital has the same causes as the capital movement within the economy or economic group. Attracting foreign investors to capital manifestation on our market is not an easy task and requires the fulfillment of positive evaluations of six basic criteria (economic strength, entrepreneurial ethics, level of integration into the world economy, compliance with the law, investment climate and political stability). The foreign investors strive either for the domestic (local) market or a share on the world market. In the first case, exports are minimal and the foreign company competes only on the domestic market which probably results in the creation of a monopoly, this has various disadvantages for the economy of the host country. In the second case, exports are at maximum and the foreign company competes with other companies on the world market which leads to the company expanding its production and invests in new technologies and innovations, this results a the higher quality of goods and services (Kadeřábková 2000, Zamrazilová 2007).

The influx of the FDI to the host country presents the following advantages (Havránek and Iršová 2010, Vidová 2011):

- Incomes to the state budget increase in the long term horizon,
- The productivity of the production factors increases (this is an indirect effect known as "a spillover", it involves the spill of technological knowledge and the creation of the competitive pressure on domestic producers at the same time),
- Increase of the employment in regions with high FDI influx.

The influx of the FDI to the host country presents the following disadvantages:
- Price creation can decrease export income,
- In some cases also there is a negative impact on the environment (resource-seeking),
- In case of a market with cheap labor force, the final result of the influx of FDI can be the so-called preserving effect when the company does not evolve further.

In the current economy, there are two best known theoretical models that explain the flow of foreign investments. The first is the gravitational model that stresses the fact that the flow of investments is positively influenced by the size of the market and negatively influenced by the distance from the host country. The second model is the so-called agglomeration model of the economy, which stresses the fact that international companies place their capital in the same space (or the same region) as their competitors, the result being a so-called synergistic effect (Kadeřábková 2000).

The assessment of the underdevelopment of individual regions of Slovakia on the NUTS III level (region) was based on the previously mentioned theory on a single economic indicator, that being the stock of FDI in euro (EUR). The reason behind this decision was that foreign investments are considered to be the most susceptible sensor of the economic development in the globalized world. Currently, the problem of slow economic development of underdeveloped regions is strongly taking the forefront. That is the reason for the search of new ideas and solutions in new approaches and more sophisticated concepts of regional policies.

3. Methodology and data

Content-wise, this article analyzes the economic development of Slovak regions (NUTS III) based on the stock of FDI through models of the neoclassical theory of regional development. The evaluation of the economic level of regions and their underdevelopment was performed with the use of a complex indicator of development in the form of FDI flowing to the particular region on the level of NUTS III (regions of the Slovak Republic). The most underdeveloped region on the level of Slovakia has the lowest percentage output of FDI during the whole monitored period in the whole Slovak Republic. The point ranking range of 0 to 100 points is the average of the percentage expression of the status of FDI in the monitored period of 6 years, where the highest number of points represents the most developed level of the region and the lowest number of points represents the most underdeveloped level of the region.

Further analysis studied the relation between two variables, the macroeconomic indicator of the stock of FDI on the level of NUTS III and a selected economic indicator of the SD (regional GDP per capita). The analysis always used a pair of variables independently for each particular region. The testing was based on the calculation of Pearson correlation coefficients since analyzed variables were nominal and not a single case repudiated the normality of division. The normality was tested by the Shapiro-Wilkov test and the Kolmogorov-Smirnov test. In one case, the test results of normality were inconclusive (PO_FDI), so for the context analysis, in addition to the parametric Pearson test, the nonparametric Kendall test was also employed. The analysis processing was done via the software STATISTICA 10.

The analyzed data were acquired from official sources of the Slovak National Bank (SNB) and the Statistical Office of the Slovak Republic for the monitored period of 2004-2009.

4. Results

4.1 Status of foreign direct investments in Slovakia according to regional differentiation

Flows of foreign direct investments into the Slovak economy are very fluctuating in various sectors. On one hand, there are sectors in which the position of foreign investors is relatively strong (industrial production, wholesale and retail, finance and insurance, transport and storage); and on the other hand, there are sectors with the share of foreign investors being negligible (agriculture, mining and quarrying, construction, hotels and restaurants, health and social care, etc.). The Slovak Republic is very focuses on the automobile industry, but economists warn of the potential risks (the so-called asymmetric shock). Hence, if the crisis occurs in the automobile industry (Albornoz et al. 2014), the country's small economy is so interlinked to it that it can fall into recession, however, monetary devices of the European Central Bank can be set completely differently. The most distinguishing factor between companies with foreign capital and those with Slovak ownership is the high amount of investment. From the beginning, foreign investors placed their resources into companies of above average productivity and profitability and after the gain of foreign investments, these companies continued to increase their productivity mainly through investments into technologies, distribution channels and labor

organization. Companies which relay the domestic capital do not apply this to a sufficient degree and in the long term perspective; they are unable to compete with companies with foreign investments.

According to the data of the National Bank of Slovakia, FDI comes mainly from the European Union, in the following order starting with the Netherlands, Austria, Germany, Italy, the Czech Republic, Hungary, France, Belgium and Luxembourg. Some the world's largest investors include companies mainly US companies located mainly in the Netherlands such as US Steel, Dell, Whirlpool, IBM, HP, Johnson Controls; German companies such as Siemens, Volkswagen, T-Systems and French ones such as PSA Peugeot Citroen, Alcatel. Furthermore, some companies originate in Asia, such as Yazaki, Tisui Sumitomo, Sony, Panasonic, Samsung, Kia Motors, Hyundai Mobis and others. The highest value of foreign direct investment was recorded in the services and industrial production. All of these investment projects have a significant impact on regional development and the resulting economic growth of the country, which was subsequently also confirmed by our analysis (Kotulič 2006).

Table 1 - Stock of FDI in Regions in the Slovak Republic during 2004 to 2009 (in thousands EUR)

Name/year	2004	2005	2006	2 007	2008	2009
SLOVAK REPUBLIC	16 068 283	19 968 325	25 517 331	29 057 987	36 226 447	36 469 023
Bratislava Region	10 501 894	11 539 044	16 021 883	17 912 606	23 879 092	24 169 988
Trnava Region	1 445 521	3 538 194	2 804 454	2 960 833	3 251 024	3 439 328
Trenčín Region	742 456	908 549	1 060 736	1 401 266	1 628 475	1 734 913
Nitra Region	477 546	537 518	1 025 106	1 165 231	1 399 116	1 467 286
Žilina Region	729 303	1 028 403	1 433 639	1 991 923	2 195 419	2 078 715
Banská Bystrica Region	391 070	407 900	519 696	756 268	876 524	891 499
Prešov Region	230 503	237 956	246 042	223 320	363 904	425 039
Košice Region	1 549 991	1 770 761	2 405 775	2 646 541	2 632 893	2 262 255

Source: Own processing based on National Bank of Slovakia, 2012

The tendency to concentrate FDI into the most developed regions is a problem not only in Slovakia but other countries of the European Union as well. Future trends also do not look favorable. Despite the declarations of the Slovak government on the efforts to push investments further to the Wastern part of Slovakia, the measures taken are insufficient and do not alleviate the growing regional differences. A significant share of investments is brought on without the help of the government and these investments are most often aimed in the direction of Bratislava and the Western part of Slovakia; these tendencies are confirmed by the official data of the Slovak National Bank on FDI measures.

The analysis which monitored Slovakia over a period of 6 years showes that the Prešov Region is the most underdeveloped region in Slovakia, while Bratislava region is the most developed on. The ranking of individual regions is provided in Table 2.

Table 2 - Development of Regions of Slovakia according to the FDI Economic Indicator (in Points)

Name/year	2004	2005	2006	2 007	2008	2009	Final points	Final rank
SLOVAK REPUBLIC	100,00	100,00	100,00	100,00	100,00	100,00	100,00	-
Bratislava Region	65,36	57,79	62,79	61,64	65,92	66,28	63,29	1.
Trnava Region	9,00	17,72	10,99	10,19	8,97	9,43	11,05	2.
Trenčín Region	4,62	4,55	4,16	4,82	4,50	4,76	4,57	5.
Nitra Region	2,97	2,69	4,02	4,01	3,86	4,02	3,60	6.
Žilina Region	4,54	5,15	5,62	6,85	6,06	5,70	5,65	4.
Banská Bystrica Region	2,43	2,04	2,04	2,60	2,42	2,44	2,33	7.
Prešov Region	1,43	1,19	0,96	0,77	1,00	1,17	1,09	8.
Košice Region	9,65	8,87	9,43	9,11	7,27	6,20	8,42	3.

Source: Author's calculation

The data analyzed reveales the following trends in the regional development of the Slovak Republic:
- There is a further deepening of the differences on the level of FDI between regions with a high share of FDI and regions with a very low share of FDI as a result of the so-called agglomeration model of the economy,
- There is a growing trend on the level of FDI in regions with gradually developing infrastructure,
- There is a low share of FDI in the Prešov Region caused by the non-existence of industrial zones and a result of unfinished road infrastructure.

The level of the regional development of individual regions of the Slovak Republic according to point ranking reached based on the methodology implemented is shown in the Figure 1. The point ranking uses the scale of 1 to 100, and represents the average percentage of the stock of FDI during the monitored period of six years (2004 – 2009). The first place is taken by the Bratislava Region (its center being Bratislava – the capital of Slovakia), which during the

monitored period of six years received an average of 63.29% of all FDI flowing to Slovakia. The second place is taken by the Trnava Region that reached the average of 11.05% of all FDI during the monitored period. The third place belongs to the Košice Region with the average of only 8.42% of all FDI. Next, the fourth place belongs to Žilina Region (5.65%), Trenčín Region at the fifth place (4.57%), Nitra Region at the sixth place (3.60%), Banská Bystrica Region at the seventh place (2.33%) and the last – eighth place belongs to the Prešov Region with the average of only 1.09 per cent of all FDI.

It is important to mention that the significant differences in the volume of FDI were partially caused by the methodology itself, since FDI was counted according to the official address of the company, thus Bratislava "officially" reached a significantly higher share of FDI.
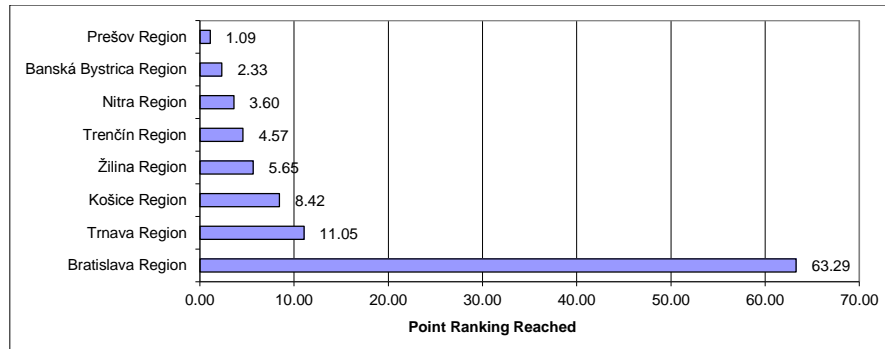

Figure 1 - Final Point Rankings of Regional Development in Slovakia on the Level of NUTS III

Based on the above mentioned points, and comparing with a ranking from the period of 1999 – 2004 using the same methodology (Kotulič 2006), we can state that the convergence process between the individual regions of Slovakia is not directly quantifiable, which can be most probably attributed to the unfinished infrastructure (the network of highways) that would effectively connect the Bratislava Region (the most developed region) with the Prešov Region (the most underdeveloped region), as well as a problematic labor force mobility.

4.2. The Correlation of FDI and Regional GDP per Capita on the Level of NUTS III in Slovakia

The sustainable development (SD) is a term that has permeated various spheres of the socio-economic life. The application of the SD allows for the integrity of economic and environmental aspects. Numerous by now evaluated dimensions of the development and growth started to be complemented by the sphere of sustainability in the last period (Huttmanová and Synčáková 2009).

The concept of sustainable development was first viewed mainly in the sense of maintaining the quality of the environment (Albornoz *et al.* 2014, Erdogan 2014). The evaluation of the sustainability is realized through a set of indicators divided into four basic groups (Tušan and Bilá 2006). These form the so-called pillars of sustainability (economic, environmental, social and institutional).

Further analysis narrowed the high number of economic indicators of sustainable development to a single indictor –GDP per capita (see Table 3). The reason behind this is its exact quantification not only on the national level but also on the NUTS III level. The relations analyzed were the ones between the macroeconomic indicator of the status of FDI on the level of NUTS III and a selected economic indicator of the SD. Pairs of variables were always analyzed individually and for each particular region. The results of correlation analyses of FDI and the GDP per capita are presented in Table 4.

Table 3 - Regional GDP per Capita in EUR at Current Prices in Slovakia

Name/year	2004	2005	2006	2 007	2008	2009
SLOVAK REPUBLIC	8 391	9 154	10 203	11 387	12 381	11 609
Bratislava Region	18 958	22 270	23 784	26 918	28 542	28 443
Trnava Region	8 852	9 896	12 427	13 675	14 197	12 928
Trenčín Region	7 771	8 081	9 537	10 503	11 220	10 265
Nitra Region	7 416	8 126	8 756	9 509	10 495	9 928
Žilina Region	6 793	7 537	8 270	9 553	10 790	10 038
Banská Bystrica Region	6 910	6 565	7 537	8 450	9 330	8 425
Prešov Region	5 022	5 385	5 583	6 259	7 268	6 654
Košice Region	7 392	7 721	8 599	9 362	10 194	9 022

Source: Statistical Office of the Slovak Republic, 2012

In the majority of regions the connection between the amount of FDI in the region and the sustainability of the development expressed through the GDP per capita in the region was confirmed. The above-mentioned analyses were repeated once again with a year time difference between the GDP per capita and the amount of FDI in the region. It was assumed that FDI in the region influence the sustainable development – the analyzed indicator – with a time lag. The time difference of one year was chosen for verification of the assumption. Results of correlation analyses are presented in the Table 5.

In this case, the assumption of the gradual influence of the amount of FDI on the regional GDP was not confirmed. In several regions, the relation was significant; however, compared to the previous case, the number of regions was lower as well as results being less conclusive. High values of correlation coefficients (at their significance) indicate a very tight relation between analyzed phenomena.

Table 4 - Results of Correlation Analyses of FDI and the Regional GDP per Capita on the Level of NUTS III

Analyzed variable	Pearson Correlation Coefficient
FDI BA / GDP BA	0,94897 **
FDI TT / GDP TT	0,5545
FDI TN / GDP TN	0,9100 *
FDI NR / GDP NR	0,9578**
FDI ZA / GDP ZA	0,9863**
FDI BB / GDP BB	0,9241**
FDI PO / GDP PO	0,7564 / 0,4667 #
FDI KE / GDP KE	0,9287**

Source: Author's calculation

Notes: * p-value < 0.05, ** p-value < 0.01, # first figure represents the Pearson correlation coefficient and the second figure represents the Kendall coefficient.

Table 5 - Results of Correlation Analyses of FDI and the Regional GDP per Capita on the Level of NUTS III (Time Difference)

Analyzed variable	Pearson Correlation Coefficient
FDI BA / GDP BA	0,8941*
FDI TT / GDP TT	0,7313
FDI TN / GDP TN	0,7428
FDI NR / GDP NR	0,8929*
FDI ZA / GDP ZA	0,9343*
FDI BB / GDP BB	0,7494
FDI PO / GDP PO	0,2474 / 0,200 #
FDI KE / GDP KE	0,8698

*Source***:** Author's calculation

*Notes***:** * p-value < 0.05, ** p-value < 0.01, # first figure represents the Pearson correlation coefficient and the second figure represents the Kendall coefficient.

The regional economic divergence is visible also on dendrograms of clustering of regions according to individual analyzed parameters and years (see Figure 2 and Figure 3), in which the Bratislava Region forms a significantly isolated group of regions in both analyzed parameters. It is followed by the Trnava Region with a huge distance (also in both parameters). The degree of similarity of the rest of regions is different according to a parameter analyzed. A higher degree of heterogeneity is in the parameter of the regional GDP than in FDI. Based on these partial analyses, it is impossible to claim its causality. It is possible that both these phenomena have the same initiator that determines them in the same manner. A further possible analysis is the analysis of the annual increase or decrease. This will be the subject of the future research.
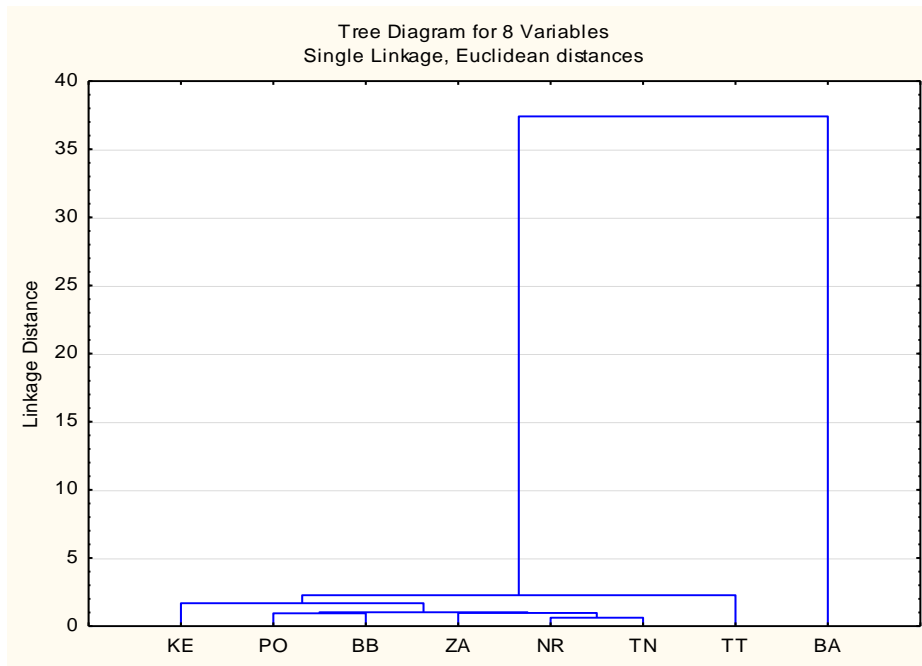
Figure 2 - Clustering of Regions according to the Stock of FDI in Slovakia
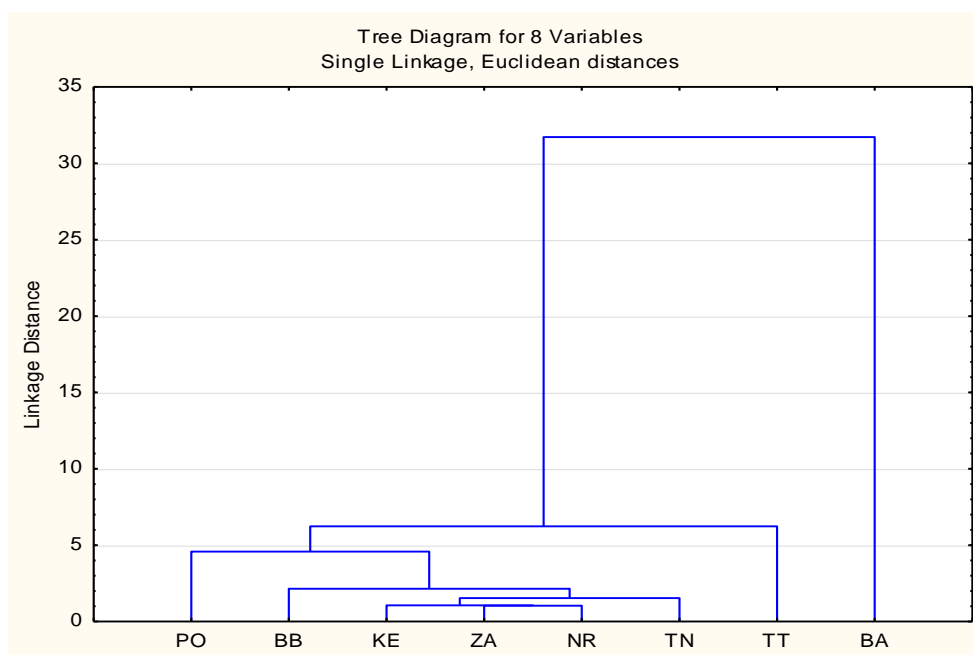
Figure 3 - Clustering of Regions according to the Regional GDP per Capita at Current Prices in Slovakia

Conclusion

The differentiation of regional differences is often the result of different localization assumptions for specific economic activities that define a certain dimension of requirements with subsequent adaptability in individual regions. Regions are able to absorb these requirements in various degrees and create an environment for a given economic activity. As problematic regions seem to be regions of mostly industrial character, which used to be wealthy, but their structure in the context of economic transformation was viewed as problematic from the aspect of adaptability. Low competitiveness of regions can be considered to be the major determinant of spatial differentiation of society and economic structures. This is the result of the interaction of a wide range of factors: from the troubled sector structure, lack of innovation capacity, quality of population potential to the absence of inter-market environment and centralistic way of managing of the companies (Slavík, Grác and Klobučník 2011).

Foreign direct investment has its own purpose particularly in local and regional development. Their positive impact is reflected in both the local and national level. They are a means of ensuring the transfer of technology, increasing employment and also they contribute to improving the quality of the workforce. Foreign direct investment is very important for regions and currently due to concerns about the loss of the relevant investor is the concept of "After Care" at the forefront, which is a kind of care of the investor operating in the given region. The most important tools in caring about investor include promoting cooperation with local and regional businesses, increasing the subcontracts, support for research and development, assistance in solving the administrative problems, increasing comfort of the investors in the social sphere, assistance in the development of human resources, support of the production capacity expansion (Ježková and Ježek 2011).

The economic policy of many countries including Slovakia is inclined to actively support investors through investment incentives. Although the international agreements in principle does not allow discrimination against foreign or domestic investors, the difference in treatment often results from the set of criteria that an investor must meet in order to get these incentives. In the Slovak Republic it is predominantly the small and medium-sized enterprises, which often cannot meet the criterion of a minimum volume of investment, and so there are the most common foreign investors who have the benefit from investment incentives (Kincl 2003).

By evaluating the state of foreign direct investment and regional gross domestic product per capita, the cluster analysis showed that the Bratislava region has a strong dominance in the period of time studied. The dominance of the Bratislava region is consistent with the classical theories of regional development, especially as regards the theory of central places of W. Christaller, followed by the J. Friedmann theory of polarized development, according to which the economic growth of the country can be strengthened by hierarchical system of cities and their functional regions. By strengthening the hierarchical system of cities but inevitably occurs to the selection of centers of growth, what does not guarantee to ahieve the desired convergence (Blažek and Uhlíř 2002, Maier and Tödtling 1998).

The main reasons for the low influx of FDI into the economy are generally considered to be insufficient political stability, insufficient law enforcement, obscure property legal relations, and low attractiveness of the economic environment and unfinished process of transformation. Apparently, the amount of foreign direct investments reflects the above mentioned shortcomings of the Slovak economy and thus still does not fulfill the required level that would accelerate the transformation process of the microeconomic sphere and thereby also a more effective growth of the Slovak economy. Even in the 21st century, underdeveloped regions are influenced by many obstacles. Low incomes result in low savings; low savings decelerate the capital growth; insufficient capital hinders the implementation of new technologies and a fast growth of productivity; low productivity leads once again to low incomes. The question for many countries even in this century thus is how to break this vicious circle. One of possible ways is to create conditions for the input of foreign capital (new technology and know-how) in the form of FDI and in this way accelerate the convergence process of underdeveloped regions to the level of the developed ones.

Acknowledgement

References

[1] Adamišin, P. (2008). Macroeconomic Coherences of Regional Development in the Slovak Republic. Paper presented at the international conference Hradecke ekonomicke dny 2008, in Hradec Kralove, Czech republic.

[2] Asaturov, K., Teplova T. and Hartwell, C.A. (2015). Volatility Spillovers and Contagion in Emerging Europe. *Journal of Applied Economic Sciences*, 6(36): 47-52.

[3] Albornoz, Facundo, Matheew Cole, Robert J.R. Elliott and Marco G. Ercolani. (2014). The environmental actions of firms: Examining the role of spillovers, networks and absorptive capacity. *Journal of environmental management*, 2014(146): 150-163. DOI: 10.1016/j.jenvman.2014.07.011

[4] Belanová, K. (2012). Investments, Uncertainty and Irreversibility: Example of Automotive Industry in the Slovak Republic. *Ekonomický časopis*, 60(2): 169-186.

[5] Blažek, J. and Uhlíř, D. (2002). Teorie regionálního rozvoje: Nástin, kritika, klasifikace [Theory of Regional Development: The Outline, criticism, classification]. Karolinum.

[6]   Blomström, M. and Wolff, E. (1994). Multinational Corporations and Productivity Convergence in Mexico. In Baumol, L. Wiliam, Richard R. Nelson, and Edward N. Wolff. Convergence of Productivity: Cross-National Studies and Historical Evidence. Oxford University Press.

[7]   Blomström, M., Fors, G. and Lipsey, R.E. (1997). Foreign direct investment and employment: Home country experience in the United States and Sweden. *Economic Journal*, 107(445): 1787-1797.

[8]   Caglayan Akay, Ebru, and Sak, N. (2015). Does Foreign Direct Investment Cause Economic Growth? Panel Data Evidence from Transition Economies. *Journal of Applied Economic Sciences*, 5(35): 11-14.

[9]   Cantwell, J., Iammarino S. and Noonan, C. (2001). Sticky places in slippery space - the location of innovation by MNCs in the European regions. In Pain N: Inward Investment, Technological Change and Growth: the Impact of Multinational Corporations on the UK Economy. Palgrave.

[10]   Chuang, Y.-C. and Lin, C.-M. (1999). Foreign Direct Investment, R&D and Spillover Efficiency: Evidence from Taiwan´s Manufacturing Firms. *Journal of Development Studies*, 1999(35): 117-137.

[11]   Demel, J., and Potužáková, Z. (2012). FDI and the Liberec Region: the Case of the Labour Market. *E&M Economics and Management Journal*, 2012(4): 4-18.

[12]   Dimelis, S. and Louri, H. (2002). Foreign Ownership and Production Efficiency: A Quantile Regression Analysis. *Oxford Economic Papers*, 54(3): 449-469.

[13]   Driffield, N. (2001). The Impact on Domestic Productivity of Inward Investment in the UK. *Manchester School*, 69(1): 103-119.

[14]   Erdogan, A.M. (2014). Foreign Direct Investment and Environmental Regulations: a Survey. *Journal of Economic Surveys*, 28(5): 943-955. DOI: 10.1111/joes.12047.

[15]   Fiľa, M., Schwarczová, L. and Mura, L. (2015). Citizen satisfaction survey as a tool of citizen relationship management of local government in Slovakia. *Serbian Journal of Management*, 2015(10): 117-129.

[16]   Havránek, T. and Iršová, Z. (2010). Meta-Analysis of Intra-Industry FDI Spillovers: Updated Evidence. Finance a úvěr - *Czech Journal of Economics and Finance*, 60(2): 151-174.

[17]   Hečková, J. and Chapčáková, A. (2011). Competitiveness of the Branch Structure of Slovak Manufacturing Industry in 1998-2008. *Ekonomický časopis*, 59(1): 59-78.

[18]   Huttmanová, E. and L. Synčáková. (2009). Dimensions for Evaluation of Sustainable Development and Human Development. Paper presented at the international conference Hradecke ekonomicke dny 2009, in Hradec Kralove, Czech republic.

[19]   Ježková, R. and Ježek, J. (2011). Podnikanie a jeho komunálna a regionálna podpora [Entrepreneurship and its municipal and regional support]. 1. Edition: EUROKÓDEX.

[20]   Kadeřábková, B. (2000). Economic growth and foreign direct investment. Paper presented at the international conference 2000, in Nitra, Slovakia.

[21]   Kincl, M. (2003). Investiční pobídky jako forma veřejné podpory [Investment incentives as a form of public support]. Linde.

[22]   Kotulič, R. (2006). Foreign direct investment and their influence on economic growth and regional development. *Review of Economic Perspectives*, 4(2): 15-25.

[23]   Lipsey, E. Rober, and Frederik Sjöholm. (2001). Foreign Direct Investment and Wages in Indonesian Manufacturing. Journal of Development Economics, No. 8299 (May), http://www.nber.org/papers/w8299 (accessed January 20, 2016).

[24]   Maier, G. and Tödtling, F. (1998). Regionálna a urbanistická ekonomika II. [Regional and urban economy II.]. Elita.

[25]   Matejková, E., Qineti, A. and Serenčéš, R. (2008). Macroeconomic aspects of the development of Slovak regions in the post-accession period. *Agricultural Economics – Czech*, 2008, 54(8): 367-375.

[26]   Mura, L., Buleca, J., Horvath, P., Machyniak, J. and Šebík, K. (2014). Identification of Funding of Regional Governments Using Correlation Analysis. *Procedia Economics and Finance*, 2014(15): 154-161.

[27] Nyen Wong, Koi, Soo Khoon Goh, and Hooi Hooi Lean. (2015). Foreign Direct Investments, Oil Prices and Global Financial Crisis: Evidence from Singapore. *Journal of Applied Economic Sciences*, 4(34): 22-26.

[28] Slavík, V., Grác, R. and Klobučník, M. (2011). Spatial Autocorrelation – Method for Defining and Classifying Regions in the Context of Socio-Economic Regionalization in the Slovak Republic. *Sociológia*, 43(2): 183-204.

[29] Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70: 65-94.

[30] Swan, T.W. (1956). Economic Growth and Capital Accumulation. *Economic Record*, 32: 334-361.

[31] Táncošová, J. and Slaný, A. (2004). Theoretical aspects of foreign direct investments. *Ekonomický časopis*, 2004, 52(1): 62-73.

[32] Tušan, R. and Bilá, A. (2006). Trvalo udržateľný rozvoj regiónov [Sustainable regional development]. TU Košice.

[33] Vidová, J. (2011). Establishment of Industrial Parks and their Effects on Unemployment in the Economy. *Ekonomický časopis*, 59(8): 823-840.

[34] Xiaming, L., Siler, P., Wang, C. and Wei, Y. (2000). Productivity Spillovers from Foreign Direct Investment: Evidence from UK Industry Level Panel Data. *Journal of International Business Studies*, 31(3): 407-425.

[35] Zamrazilová, E. (2007). Foreign direct investments in the Czech republic: selected macroeconomic issues. *Politická ekonomie*, 5: 579-602.

*** OECD. The Economics of International Investment Incentives. http://www.oecd.org/investment/investment policy/2487874.pdf

*** National Bank of Slovakia. Foreign Direct Investment. http://www.nbs.sk/sk/statisticke-udaje/statistika-platobnej-bilancie/priame-zahranicne-investicie

*** Statistical Office of the SR. Regional GDP. http://portal.statistics.sk/showdoc.do?docid=1804

APPENDIX

List of Abbreviations:

BA	Bratislava Region
BB	Banská Bystrica Region
KE	Košice Region
NR	Nitra Region
PO	Prešov Region
TN	Trenčín Region
TT	Trnava Region
ZA	Žilina Region
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
NUTS III	Statistical Territorial Unit (Region)
NBS	National Bank of Slovakia
SR	Slovak Republic
SD	Sustainable Development

Determinants of Leviathan in the European Countries

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Abstract:

The article focuses on factors that influence the government size, in literature known as revenue-maximizing Leviathan using the instrument of taxing. The theory admits two possibilities how to constrain the tax maximizing incentives of the "beast", constitutional constraint and intergovernmental competition. Investigation on Leviathan´s determinants is made using the cluster analysis of 30 European countries during the period from 1995 to 2014. After segmentation of countries into five clusters the regression models of fixed effects and random effects using panel data were estimated for each cluster. The influence of public deficit on Leviathan seems to be stable and negative. The influence of redistribution needs reflecting the population out of working age and country size on Leviathan is significant but varies depending on cluster. The importance of fiscal decentralization, which is according to overwhelming literature considered as a main constraint to the Leviathan, is feeble.

Keywords: government size, Leviathan hypothesis, fiscal decentralization, local government, local tax.

JEL Classification: H77.

1. Introduction

The undying interest in government size persists in current discussed topics, but the beginnings of the government size research could be found much earlier. Series of contributions intending on government size were published in the second half of the 20th century. The most known is the Leviathan hypothesis elaborated by Brennan and Buchanan (1980). It states that total government intrusion into the economy should be smaller, ceteris paribus, the greater the extent to which taxes and expenditures are decentralized. The Leviathan model of government assigns to government an objective of maximizing its size. Leviathan sets such a tax rates that maximize its tax revenue to reach the peak of Laffer curve. Two possibilities are negotiable; constitutional constraint and intergovernmental competition (Crowley and Sobel 2011, Pruitt 2014). The eligibility of decentralization in public sector was afore presented by Decentralization theorem (Oates 1972). Linkage between fiscal decentralization and government size consists in better match of citizens´ preferences and tax-expenditure nexus, in tailoring local public goods to local preferences and in reducing the corruption by increasing the accountability and visibility of local representatives. In addition, bringing government closer to people (Stansel 2006) means better information and thus vote against poor political performance or rent-seeking.

Government expenditures refer on demands of citizens for public spending. It is influenced by demographic and geopolitical factors. Countries with high share of population beyond the working age might have larger governments, because demand for redistribution encourages government spending (Rodden 2003). Rent- seeking (the concept originated by Adam Smith) appears when the natural information asymmetry between representatives and voters allows the representatives to fill their own pockets, what leads to a larger government spending (Krueger 1974). The other cause of government expenditure growth is politicians´ interest in reelection. Their electoral motivations attempt them to spend more, especially in election years (Delgado *et al.* 2011). Behaviour of representatives might be also opposite. Under the conditions of fiscal decentralization jurisdictions compete for mobile tax base (source of revenue) by reducing tax rates. The dropout of revenues causes cuts on the expenditure size of the local budget. Government size decreasing is accompanied by the disadvantage of tax competition, known as the race-to-the –bottom hypothesis (Musgrave 1959, Mendoza and Tesar 2005, Razin and Sadka 2011). Generally fiscal decentralization is thought to restrict the growth of the government expenditure, but on the other side, it can create a worrisome race-to-the bottom (Rodden 2003, Crowley and Sobel 2011, Horváth *et al.* 2013).

The aim of this article is to find out determinants of the government size through the empirical analysis, refereeing on other reliable studies in this field. According to former research the panel dataset of 30 countries from 1995 to 2014 was created. The data are remitted to cluster analysis which divides countries to more homogenous groups. After it panel regression analysis of each cluster is realized and results are discussed. The structure of the article reflects current requirements. Literature overview, methods and data and results are followed by conclusion and references.

2. The literature review

Available Leviathan literature considers the decentralization for the most important instrument of determining the government size (expenditures). The development of the connection of the fiscal decentralization and Leviathan is often based on panel estimation. Besides it, there is other stream of research accentuating the tax competition as a limit of the

Leviathan. Moreover, other political, institutional and demographical variables are included to the Leviathan´s determinants research.

Jin and Zou (2002) made an econometric analysis using panel data of 32 industrial and developing countries from 1980 to 1994.They monitored the impact of different types of fiscal decentralization measurements on various level of government – local, national and aggregate government. Political and institutional variables of the model were the lack of independency of central bank, federal or unitary constitution, subnational borrowing. Control variables were real GDP p.c., GDP growth p.c., openness, CPI changes and % of urban population. According to their results, expenditure decentralization reduces national government less than increases local government, so the aggregate effect is an increase of government size. Revenue decentralization, oppositely to expenditure decentralization, increases local government less than reduces national government, so the aggregate government size decreases. Vertical imbalance increases local and national government, so the aggregate government size increases. Fiva (2006) measures the effect of fiscal decentralization on size of the government using the regression analysis of panel data of 18 OECD countries. His results support the negative impact of fiscal (tax) decentralization on government size. The variables involved to the OLS estimation were unemployment, openness, population, rural population and population less than 15 years and 65 years over state constitution and political adherence to the left or center. The fixed- effects estimation varies in the state constitution variable. Ashworth *et al.* (2012) used a panel cointegration analysis to detect the impact of fiscal decentralization on growth of the government in 28 countries. Their conclusions distinguish between long run effects and short run effects; the raise of local government revenue causes in short term increase of government size and in the long term oppositely the decrease of government size, raise of local grants has positive influence on government size in long term, and increasing expenditure decentralization causes the short term increase of government spending The variables included to the estimation were quite similar to the Rodden´s (2003) except of the decentralization variable. Ashworth *et al.* (2012) created for their purpose a vector of dummy variable that capture the degree of decentralization of public expenditures. According to Rodden´s (2003) ECM model, fiscal decentralization restricts the growth of the government spending. He uses the possible complete balanced panels of 25 countries from 1980 to 1993. Independent variables tested in his fixed-effects model are share of grants on total revenues, share of own source subnational revenues on total revenue and its lags to reveal the long- time effects. Controls variables and their lags used in the estimation are GDP per capita, population, dependency ratio, share of trade on GDP, openness, democracy, central government surplus, veto players and other political dummy variables. He also discusses the negative influence of fiscal decentralization supporting the race-to-the bottom. Impact of tax competition within the EU community and the race-to-the –bottom hypothesis was tested in Horváth *et al.* (2013). The variation of tax revenue with a tax rate was calculated there and the negative sign of revenue derivative with respect to tax burden was achieved. Crowley and Sobel (2011) realizing the research in Pennsylvania found the constraint to Leviathan in the tax competition under the conditions of fiscal decentralization. They develop their own measure of the degree of decentralization called as „Leviathan ratio“, which is the proportion of current tax rates on tax rates of the Leviathan (those set at the peak of the Laffer curve). Increasing values of the Leviathan ratio indicates more of competitiveness. Pruitt (2014) estimates the USA Leviathan ratio introduced primarily by Crowley and Sobel (2011). She summarizes the occurrence of the government size limit. It is expected to vary inversely with the degree of fiscal decentralization, but different results refer to certain types and funding of fiscal decentralization. In accordance with fiscal competition theories, tax revenue decentralization reduces the size of government, and expenditure decentralization has a contradictory effect. Her research is based on comparing average tax rates to revenue-maximizing rates; she estimates the interstate tax competition using a spatial autoregressive model and measures the fiscal decentralization using a panel model. Her results support the fiscal decentralization as a constraint to the Leviathan. Variables describing the research´s objective are sales tax, personal income tax, expenditures p.c., income p.c., transfers p.c., population, population density, population in public schools, ratio of population of African American and index of state liberal ideology.

However Oates (1985) and (1989), who stands somewhere in the beginning of the Leviathan research, is not growth together with the idea of constraining the Leviathan by fiscal decentralization and tax competition. According to him, local governments have to face the increasing requirements of citizens in the field of the shift of responsibilities on local governments. More responsibilities imply more spending, so the increase of public sector is expected as a result.

3. Methods and data

One of two important analytical instruments used in this article is the cluster analysis also known as data segmentation. The algorithm of hierarchical clustering is used to find out similarities among analysed objects (Řezánková *et al.* 2009). Clustering measures the distance or dissimilarities between rows and columns of a matrix. It is a stepwise algorithm of merging two objects which have the least dissimilarity at each step. The goal is to create clusters which represent groups of objects that are similar according to chosen variables. The main principle of clustering is to obtain the highest possible similarity inside the group and the lowest similarity among different groups. The hierarchical

clustering is mostly based on Euclidean distance and Ward´s method, and its graphic output binary tree dendrogram with n-1 nodes, is well known.

Panel data are also known as longitudinal data or cross-sectional time-series data. In such as dataset the behaviour of entities is observed across the time. According to Hsiao (2003) panel data give a large number of data points what increases the degrees of freedom and reduces the collinearity among explanatory variables.

For panel data fixed-effects and random-effects models are estimated in this article.

We use a fixed – effect model to analyse the impact of variables that vary over time. In such a model individual effects are unobserved and correlated with explanatory variables. The intercept may vary across countries, but is time invariant (Greene 2011). This type of model allows for heterogeneity among countries by having its own intercept value. The equation for the fixed effects model becomes:

$$y_{it} = \alpha_i + \beta_1 x_{it1} + \beta_2 x_{it2} + ... + \beta_k x_{itk} + u_{it},$$
(1)

where α_i $(i=1, ...,n)$ is a fixed effect and represents an unknown intercept for each entity, y_{it} is dependent variable (where i=entity, i=1,...,n; t=time, t=1,...,T), x_{it} are independent variables, β are the coefficients and u_{it} is the error term (Lukáčiková and Lukáčik 2008).

In random – effects model individual effects are unobserved and uncorrelated with all independent variables. Countries have common intercept (Greene 2011). The equation for the random effects model becomes:

$$y_{it} = \beta_1 x_{it1} + \beta_2 x_{it2} + ... + \beta_k x_{itk} + (\alpha + \varepsilon_i) + u_{it}$$
(2)

where $\varepsilon_i + u_{it}$ is composed error term, which assumes also specific error term for each entity, α is an individual (random) effect, y_{it} is dependent variable (where i=entity, i=1,...,n; t=time, t=1,...,T), x_{it} are independent variables, β are the coefficients (Lukáčiková and Lukáčik 2008).

To decide between fixed effects model and random effects model the Hausman test is used (Baltagi 2001). Hausman test is about testing the Null hypothesis that GLS estimates are consistent, if p-value <0.05, Null hypothesis is rejected and we follow the fixed effects model.

Data are analysed trough the econometric program R 3.2.3 and program Gretl. The input to the econometric processing is a pre-prepared dataset of chosen variables of the EU countries. The main source of data used in this article is the Eurostat. Obtained dataset is a panel:

- data are collected from 1995 to 2014 at annual base, so there is a 20 years long period monitored,
- dataset includes 30 European countries, including EU countries (Malta was excluded because of missing data) and other European countries as Switzerland, Iceland and Norway,
- various fiscal, demographic, macroeconomic and political variables are analysed -fiscal variables are total government expenditures, public deficit and the relative of local government revenues on total government revenues. Macroeconomic indicator is GDP per capita. Demographic variables are the total country´s population, and for other needs, the population less than 15 years and 65 years over. Political variable is the democracy indicator.

All hereinbefore mentioned variables served as input to the cluster analysis. As there were some technical difficulties in clustering the panel data, averages were computed for each variable and country. Following the clustering algorithm, the distance matrix was computed in R and under the obvious hierarchical clustering procedure the dendrogram was plotted to find out optimal number of clusters and cluster composition (countries´ membership to the cluster). After the decomposition into clusters, the primary panel dataset was divided in sub-datasets which entered the econometric estimation.

Econometric estimation is based on mentioned linear regression models for panel data, where the dependent variable is the government size; explanatory variables are GDP per capita, indicator of redistribution needs, indicator of fiscal decentralization, country size, public deficit and political indicator. The nature of variables is as following:

- For measuring the government size – the Leviathan, the variable total government expenditures is used according to available literature as Ashworth *et al.* (2012). Total government expenditures is mentioned as percentage of GDP. The Eurostat database offers the data in the Annual government finance statistics.
- GDP per capita is computed form GDP at market prices and total population of country from the Eurostat.
- Variable introducing the redistribution needs of the public sector is composed from the share of population less than 15 years old and 65 years over on total population on 1st January. It is unvaried from those mentioned in Rodden (2003) or Ashworth *et al.* (2012) (dependency ratio). This variable is often connected with shifting the pay-off of the shared tax to local government under the conditions of fiscal decentralization. Data are collected according to the Eurostat database.

▪ Fiscal decentralization can be measured by various indicators. According to Fiva (2006) studies describe the degree of fiscal decentralization as subcentral share of total government expenditures or revenues. In Horváthová *et al.* (2012) are mentioned similarly to Fiva (2006): the share of total local government revenues on total general government revenues – revenue decentralization, the share of total local government expenditures on total general government expenditures – expenditure decentralization, the share of local government taxes on total general government revenues - tax revenue decentralization. Other adjusted indicators are share of local government taxes and grants on total general government revenues (Fiva 2006). Data for total general and local government expenditures, total general and local government revenues, local government taxes and local government grants are mentioned as percentage of GDP and are available in Annual government finance statistics on Eurostat. For the article purpose the revenue decentralization indicator was used following the significance appearance of this indicator in Horváthová *et al.* (2012). In addition, preliminary calculations did not support the expenditure decentralization variable significance. Unfortunately, tax revenue decentralization was excluded from the investigation due to the absence of data, although its importance was reasoned in Rodden (2003) and Fiva (2006). The application of adjusted indicator of Fiva (2006) including local grants bounced the incomplete dataset, what disabled its utilization in the cluster analysis. A vector dummy variable for decentralization of Ashworth *et al.* (2012) is indeed inspiring, the decision to not emulate it was taken according to none significance of administration decentralization variable in Horváthová *et al.* (2012).

▪ Country size is expressed by country´s total population on 1st January. The source is Eurostat.

▪ Public deficit data are obtained from the annual government finance statistics – government deficit/surplus as a percentage of GDP mostly from the Eurostat database, missing values were completed from the Global Economy database.

▪ Political indicator is dummy variable of political regime of the country. The values according to Polity IV Database are scored from 6 to 10 if the country is a democracy, from -6 to -10 if autocracy and from -5 to 5 of anocracy. In the case of European countries, most of them are full democracies or democracies and values ranges from 8 to 10.

3. Results

Result of hierarchical clustering countries according to variables government size (totexp), GDP per capita (gdppc), country size (pop), redistribution needs (redistribution), fiscal decentralization (locrevtotrev), public deficit (pubdef) and policy (democracy) is shown in Figure 1.
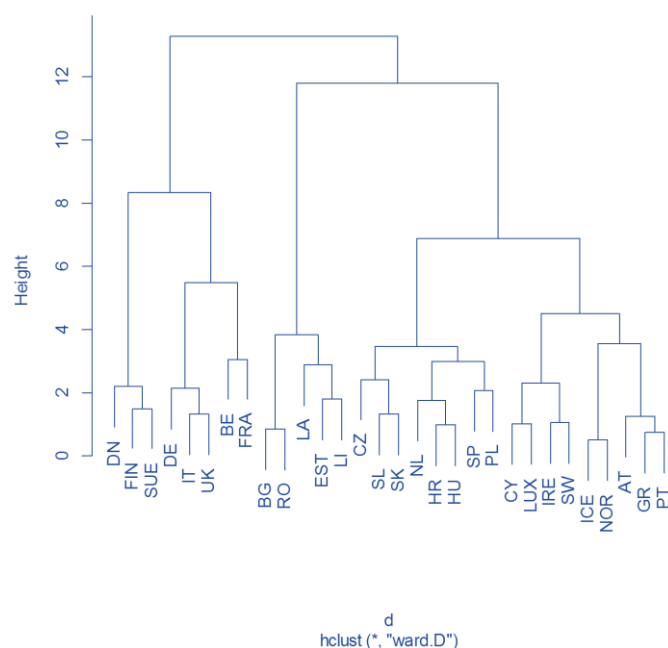
Source: Author´s calculation, R

Figure 1 - Cluster dendrogram

For searching the optimum it is necessary to analyse the Figure 1. According to author´s opinion, two possibilities come in to the question: at the height 8 four clusters are suitable and at height 6 five clusters are suitable. If there were only four clusters, the cluster created on the right side of the cluster tree would include two smaller groups. They could be clearly separated. Hence five clusters should be the optimum. Cutting the dendrogram in five clusters is shown in Figure 2.
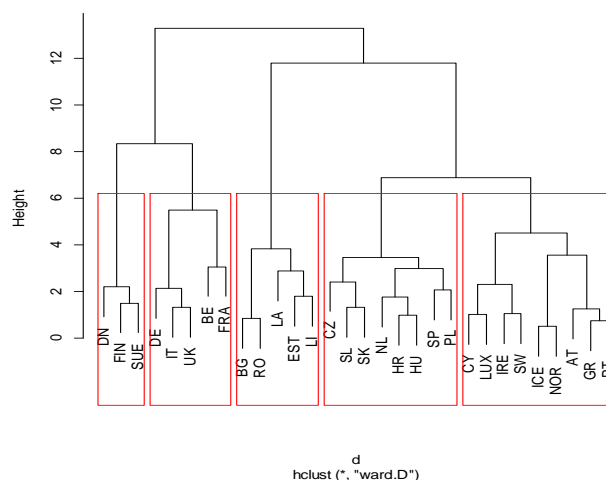
Source: Author´s calculation, R

Legend: BE-Belgium, BG-Bulgaria, CZ-Czech Republic, DN-Denmark, DE-Germany, EST-Estonia, IRE-Ireland, GR-Greece, SP-Spain, FRA-France, HR-Croatia, IT-Italy, CY-Cyprus, LA-Latvia, LI-Lithuania, LUX-Luxemburg, HU-Hungary, NL-Netherlands, AT-Austria, PL-Poland, PT-Portugal, RO-Romania, SL-Slovenia, SK-Slovakia, FIN-Finland, SUE-Sweden, UK-United Kingdom, ICE-Iceland, NOR-Norway, SW-Switzerland

BE	BG	CZ	DN	DE	EST	IRE	GR	SP	FRA	HR	IT	CY	LA	LI	LUX	HU	NL	AT	PL	PT	RO	SL	SK	FIN	SUE	UK	ICE	NOR	SW
1	2	3	4	1	2	5	5	3	1	3	1	5	2	2	5	3	3	5	3	5	2	3	3	4	4	1	5	5	5

Figure 1 - Cutree Cluster dendrogram – 5 clusters, memebrs of clustres

According to the Figure 2 legend, the adherence of each country to one of five clusters is visible. From the left side of the Figure 2 the order of clusters is following: cluster 4, cluster 1, cluster 2, cluster 3 and cluster 5. Membership of countries is clearly classified in Table 1.

Table 1 – Members of clusters

Cluster	Members
1	Belgium, Germany, France, Italy, United Kingdom
2	Bulgaria, Estonia, Latvia, Lithuania, Romania,
3	Czech Republic, Spain, Croatia, Hungary, Netherlands, Poland, Slovenia, Slovakia,
4	Denmark, Finland, Sweden
5	Ireland, Greece, Cyprus, Luxembourg, Austria, Portugal, Iceland, Norway, Switzerland

Source: Author´s calculation, Gretl

In the next part of this article the descriptive statistics is made for each cluster. In the cluster 1 the most developed countries of Western Europe (Belgium, Germany, France, Italy and United Kingdom) are involved. Its descriptive statistics is shown in Table 2.

Table 2 - Descriptive statistics of cluster 1 variables

Variable	totexp	gdppc	pop	redistribution	pubdef	locrevtotrev	democracy
Mean	48,670	0,025	5,472e+007	0,340	-3,125	0,225	9,8
Median	48,850	0,026	5,971e+007	0,343	-3,100	0,211	10
Minimum	37,800	0,015	1,013e+007	0,312	-10,800	0,127	9
Maximum	57,500	0,036	8,254e+007	0,366	1,200	0,351	10
Std. Dev.	4,695	0,006	2,385e+007	0,011	2,331	0,072	0,402
Skewness	-0,325	-0,193	-0,973	-0,759	-0,683	0,222	-1,5
Kurtosis	-0,359	-1,008	-0,236	0,094	0,996	-1,5	0,25

Source: Author´s calculation, Gretl, Summary Statistics, using the observations 1:01 - 5:20

The cluster 2 besides Bulgaria and Romania includes all Baltic countries, what refers to their common development trends. As Šuliková, V., Siničáková, M. and Horváth D. (2014) mention, Estonia, Lithuania and Latvia belong to small open economies, they represent a sample of the most successful countries in the field of public finance administration and their GDP, public debt, current account and investments are comparable. Descriptive statistics of cluster 2 is in Table 3.

Table 3 - Descriptive statistics of cluster 2 variables

Variable	totexp	gdppc	pop	redistribution	pubdef	locrevtotrev	democracy
Mean	37,357	0,006	7,233e+006	0,325	-1,831	0,239	9
Median	36,850	0,005	3,377e+006	0,323	-1,400	0,245	9
Minimum	30,500	0,001	1,316e+006	0,309	-11,800	0,117	8
Maximum	50,300	0,015	2,271e+007	0,343	2,900	0,323	10
Std. Dev.	3,304	0,004	7,480e+006	0,009	2,837	0,045	0,636
Skewness	0,997	0,694	1,216	0,435	-1,090	-0,725	0,00
Kurtosis	1,470	-0,549	-0,156	-0,752	1,423	0,161	-0,50

Source: Author´s calculation, Gretl, Summary Statistics, using the observations 1:01 - 5:20

Cluster 3 is composed from the Visegrad group countries (Czech Republic, Hungary, Poland and Slovakia) and also other post-transitive countries as Croatia and Slovenia. This classification again points similar tendencies in economic development of these countries as was the example of Baltic countries in the previous cluster. Fiscal and demographical development of Spain and Netherlands seems to be similar to those of above mentioned countries. Descriptive statistics of cluster 3 variables is represented in Table 4.

Table 4 - Descriptive statistics of cluster 3 variables

Variable	totexp	gdppc	pop	redistribution	pubdef	locrevtotrev	democracy
Mean	45,108	0,013	1,621e+007	0,312	-4,101	0,249	9,875
Median	45,100	0,010	1,023e+007	0,314	-3,650	0,273	10
Minimum	36,100	0,003	1,978e+006	0,278	-15,000	0,064	9
Maximum	60,300	0,039	4,682e+007	0,343	2,200	0,477	10
Std. Dev.	3,893	0,009	1,482e+007	0,015	2,818	0,078	0,332
Skewness	0,368	1,304	0,949	-0,283	-0,711	-0,280	-2,268
Kurtosis	0,715	1,098	-0,721	-0,671	1,270	-0,381	3,143

Source: Author´s calculation, Gretl, Summary Statistics, using the observations 1:01 - 8:20

Northern European countries Denmark, Finland, Sweden are involved in isolated cluster 4. The absence of the Norway (and its consequential classification to the cluster 5) could be caused by its high and positive values for the public (deficit) surplus variable. Table 5 shows the descriptive statistics of the cluster 4.

Table 5 - Descriptive statistics of cluster 4 variables

Variable	totexp	gdppc	pop	redistribution	pubdef	locrevtotrev	democracy
Mean	53,737	0,034	6,587e+006	0,343	0,2900	0,474	10
Median	53,150	0,034	6,587e+006	0,340	0,000	0,440	10
Minimum	46,800	0,020	5,099e+006	0,326	-7,000	0,321	10
Maximum	63,500	0,046	9,645e+006	0,365	6,900	0,661	10
Std. Dev.	3,819	0,007	1,796e+006	0,011	2,936	0,104	0
Skewness	0,298	-0,048	0,718	0,420	0,420	0,367	undefined
Kurtosis	-0,522	-0,838	-1,431	-1,078	-0,418	-1,175	undefined

Source: Author´s calculation, Gretl, Summary Statistics, using the observations 1:01 - 3:20

Cluster 5 seems to be overall, is quite heterogeneous and ranges from countries that are considered as developed to countries with worse economic indicators. Ireland, Greece, Cyprus, Portugal and Iceland have faced to high public deficits in the period of economic crisis (for example public deficit variable met his minimum in Ireland 2010 (-32.3 according to Eurostat)). The membership of Luxembourg, Austria, Switzerland and Norway in this cluster could be interpreted as faultiness of the clustering procedure, when similarly to Gazda *et al.* (2014) the distances among all objects are computed, and the extreme values are put in the same groups, though the intuition supports the divergent trends among them. Descriptive statistics of cluster 5 variables is represented in Table 6.

Table 6 - Descriptive statistics of cluster 5 variables

Variable	totexp	gdppc	pop	redistribution	pubdef	locrevtotrev	democracy
Mean	42,999	0,035	5,244e+006	0,330	-0,952	0,179	10
Median	42,700	0,032	4,606e+006	0,328	-1,155	0,168	10
Minimum	30,800	0,009	266978,0	0,293	-32,300	0,036	10
Maximum	65,700	0,089	1,112e+007	0,360	13,80	0,413	10
Std. Dev.	6,603	0,019	3,976e+006	0,013	6,737	0,087	0,0
Skewness	0,221	0,832	0,056	0,015	0,107	0,369	undefined
Kurtosis	-0,141	-0,037	-1,486	0,162	2,426	-0,444	undefined

Source: Author´s calculation, Gretl, Summary Statistics, using the observations 1:01 - 9:20

As mentioned above, in the "Methods and data" part of this article, data segmentation through the clustering serves to create more homogenous groups of countries. These groups came under the econometric estimation. Dependent variable is the government size; explanatory variables are GDP per capita, indicator of redistribution needs, indicator of fiscal decentralization, country size, public deficit and polity indicator.

Results of estimations are in Table 7. For the cluster 1, 2, 4 and 5 fixed-effects model is appropriate, for the cluster 3 the random effects model.

Table 7 - Regression analysis

	CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 4	CLUSTER 5
	Fixed effects model (HAC)	Fixed effects model (HAC)	Random effects model (HAC)	Fixed effects model (HAC)	Fixed effects model (HAC)
const	28,93*	8,11	4,29	18,29	40,68
gdppc	67,58	21,61	−20,01	−200,46**	−80,02
pop	5,22e-07***	−1,33e-07	−6,85e-08	−4,47e-06***	3,07e-06
redistribution	−19,28	90,41***	74,55***	189,86***	−40,25***
pubdef	−0,97***	−1,05***	−0,88***	−0,82***	−0,86
locrevtotrev	−30,89	−5,22	−9,57**	14,60	8,26
democracy	Omitted due to exact collinearity	Omitted due to exact collinearity	1,79	Omitted due to exact collinearity	Omitted due to exact collinearity
R-squared	0,83	0,60	Hausman test p-value = 0,77	0,93	0,71
Durbin-Watson	0,42	1,08		0,91	0,40
*** denotes 1% significance level, ** 5% significance level, *10% significance level					
Robust (HAC) standard errors					

Source: Author´s calculation, Gretl

Fixed-effects model for the cluster 1 shows the impact of the variable country size (pop) and public deficit (pubdef) on the Leviathan (total government expenditures). Impact of the country size on Leviathan is positive, against that the impact of public deficit is negative. For the cluster 2 also the fixed-effects model was estimated and the results indicate the positive influence of the redistribution variable on the government size, and negative impact of the public debt. Random-effects model for the cluster 3 expresses the impact of three variables on Leviathan´s size. Positive impact of the variable redistribution accompanies the negative impact of the public deficit and fiscal decentralization on total government expenditures. In cluster 4 according to fixed-effects model four variables influent the size of government. The positive impact is remarkable in case of the redistribution variable. Variables GDP per capita, country size and public debt have negative influence on Leviathan. Cluster 5 is characterized as the most heterogeneous according to its membership countries, so the fixed-effects model presents only one significant variable. Negative impact of the redistribution variable on Leviathan is observable.

Following the methodology of Rodden (2003), Ashworth *et al.* (2012) or Horváthová *et al.* (2012) lagged estimators were covered to the model. The assumption of 1 period lagged influence of variables redistribution; public deficit and fiscal decentralization were introduced. The results of lagged models recapitulated in Table 8 do not vary markedly from those in Table 7. In addition the R-squared was reduced.

Table 8 - Regression analysis: Lagged models

	CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 4	CLUSTER 5
	Fixed effects model (HAC)	Fixed effects model (HAC)	Random effects model (HAC)	Fixed effects model (HAC)	Fixed effects model (HAC)
const	25,21	2,99	4,02	−28,06	42,50
gdppc	66,30	113,73	104,76**	−372,31***	−165,89*
pop	8,31e-07***	2,63e-07	−1,86e-08	−7,81e-07	7,57e-06*
redistribution_1	−74,52	91,86***	92,52***	216,47***	−102,85**
pubdef_1	−0,44***	−0,54***	−0,41***	−0,35	−0,40***
locrevtotrev_1	0,32	4,02	−9,25	54,37	1,35
democracy	Omitted due to exact collinearity	Omitted due to exact collinearity	1,17	Omitted due to exact collinearity	Omitted due to exact collinearity
R-squared	0,63	0,18	Hausman test p-value = 0,16	0,81	0,38
Durbin-Watson	1,05	1,43		1,22	1,28
*** denotes 1% significance level, ** 5% significance level, *10% significance level					
Robust (HAC) standard errors					

Source: Author´s calculation, Gretl

There are not important differences in the cluster 1 fixed-effect models. Here the country´s size positive impact and lagged public deficit´s negative impact on the Leviathan is comparable with this in Table 7. Lagged fixed-effects model for cluster 2 shows the positive impact of lagged redistribution and negative impact of lagged public deficit on Leviathan likewise in previous case. For the cluster 3 is in the lagged random-effects model significant variable GDP per capita contrary to model without lags. The impact of redistribution and public deficit is the same and the variable fiscal decentralization lost his significance in the lagged model. The fixed-effects model with lags of cluster 4 shows the comparable significance of GDP per capita and lagged redistribution. Variables country size and lagged public deficit are not significant. Redistribution variable was the only one significant in the cluster 5 fixed-effects model. In the model with lags, some other variables are significant. Negative impact of GDP per capita, positive impact of country size and negative impact of lagged public deficit on Leviathan is observable.

Conclusion

This study examines constraints of government expenditures. For this purpose 30 European countries where divided into five groups using the cluster analysis. Clusters represent the segmentation of countries according to their fiscal, macroeconomic, demographic and political variables, monitored in period from 1995 to 2014, finding the maximum similarity inside the cluster and maximum difference among clusters. After, an econometric model was estimated for each cluster separately. The goal of investigation was to reveal the significant influence of a set of variables on the Leviathan. Fixed-effects or random effects models for panel data were estimated, and as the previous studies mention, lagged models were also introduced. The results of the impact of fiscal decentralization on the Leviathan do not support strongly the theory presented in the available literature. The negative influence of the revenue decentralization variable is observable only in case of cluster 3 composed from former transitive economies of Czech Republic, Croatia, Hungary, Poland, Slovenia, Slovakia and other countries as Spain and Netherlands. The assumption that fiscal decentralization decreases the government size was not confirmed in other clusters or in lagged models. But other determinants of Leviathan are important. The influence of public deficit on the government size is negative; the increase of public deficit and public deficit with 1 year lag causes de decrease of government expenditures, what reflects on cuts in government expenditures. The influence of the redistribution variable is mostly significant, but varies depending on cluster. For clusters 2, 3 and 4 it has a positive impact contrary to its impact on the Leviathan inn cluster 5. Lagged redistribution has equal results. The economic interpretation refers to raised demand on redistribution transfers on the expenditure side of the budget. Country size has positive impact on Leviathan in cluster 1, but negative in cluster 4. Lagged models show positive impact of this variable for cluster 1 and 5. As larger are the population; more public services and goods have to be provided by public sector. GDP per capita is significant in cluster 4 and for lagged models in cluster 3, 4 and 5. Its positive impact on the Leviathan was expected confirming the concept of government spending income elasticity. Results varies, in cluster 4 its impact is negative, and in lagged models for cluster 3 its impact is positive and for cluster 4 and 5 is negative. Variable democracy was mostly omitted from the estimation due to exact collinearity.

Acknowledgement

References

[1] Ashworth, J., Galli, E. and Padovano, F. (2012). Decentralization as a constraint to the Leviathan: A panel cointegration analysis. *Public Choice* http://link.springer.com/article/10.1007%2Fs11127-012-9962-8#/page-1 (accessed January 12, 2016).

[2] Baltagi, B. H. (2001). Econometric Analysis of Panel Data. 2. Edition. Chichester: John Wiley & Sons, Ltd. 293 s. I.

[3] Brennan, G. and Buchanan J. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. New York: Cambridge University Press.

[4] Crowley, G.R. and Sobel, R.S. (2011). Does Fiscal Decentralization constrain Leviathan? New evidence from local property tax competition, Public Choice 149, 5-30.

[5] Delgado, F.J., Lago - Penas, S. And Mayor, M. (2011). On the determinants of local tax rates: new evidence from Spain, 2011. Working Papers 2011/4, Institut d'Economia de Barcelona.

[6] Fiva, H. J. (2006). New evidence on the effect of fiscal decentralization on the size and composition of government spending. *FinanzArchiv/ Public Finance Analysis* 62(2): 250-280.

[7] Gazda, V., Šuliková, V., Horváth, D., Siničáková, M. and Horváth J. (2014). On the structure of European Economic and Monetary Union - clues from the data and economic intuition. *Procedia Economics and Finance: Emerging Markets Queries in Finance and Business*: 24-27 October 2013, Tîrgu Mureş, Romania. 15: 200-205.

[8] Greene, W. (2011). Économétrie, Édition francophone, 7e Édition, Pearson Education France.

[9] Horváth, D., Maličká, L. and Gazda, V. (2013). Towards a Proability Transition Matrix Model of the Tax Competition. In: *Economic Computation and Economic Cybernetics Studies and Research*. 47(4): 1-14.

[10] Horváthová, L. *et al.* (2012). Fiscal Decentralization and Public Debt in the Europeam Union. *Lex Localis: Journal of Local Self-Government*. 10(3): 265-276.

[11] Hsiao, Ch. (2003). Analysis of Panel Data. 2nd Edition [online] Cambridge: Cambridge University Press. http://books.google.sk/books?id=i9iPG7C3EP4C&printsec=frontcover&hl=sk&redir_esc=y#v=onepage&q&f=false (accessed January 13, 2016)

[12] Jin, J., and Zou, H. (2002). How Does Fiscal Decentralization Affect Aggregate, National, and Subnational Government Size? *Journal of Urban Economics,* 52: 270–293.

[13] Krueger, A.O. (1974). The Political Economy of the Rent Seeking Society, In: *The American Economic Review*, 64(3). Available at https://www.aeaweb.org/aer/top20/64.3.291-303.pdf (accessed January 13, 2016)

[14] Lukáčiková, A. and Lukáčik, M. (2008). Ekonometrické modelovanie s aplikáciami. Bratislava: Vydavateľstvo EKONÓM.

[15] Mendoza, E.G. and Tesar, L.L. (2005). Why hasn´t tax competition triggered a race-to-the-bottom? Some quantitative lessons from the EU. *Journal of Monetary Economics,* 52:163-204.

[16] Musgrave, R. (1959). The Theory of Public Finance. New York: McGraw

[17] Oates, W.E. (1972). Fiscal Federalism, Harcourt, New York.

[18] Oates, W.E. (1985). Searching for leviathan: an empirical study. *The American Economic Review,* 75(4): 748-757.

[19] Oates, W.E. (1989). Searching for Leviathan: A reply and some further reflections, *The American Economic Review* 79. 578–583.

[20] Pruitt, J. (2014). Fiscal Decentralization and State-Level Tax Competition: A Leviathan Perspective. http://www.antolin-davies.com/theses/pruitt.pdf (acessed January 17, 2016)

[21] Razin, A., Sadka. E. (2011). Tax Competition and Migration: The Race-to-the-Bottom Hypothesis Revisited. NBER Working Paper Series. No. 11670, https://www.uclouvain.be/cps/ucl/doc/econ/documents/textesadka.pdf (acessed January 12, 2016)

[22] Řezánková, H., Húsek, D. and Snášel, V. (2009). *Zhluková analýza dat.* Professional Publishing. PBTisk, Příbram, Druhé vydání.

[23]   Rodden, J. (2003). Reviving Leviathan: Fiscal Federalism and Growth of Government. *International Organization* 57, 695–729.

[24]   Stansel, D. (2006). Interjurisdictional competition and local government spending in U.S. metropolitan areas. *Public Finance Review* 34(2): 173-194.

[25]   Šuliková, V, Siničáková, M. and Horváth D. (2014). Twin Deficits in Small Open Baltic Economies: In: *Panoeconomicus*. Vol. 61, no. 2 (2014), p. 227-239.

***   Eurostat http://ec.europa.eu/eurostat/help/new-eurostat-website (accessed January 10, 2016).

***   Polity IV http://www.systemicpeace.org/polity/polity4.htm (accessed January 10, 2016).

***   The Global Economy.com http://www.theglobaleconomy.com (accessed January 10, 2016).

Cantonal Convergence in Ecuador: A Spatial Econometric Perspective

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Abstract

The paper analyses the convergence process of Ecuadorian cantons during the period 2007-2012 accounting for the role of spatial spillovers through using spatial econometrics. The advantage of this technique is to provide reliable estimations because it takes into account the spatial interaction in the territory. In addition, it allows identifying clusters of cantons characterised by similar spatial patterns that can be interpreted as convergence clubs because they represent areas with similar initial conditions in the "basin of attraction" that, according to economic theory, converge to a common steady state equilibrium.

The results highlight that a convergence process is present, but it involves the cluster of most developed cantons. This opens various policy implications related to i) the capacity of cantons to take advantage from the positive dynamics of neighbours, ii) the persistence of development in some circumscribed areas, and iii) the spatial unbalanced development.

Keywords: subnational convergence, spatial econometrics, convergence clubs, Ecuador.

JEL Classification: C21, O47, R11.

1. Introduction

The recent economic history of Ecuador has been characterised by serious instabilities that were the result of inefficient and ineffective policies that caused structural failures whose magnitude jeopardized the achievement of higher levels of development. One of them is represented by the severe provincial disparities still persisting in Ecuador, reflected in a heterogeneous economic and social geography, which accounts for provinces with asymmetric characteristics in terms of productivity and competitiveness, as well as in terms of differentiated population and social. These asymmetries between subnational areas can inhibit the growth of domestic production and contribute to its instability, becoming a problem of circular causation that can undermine the future development of the whole country. This process of unbalanced growth justifies the implementation of compensatory territorial policies whose effects have to be tested in light of the latest progresses of economic and econometric theories. The endogenous growth theory, in particular, put emphasis in the role of spillovers in order to determine the growth pattern of an economy. These spillovers, called dynamic externalities, may have various sources and are often directly linked with agglomeration economies. In contrast with traditional localization and urbanization economies, dynamic externalities explain both the formation of urban areas and local economic development over time. Under a methodological point of view, in this paper cantonal convergence in Ecuador will be evaluated by mean of spatial econometrics, a technique that accounts explicitly the first law of geography according to which everything is related to everything else, but near things are more related than distant things (Tobler 1970).

This concept is translated into a statistical indicator called Moran's I which relates the value of a variable to the values of the same variable in the neighbours locations. In literature it is demonstrated that socio-economic variables are strongly correlated to their relative location in space creating spatial dependence, i.e. spatial clusters with homogeneous values. Spatial dependence, which has implications for the correct estimates of the parameters in the basic regression models, will be explicitly accounted in order to estimate models that consider this evidence, reaching a double advantage: to obtain reliable results and to account for the role of space in economic growth, that, according to recent literature, cannot be neglected.

In addition, concerning the spatial heterogeneity problem, we determine spatial regimes according to Moran's I, which are interpreted as spatial convergence clubs (Ertur *et al.* 2006), to capture territorial polarization pattern observed in Ecuadorian cantons.

The paper is structured into four further sections. The first one deals with the concept of endogenous growth theory and spatial spillovers. The second section covers the estimation technique in presence of spatial spillovers, before proceeding to analyse the economic convergence of Ecuador. The final section consists of the conclusions and the possible policy implications.

2. From endogenous growth theory to spatial spillovers

Economic growth and convergence is a topic that has been widely studied by scholars in the last decades. Theoretical contribution shave been based on the seminal contribution of Barro and Sala-i-Martin (1991) and Mankiw *et al.* (1992) and have considered the role of different factors in determining the steady state level of income per capita and in fostering growth. The models based on neoclassical assumptions, anyway, do not account explicitly for the role of geography as a crucial factor that can affect the path of growth of regions and nations. This is highlighted explicitly by Rey and Montouri (1999, 144), who indicate that "despite the fact that theoretical mechanisms of technology diffusion, factor mobility and transfer payments that are argued to drive the regional convergence phenomenon have explicit geographical components, the role of spatial effects in regional studies has been virtually ignored". Under a theoretical point of view, these empirical evidences can be considered as a confirmation of the endogenous growth theory. According with Martin and Sunley (1998, 208): "there are two different types of endogenous growth theory which envisage different sorts of increasing returns: endogenous broad capital models and endogenous innovation models (Crafts 1996). Endogenous broad capital models can be further separated into two sets: those which simply show capital investment as generating externalities, and those which emphasise human capital and relate technological change to 'learning by doing' and 'knowledge spillovers'. The second type, endogenous innovation growth theory has been labelled Schumpeterian because it emphasises the returns to technological improvements arising from deliberate and intentional innovation by producers". The summary of the characteristics of the endogenous growth models is in Table 1.

Table 1 - A typology of 'New' Growth Theories

Type of growth theory	"Engine of growth"	Spread (basis point) (Student copulas)
Endogenous broad capital	Capital investment, constant returns through capital spillovers;	Cumulative divergence but shaped by government spending and taxation;
Intentional human capital	Spillovers from education and training investment by individual agents;	Dependent on returns investment, public policy and patterns of industrial and trade specialization;
Schumpeterian endogenous innovation	Technological innovation by monopolistic producers with technological diffusion, transfer and imitation;	Multiple steady states and persistent divergence. Possible club convergence and "catch up";
Augmented Solow neoclassical	Physical and human capital, exogenous technological process universally available.	Slow and conditional convergence – with club of countries with similar socio-economic structure.

Source: Martin and Sunley (1996)

The endogenous growth theory puts emphasis in the role of spillovers in order to determine the growth pattern of an economy. These spillovers, called dynamic externalities, may have various sources and are often directly linked with agglomeration economies[11]. In contrast with traditional localization and urbanization economies, dynamic externalities explain both the formation of urban areas and local economic development over time. We can recall three main theories on dynamic externalities that consider their different nature and origin. Marshall-Arrow-Romer (MAR) externalities (Marshall 1890, Arrow 1962, Romer 1986) arise from intra industry knowledge spillovers (Glaeser *et al.* 1992). Increased concentration of firms of the same industry within a region facilitates knowledge spillovers, which in turn increases productivity. In this sense, local monopoly benefits innovations and then promotes growth. Porter (1990) agrees with MAR theory but argues that a higher degree of local competition induces firms to innovate to remain competitive. Therefore, while for Porter externalities competition is good for economic growth, for MAR externalities it is not. Finally, contrary to MAR externalities, the so-called Jacobian externalities emphasise the inter industry knowledge spillovers (Jacobs 1969); diversity among firms is then beneficial and competition, like for Porter externalities, is good for economic growth.

These types of externalities have an explicit spatial dimension because the intensity and magnitude of knowledge transfersdepend from the proximity of firms and/or regions to which firms belong. This idea refers to the well-known first law of geography stated by Tobler (1970), that following Ertur and Koch (2007), we can write formally by means of a standard Cobb-Douglas production functionthat includes spatial externalities:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \qquad \text{with } 0 < \alpha < 1 \qquad (1)$$

where Y_i is the output, K_i is the input capital, L_i is the input labour and the aggregate level of technology A_t is defined as follows:

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[11] For a review of growth models and agglomeration see Baldwin and Martin (2004).

$$A_{it} = \Omega_t k_{it}^{\theta} \prod_{\substack{j \neq i}}^{N} A_{ji}^{\rho W_{ij}} \tag{2}$$

where $\Omega_t = \Omega_0 e^{\mu t}$ is the common stock of knowledge which grows at rate μ. This factor reflects the knowledge progress due to the belonging to a given group of country. The technology level A_{it} is given by two additional terms: physical capital and the stock of knowledge in the neighbouring regions. The weight of the physical capital is determined by θ, varying between 0 and 1. The exponent W_{ij}, is the spatial weight matrix which measures the strength of proximity of each pair of locations and that will be explained in detail in the following section. Finally, the scalar ρ determines the strength of the technological spatial spillovers due to the proximity to other regions and it is assumed to vary between 0 and 1.

3. Econometric estimation of spatial spillovers

Spatial weights matrix

The "degree" of advantage that a region can take from spatial spillovers depends from its relative spatial location, i.e. from the average distance from other regions, which is fundamental to measure the possibility of diffusion of the knowledge process. In this extent, as recalled by the first law of geography, the definition of distance is crucial. According to literature, the notion of distance can refer to a wide range of alternative definitions that can be classified into three main categories:
- Physical distance: based on the physical characteristics of a territory;
- Socioeconomic distance: based on the cultural or economic closeness of some territories;
- Mixed physical-socioeconomic distance: based on a weighted mixture of the two previous concepts.

Physical distance has various dimensions. Among the most used there are Rook and Queen criterion (Figure 1a and 1b) which consider two locations as neighbours if they have at least a border and a point in common, respectively. Then, we have k-means criterion (Figure 1c) where the number of closest neighbours is fixed *a priori* and the kernel based distance[12] (Figure 1d) in which the neighbours are weighted in function of their physical distance (in linear or route kilometres, miles or travel time) from the study region[13].

a) Rook contiguity criterion
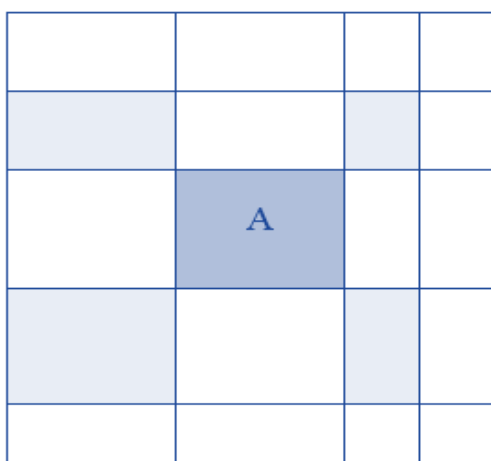
b) Queen contiguity criterion
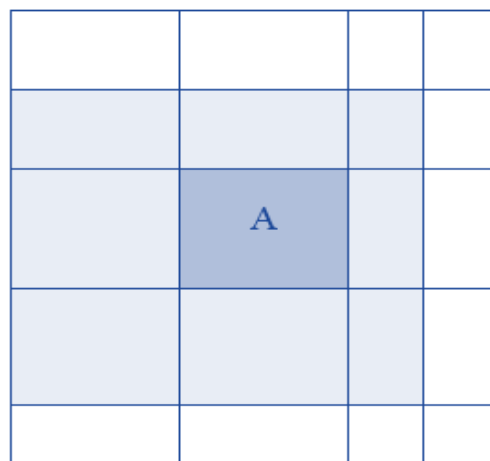
c) K-means contiguity criterion (k = 2)

d) Kernel based distance

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[12] The most common kernels are the Gaussian function $w_{ij} = exp(-0.5 \times d_{ij}^2/h_{ij}^2)$ and the modified bi-squared function $w_{ij} = [1 - (d_{ij}^2/h_{ij}^2)]^2$, accounting only for the N closest neighbours whose distance h_{ij} is smaller than the threshold distance d_i. Otherwise $w_{ij} = 0$.

[13] In the case of k-means and Gaussian criterion, the distance is calculated with respect to the centroids of the polygons. The centroid or geometric center of a two-dimensional region is the arithmetic mean, or average, position of all the points in the shape.
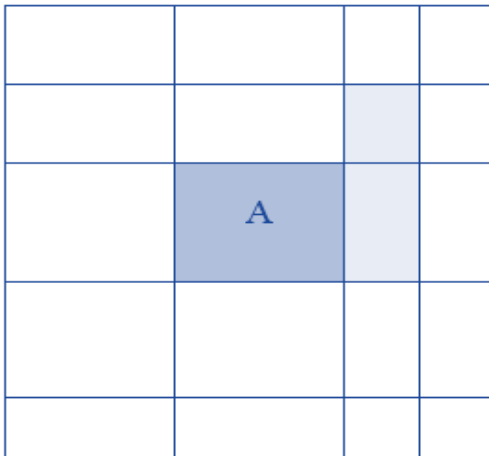
Source: authors' elaboration.
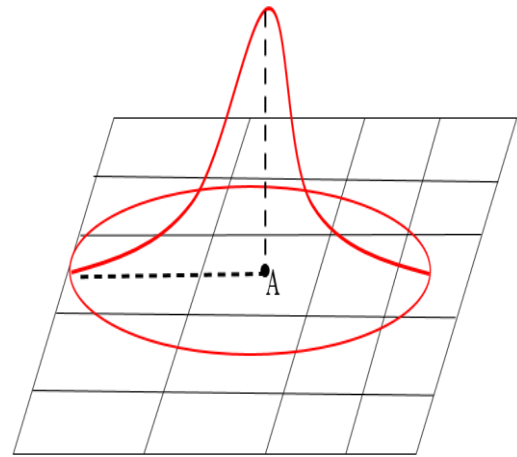
Figure 1 - Physical distance

Socioeconomic distance is little used in economic analysis. We can recall the studies of Moreno and Lopez-Bazo (2007) and Pontarollo and Ricciuti (2015) who adopt a distance based on the inverse of the absolute difference between the population densities as a proxy for agglomeration economies of each pair of regions. The idea is that the more similar the economies of two locations are, the greater their weights.

More emphasis is put in the distance conceived as a mix of physical and socio-economic factors. The typical function is of the form:

$$\begin{cases} w_{ij} = y^{\alpha} d_{ij}^{-\gamma} & \text{if } d_{ij} < h_{ij} \\ w_{ij} = 0 & \text{if } d_{ij} \geq h_{ij} \end{cases} \tag{3}$$

Where, y is a socio-economic variable referred to the neighbour region (Fingleton 2001, Moreno and López-Bazo 2007), or an interaction between variables (Montresor *et al.* 2011). The variable d_{ij} is a measure of geographical separation of locations i and j and h_{ij} is the threshold distance. The coefficients α and γ reflect the weight attributed to y and d_{ij}, with $\alpha = 0$ corresponding to a pure distance effect, and $\gamma = 0$ corresponding to a pure economic size effect. The difficulties to estimate these coefficients make practical sense to assign values to these coefficients a priori. Examples of this approach are in LeSage and Pace (2008), Fingleton and Le Gallo (2008) and Arbia *et al.* (2010).

Once the distance is defined, a squared connectivity matrix in which the diagonal is put equal to zero by convention, such as a region is not a neighbour of it self, is created. In the other cells, zero is put in the case in which a region is not a neighbour of another and 1, or the appropriate weight, vice versa. The resulting matrix is then generally standardized by row to 1, takes the name of spatial weight matrix and it is conventionally written as W_{ij}.

In order to summarise, the concept of spatial weights matrix is rather complex and still debated in literature because i) the concept of neighborhood is not unique and ii) the widely accepted choice to use binary weight scheme does not include information such as the degree of proximity and/or of dissimilarity among regional economies. The strength of the spatial spillovers, then, is due to the linkage path determined by W_{ij} that, in empirical investigations, has to be deeply understood and related to the particular context of analysis.

Exploratory Spatial Data Analysis (ESDA)

The Exploratory Spatial Data Analysis is used to measure the strength of spatial dependence. The most known is the Moran's I (*MI*) (Moran 1950). The Moran's I, basically, relates the value of a selected variable with its spatial lag, i.e. the value of the same variable in the neighbour areas, and it is defined as:

$$MI = \frac{N}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij} (x_i - \bar{x})(x_i - \bar{x})}{\sum_i (x_i - \bar{x})} \tag{4}$$

where N is the number of spatial units indexed by i and j; x is the variable of interest; $\bar{x}$ is the mean of x; and w_{ij} is an element of a matrix of spatial weights matrix W_{ij}.

The expected value of Moran's *I* under the null hypothesis of no spatial autocorrelation is:

$E(MI) = -1/(N-1)$ (5)

The calculated Moran's I for global autocorrelation varies between -1 and 1. A positive coefficient corresponds to a value of Moran's I that is larger than its theoretical mean of –1/N-1, or, equivalently, a positive z-value, and points to positive spatial autocorrelation, i.e. cluster of similar values can be mapped. The reverse represents regimes of negative association, i.e. dissimilar values clustered together in a map. A zero value indicates a random spatial pattern. For statistical hypothesis testing, Moran's *I* values can be transformed to Z-scores in which values greater than 1.96 or smaller than −1.96 indicate spatial autocorrelation that is significant at the 5% level.

The advantage of this statistic is that it can be visualised on a scatterplot, the so-called Moran scatterplot (figure 2), in which the spatial lag of the (standardized) variable is on the vertical axis and the original (standardized) variable is on the horizontal axis. Thus, each of the points in the scatterplot represents a combination of a locations' value and its corresponding spatial lag.
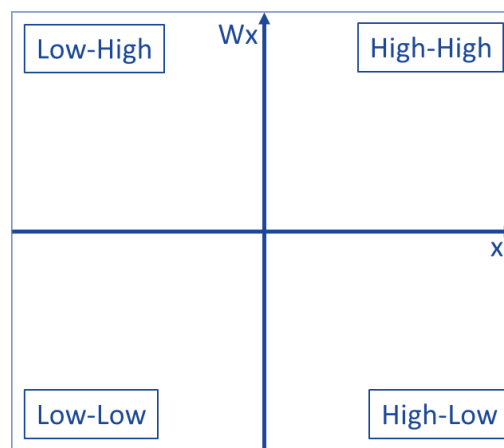
Source: authors' elaboration.

Figure 2 - Moran Scatterplot

The x- and y-axes divide the scatterplot into 4 quadrants (anticlockwise from top right): in the first and third (high-high, HH, and low-low, LL, respectively) a location that exhibits a high (low) value of the variable is surrounded by locations with a high (low) value of the variable as well. In the second and fourth (low-high: LH and high-low: HL, respectively) a location that with a low (high) value of the variable is surrounded by location with a low (high) value of the variable. A concentration of points in the first and third quadrants means that there is a positive spatial dependence (that is, nearby locations will have similar values), while the concentration of points in the second and fourth quadrants reveals the presence of negative spatial dependence (that is, nearby locations will have dissimilar values).

Spatial regressions

The problem with classical empirical analyses that ignore the influence of spatial location on the process of growth is that they may produce biased results and hence misleading conclusions. To address this problem, some regional economists and economicgeographers suggest accommodating spatial heterogeneity and dependence in regionalgrowth specifications. Spatial dependence has implications for the estimates of the parameters in the basic regression models. In particular, if spatial structure is in the residuals of an Ordinary Least Squares (OLS) regression models, this will lead to inefficient estimates of the parameters, which in turn means that the standard errors of the parameters will be too large. This lead to incorrect inference on significant parameter estimates. When spatial structure is in the data, the value of the dependent variable in one spatial unit is affected by the independent variables in nearby units. In this case the assumption of uncorrelated error terms as well as of independent observations is also violated. As a result, parameter estimates are both biased and inefficient.Some authors, then, explicitly included spatial effects in growth models.

The model that accounts for spatial dependence in the dependent variable is called spatial lag and its cross-section specification is as follows:

$y_i = \rho W y_i + \alpha + \psi X_i + u_i$ with $u_i \sim i.i.d(0, \sigma^2)$ (6)

Where on the left hand side (LFS) of Eq. (6) we have the dependent variable y_i, and, on the right hand side (RHS) a set of additional explanatory variables X_i and the spatial lag of the dependent variable, Wy_i and the

associatedparameter $\rho$to be estimated. The spatial lag specification includes the fact that the variable in each location, for example economic growth,is potentially affected by the same variable in its neighbours. Rewriting in matricial form for convenience we have:

$$\mathbf{Y} = (\mathbf{I} - \rho\mathbf{W})^{-1}[\alpha\mathbf{I} + \mathbf{X}\psi + \mathbf{u}] \tag{7}$$

where Y is a*1-by-n* vector, and **X** is the *k-by-n* matrix of additional explanatory variables and **ψ** is the vector of coefficients.

So the expected value of **Y** is:

$$E[\mathbf{Y}] = (\mathbf{I} - \rho\mathbf{W})^{-1}[\alpha\mathbf{I} + \mathbf{X}\psi] \tag{8}$$

since the errors all have mean zero. The inverse matrix term is called spatial multiplier, and indicates that the expected value of each observation **Y** will depend on a linear combination of X-values taken by neighbouring observations, scaled by the dependence parameter ρ. The presence of the autoregressive parameter ρ makes the estimation of Eq. (6) by OLS inconsistent (Anselin, 1988). This implies that a maximum likelihood approach has to be used:

$$\ln L(\rho, \psi, \sigma^2) = -\frac{N}{2}\ln 2\pi - \frac{N}{2}\ln \sigma^2 + \ln|\mathbf{I} - \rho\mathbf{W}| - \frac{1}{2\sigma^2}\mathbf{u}'\mathbf{u} \tag{9}$$

where $\mathbf{u} = (\mathbf{I} - \rho\mathbf{W})\mathbf{Y} - [\alpha\mathbf{I} + \mathbf{X}\psi]$

where N is the number of observations and |**I** –ρ**W**| stands for the determinant of the matrix. The parameters with respect to which this likelihood has to be maximised are ρ, **ψ** and σ^2.

The interpretation of Eq. (6) is not straightforward for the presence of the autoregressive parameter; at this regard it is convenient using the matrix notation (7) to consider the asymptotic expansion of the inverse relationship of the spatial multiplier (Debreu and Herstein, 1953):

$$(\mathbf{I} - \rho\mathbf{W})^{-1} = \mathbf{I} + \rho\mathbf{W} + \rho^2W^2 + \rho^3\mathbf{W}^3 + \ldots + \rho^N\mathbf{W}^N \tag{10}$$

that makes possible to rewrite Eq. (7) as follows:

$$\mathbf{Y} = (\mathbf{I} + \rho\mathbf{W} + \rho^2W^2 + \rho^3\mathbf{W}^3 + \ldots + \rho^N\mathbf{W}^N)[\alpha\mathbf{I} + \mathbf{X}\psi + \mathbf{u}] \tag{11}$$

where we have a direct effect when the term **I** in the first parenthesis of the RHS of Eq. (11) is multiplied by the terms in the second parenthesis. In this case the interpretation, like in the OLS models, is the partial derivative of independent variable with respect to dependent. The first order indirect effect, ρ**W**, is the effect due to a change in the values of the variables in the contiguous areas; the second order indirect effect, ρ^2**W**^{2} is due to a change of the independent variable in the neighbour of the neighbour regions[14], and so on.

Accordingly, as noted by Anselin (2003), the spatial structure in (6) is related to the presence of global externalities. A shock in a region *i* is transmitted to its neighbours by parameter ρ that, in turn, through the spatial weights matrix **W**, is transmitted again to region *i*, reinitiating the process until the effect becomes negligible for *N* that tends to infinite.

Another widely used model is the spatial error:

$$y_i = \alpha + \psi X_i + u_i \qquad\qquad u_i = \lambda W u_i + v_i \qquad\qquad \text{with } u_i \sim i.i.d(0, \sigma^2) \tag{12}$$

or, alternatively, in matrix form:

$$\mathbf{Y} = \alpha\mathbf{I} + \beta\mathbf{y} + \mathbf{X}\psi + (\mathbf{I} - \lambda\mathbf{W})^{-1}\mathbf{v} \tag{13}$$

with the complete error variance–covariance:

$$E[\mathbf{v}'\mathbf{v}] = \sigma^2(\mathbf{I} - \lambda\mathbf{W})^{-1}(\mathbf{I} - \lambda\mathbf{W})^{-1} \tag{14}$$

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[14] Note that a region is also a neighbor of itself, so **W**^{2} has positive elements in the diagonal.

The spatial error model has an expectation equal to that of the standard regression model. While in large samples estimates for the parameters and OLS regression will be the same, in small samples there may be an efficiency problem if spatial dependence in the error terms is not correctly specified.

Spatial error model is estimated through Maximum Likelihood like spatial lag model (Anselin, 1988). Assuming normality for the error terms, and using the concept of a Jacobian for this model as well, the log-likelihood can be obtained as:

$$\ln L\left(\lambda,\psi,\sigma^2\right) = -\frac{N}{2}\ln 2\pi - \frac{N}{2}\ln\sigma^2 + \ln\left|\mathbf{I} - \lambda\mathbf{W}\right| - \frac{1}{2\sigma^2}\mathbf{v}'\mathbf{v} \tag{15}$$

where $\mathbf{v} = \left(\mathbf{Y} - \left[\alpha\mathbf{I} + \mathbf{X\psi}\right]\right)\left(\mathbf{I} - \rho\mathbf{W}\right)$.

In this case, a random shock in region *i* affects the growth rate in that region and additionally impacts all the other regions through the spatial transformation (Fingleton and López-Bazo, 2006). As a result, model (14) recognises the presence of global externalities associated solely with random shocks (Anselin 2003), and the partial derivative is equivalent to a standard OLS regression.

Starting from Eq. (14), it is possible to develop the spatial multiplier $(\mathbf{I} - \lambda\mathbf{W})^{-1}$ in order to obtain a model with the spatial lag of both dependent and independent variables (LeSage and Pace, 2009), called spatial Durbin model. The unconstrained model is as follows:

$$y_i = \rho W y + \alpha + \psi X_i + \varphi W X_i + u_i \tag{16}$$

with $u_i \sim i.i.d(0,\sigma^2)$.

As noted by LeSage and Fischer (2008), the spatial error model used in many spatial growth studies can arise only if there are no omitted explanatory variables, or if these are not correlated with included explanatory variables, both of which seem highly unlikely circumstances in applied practice.

The interpretation of the spatial Durbin model is analogous to the spatial lag model, but in this case we have that the indirect effect is due both to the lag of the dependent and independent variables.

The last model, largely neglected by spatial econometricians, but of extreme interest because it is able to account for local spillover effects, is the spatial lag of X (SLX) model. SLX model includes only the lag of the independent variables and it is defined as follows:

$$y = \alpha + \psi X_i + \varphi W X_i + u_i \tag{17}$$

with $u_i \sim i.i.d(0,\sigma^2)$.

The estimation methodology is the classical OLS and the marginal effects are like usual. The peculiarity of this model is that it does not account for global spillovers, but for local ones. Global spatial multiplier of spatial lag and spatial Durbin models, on the other hand, requires that regions are rather homogeneous within each cluster, i.e. regions in the cluster with high (low) values have to be surrounded by others with pretty similar values. This precondition allows that the economic shocks spread over a large area self-reinforcing themselves because of the similar characteristics of the regions in that area. The similarity, in the case of growth regressions, has to be in the average regional growth rate that requires that their economic structure and interrelations are quite strong. The main evidences of the existence of global spillovers are in Europe, where the regions are very homogeneous and well as integrated (under the point of view of infrastructure, trade, commuting, technology, etc.) within the cluster of richer regions (centre and north) and poorer ones (Mediterranean regions) Ertur *et al.* (2006).

The choice between spatial models can follow two approaches: a specific-to-general approach and a general-to-specific approach.

In the first case (Figure 3) the selection between the spatial lag and spatial error model is done through a (robust) Lagrange Multiplier (LM) test (Anselin and Rey, 1991 and Florax and Folmer, 1992) performed on OLS estimates. Nevertheless, as recently observed by López-Bazo *et al.* (1999) and Fischer and LeSage (2008), the choice of spatial error model could hide misspecification problems that can lead not only to inefficient estimations, but also to bias results. In this case, a solution proposed by LeSage and Pace (2009), is to choose the spatial Durbin model, especially LM test for spatial Durbinis significant too, On the other hand, Elhorst (2010) suggests that if LM testsfor spatial lag and error both significant, the next step shouldbe to estimate the spatial Durbin model.
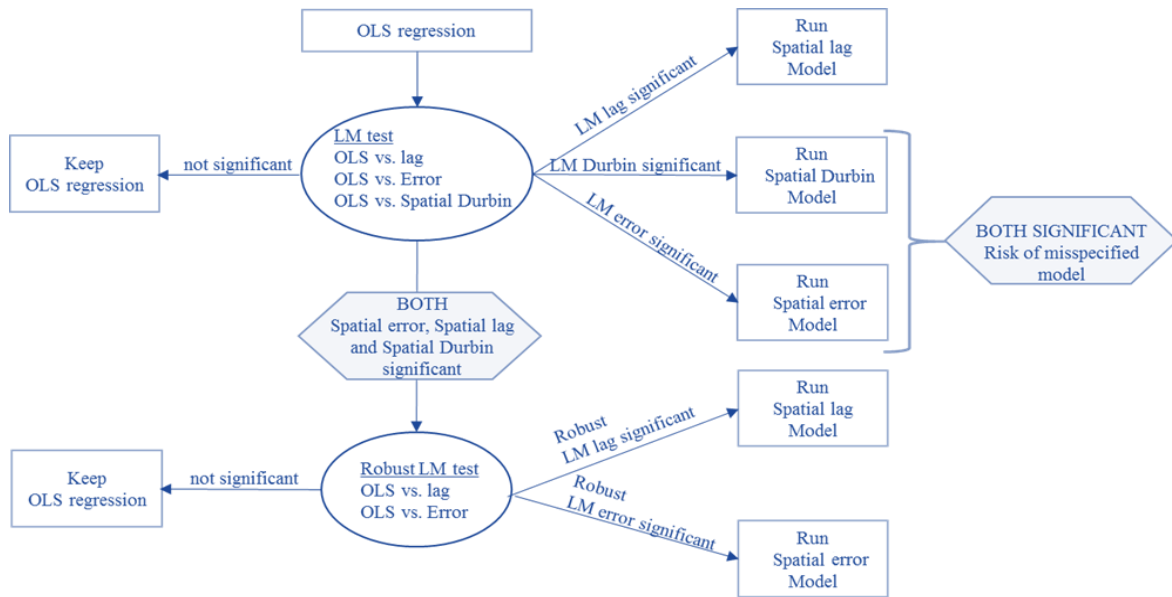
Source: authors' elaboration

Figure 3 - Specific-to-general approach

The second approach, the general-to-specific (Figure 4), is highly suggested by (LeSage and Pace, 2009). In this case, a Lagrange Ratio (LR) and a Wald test are performed to investigate whether spatial Durbin model (with spatial lag of both dependent and independent variables) can be simplified to a spatial lag, spatial error model (Mur and Angulo, 2006) or SLX model.

The two approaches have to be followed in parallel. The possibility that in the specific-to-general case the Spatial Durbin model is selected has to be further investigated in particular if the LM test points that spatial error model is the right model too. In this case a possible misspecification problem might arise and the general-to-specific approach helps to overcome this problem.
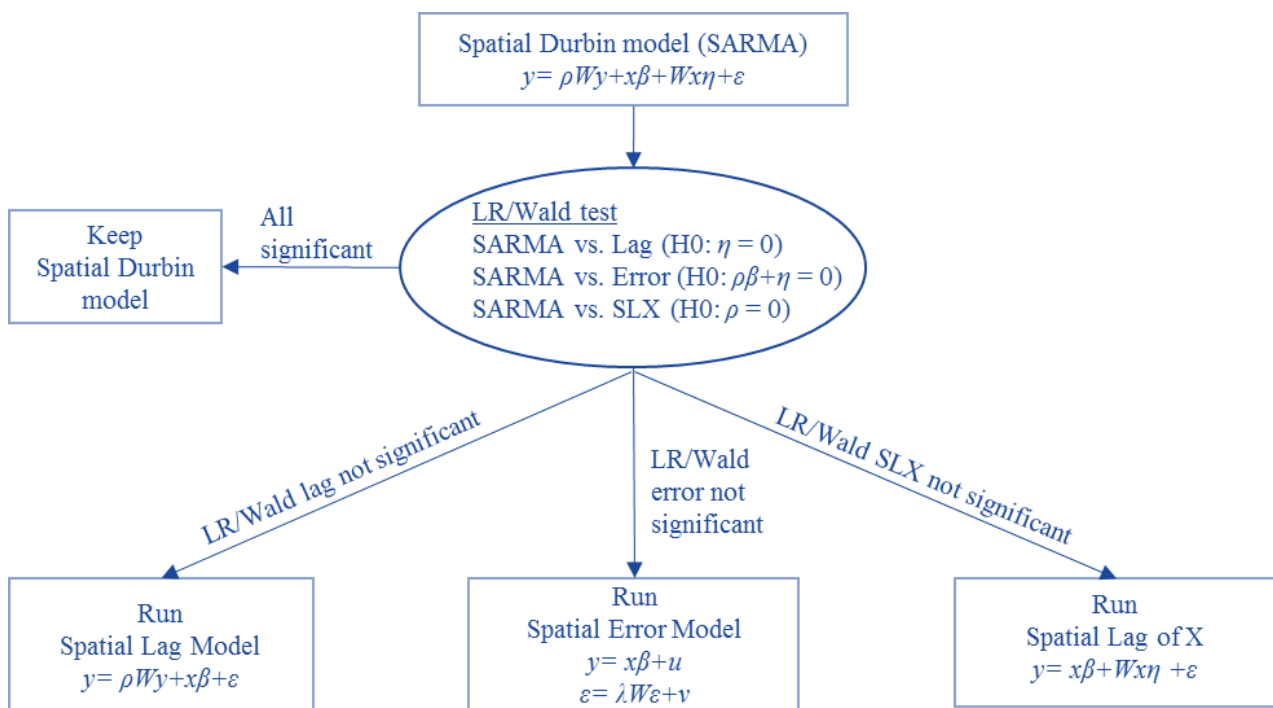
Source: authors' elaboration.

Figure 4 - General-to-specific approach

4. Empirical estimation: the case of Ecuador

With an area of 283,500 squarekilometres, the Republic of Ecuador is divided into 24 provinces, 221 municipalities (also called cantons) and 1,228 parishes, with around 16 million inhabitants.

The recent history of Ecuador is characterised by severe economic downturns (Figure 6), which have been accompanied by political, social and institutional instability, and associated with the volatility of prices and production of oil, the main export product from 1974. This instability has caused a territorial heterogeneity, with profound economic and social subnational asymmetries (Mendieta 2015a, Alvarado 2011, CEPAL 2009).

Source: authors' elaboration on the basis of INEC.

Figure 5 - Provinces of Ecuador

During the eighties and nineties in Ecuador, as in many Latin American countries, we had the implementation of a series of policies and reforms with the stated aim to decentralise and make more autonomous the management of development policies, aimed at increasing fiscal transfers to provincial and municipal governments, together with certain administrative powers (Carrión *et al.* 2007). This moment of decentralisation coincides with neoliberal policies, which characterised the moment of instability that Ecuador lived in those decades. This, combined with the marked economic and social differences between subnational regions explains the limited benefit that these decentralisation policies obtained in terms of reduction of asymmetries. (Barrera 2007)
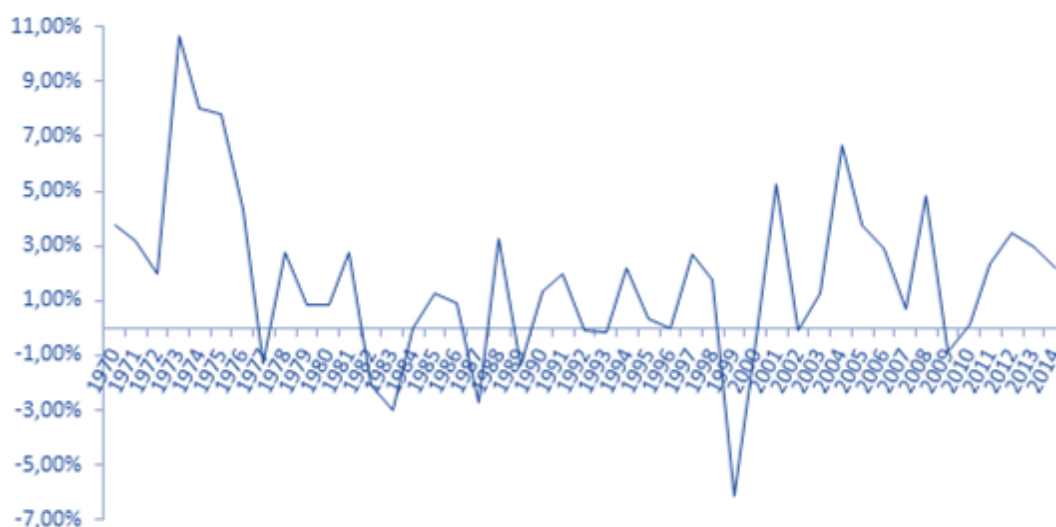
Source: authors' elaboration on the basis of INEC

Figure 6 - Annual rate of GDP per capita growth in Ecuador: period 1970-2014

In 2008, with the came into force of the new Constitution, decentralisation had another push. This process is coordinated by the National Secretariat of Planning and Development (SENPLADES), which promotes decentralisation of governance, and seeks to expand local capacity for autonomy and development within the framework of the objectives of the National Plan for Good Living (PNBV). Finally, by the end of 2010, it has come into force the Code of Land Management, Autonomy and Decentralization (COOTAD 2010), which contains a number of institutional mechanisms for expanding the opportunities and responsibilitiesof different local institutional levels: regions, provinces, municipalities and parish councils.

This decentralisation process implied, in recent years, an unprecedented level of public investment deployed throughout the country, especially on roads, hydroelectric projects and in various areas among which health, education, which was made possible thanks to the significant government revenues derived mainly from high oil prices and a more efficient tax collection. The effects of these actions and strategies begin to show their effects in terms of poverty reduction (Mideros 2012) and economic growth (Martin 2012), but, given the severe structural problem inheritedfrom the past, they still do not give grounds to a lasting reduction of local economic disparities (Mendieta 2015b).

The issue of subnational convergence and balanced territorial growth, then, is an actual and debated topic, which this study will analyse under the perspective of spatial econometrics, which is able to give some insights with respect to the role of space into economic development.

The analysis of convergence regarding the Ecuadorian case starts with the exploratory spatial data analysis of 214 cantons[15] over the period 2007-2012 using data from the National Statitical and Census Institute (INEC).

The first step consists in an Exploratory Spatial Data Analysis based on a Queen Contiguity matrix where the islands have been connected to Guayaquil canton[16]. Then we standardised the matrix by row. This allows reading the spatial lag as a weighted average of the values of the variables in the neighbour cantons.

Figure 7 shows the Moran scatterplot (in the right side) and the map of the quadrants (in the left side) of Gross Value Added per person in 2007, in 2012 and of its growth over that period. The information that we have from this figure is that the concentration of cantons with similar values is not very strong, but highly statistically significant. In 2007 the Moran's I is 0.19 (p-value < 0.001). The clusters of cantons with the highest GVA per capita arearound Guayaquil and in the provinces of Azuay, El Oro, Pichincha, Santo Domingo, Galapagos and in the south of Napo. Despite the rather strong and homogeneous concentration, the low Moran's I is due to the presence of many "border" cantons, located between the cluster high-high (first quadrant) and low-low (third quadrant). These cantons are extremely interesting because they correspond to a situation in which a low-developed area is surrounded by well-developed ones (second quadrant), or a well-developed area is surrounded by low developed ones (fourth quadrant). In the first case it is important that the low-developed cantons take a benefit from the favourable context, and then that the spillovers from richer cantons spread over the weaker, increasing their Gross Value Added per capita. Under a policy point of view, the challenge is to exploit the growth potential of lagging areas through the surrounding territorial context as a driver for growth. This clearly requires a cluster perspective and common shared objectives between territorial actors (Ketels 2013). The second case consists in developed cantons surrounded by lagging ones. In this situation, the main problem is to make possible that the direction of the spillovers will be from the stronger area to the weaker ones, and not vice-versa, which would mean depressing the developed cantons. The difficulty, then, is, first, to avoid that a strong canton will fall at the level of the surrounds cantons; second, create policy interventions able to support the level of wealth of developed areas without leaving aside the lagging ones.

Figure 7b corresponds to Figure 7a, but in 2012. The situation does not strongly change. The only difference is that some cantons in the provinces of Napo, Pastaza and Orellana, form "border" cantons in 2007 become part of the high-high quadrant and that some cantons in the province of El Oro from the first quadrant shifted to the second.

Figure 7c, finally, shows the average growth of Gross Value Added per person between 2007 and 2012. The clusters of cantons with higher growth roughly correspond to the provinces of Napo, Pastaza and Orellana, Pichincha, Guayas, Imbabura and Zamora, showing that cantons that converge do not always correspond to the less developed. This probably justify also the increasing observed inequality which raised of 17% between 2007 and 2012.[17]

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[15] We excluded the cantons of Putumayo, Shushufindi, Cuyabeno, Orellana, La Joya, De Los Sachas, Las Golondrinas, El Piedrero, Sevilla De Oro, Quinsaloma and Manga Del Cura for the absence of data of because they are outliers in which the GVA is given by mining.

[16] In principle, it is possible to use spatial weights matrices with location without neighbours, but it is not generally used in literature because it complicates the interpretation of results and because the islands are not unconnected from the continent under a socio-economic point of view.

[17] Variance, as customary, of computed over the log of GVA per person

a) Gross Value Added per person in 2007
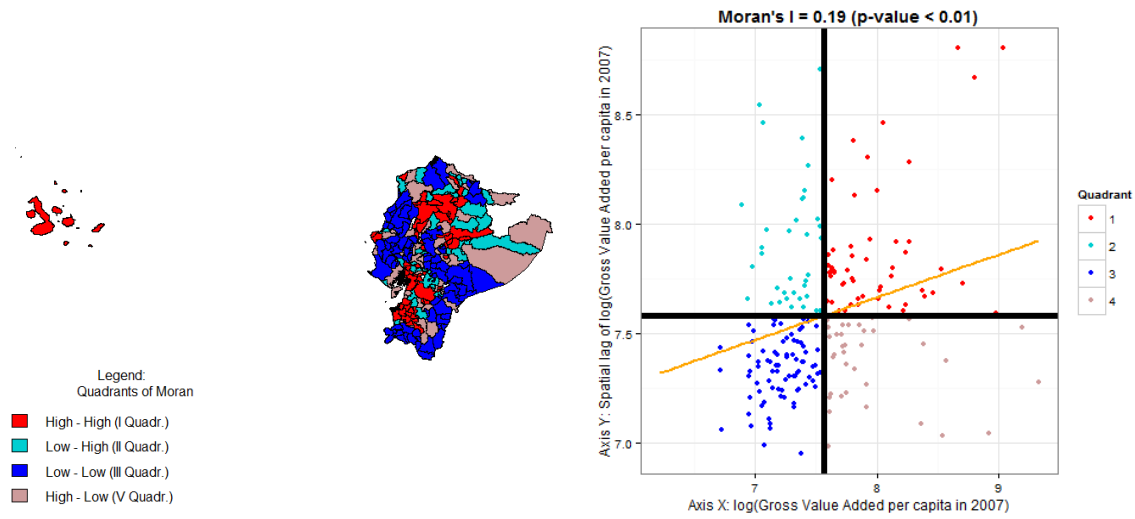
b) Gross Value Added per person in 2012
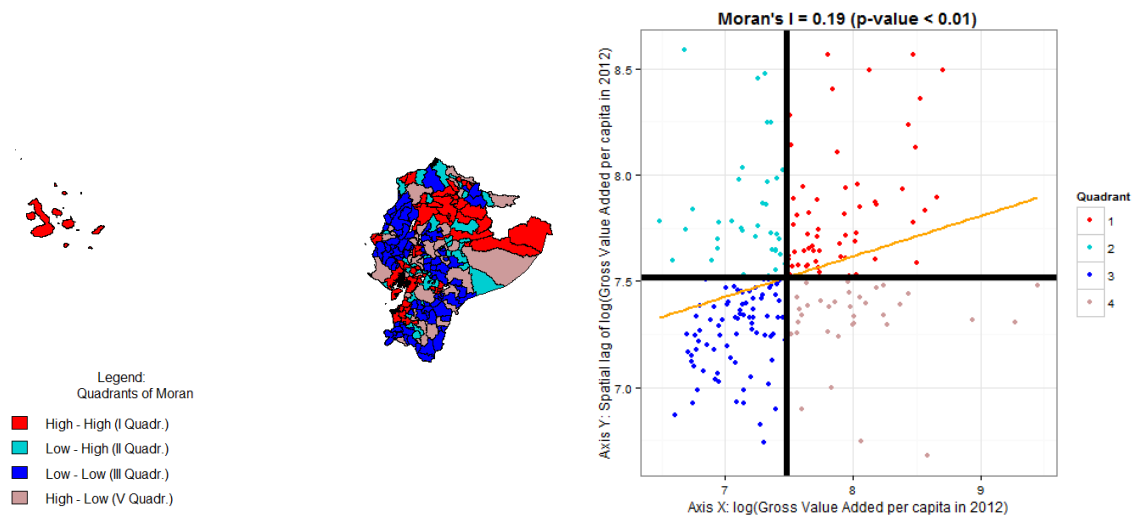
c) growth of Gross Value Added per person in 2007-2012
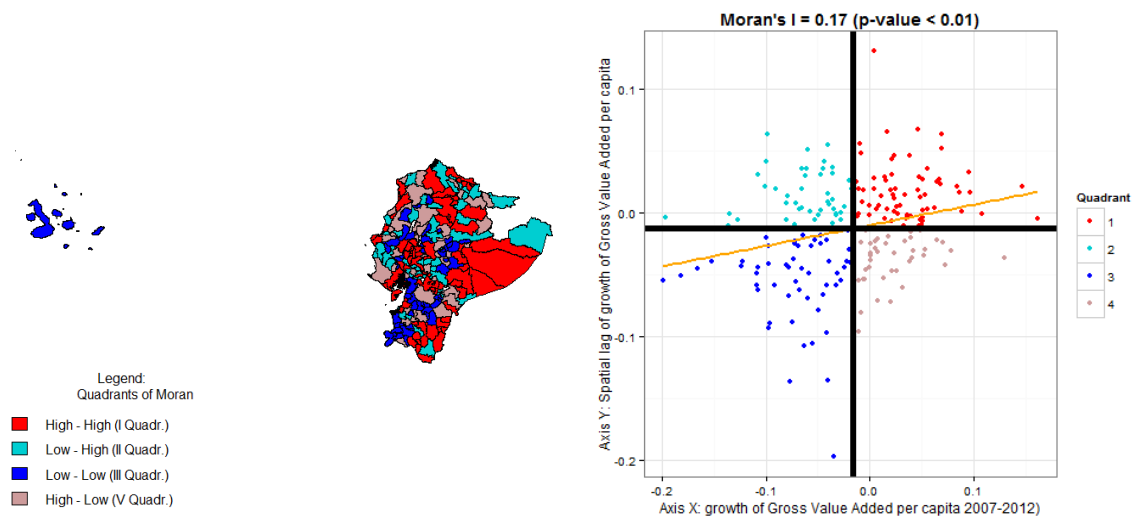
Source: authors' elaboration on the basis of INEC.

Figure 7 - Moran clusters and scatterplot

The first exploratory analysis gave us some insights about the territorial dimension of the GVA per person between 2007 and 2012 and of its growth, but a more refined analysis has to be done via regression analysis that, following Barro and Sala-i-Martin (1991), is defined as follows:

$$\frac{1}{T}\ln\left(\frac{y_{iT}}{y_{i0}}\right) = \alpha + \beta\ln\left(y_{i0}\right) + \psi X_i + u_i \qquad\qquad \text{with } u_i \sim i.i.d(0,\ \sigma^2) \qquad\qquad (18)$$

where on the left hand side (LFS) of Eq. (18) we have the average growth of GVA per capita between period *0* and *T*, and, on the right hand side (RHS) its initial level, y_{i0}, and a set of additional explanatory variables X_i. In the case in which the parameter β is statistically significant and negative, the convergence hypothesis holds: the poor economies tend to grow faster that the richer ones. Finally, α is a constant, and ψ a parameter to be estimated. In the case in which no additional variables $X_i$are added to the model or if they are not statistically significant there is absolute convergence, that means that all cantons converge to the same steady state. Absolute convergence requires that all cantons have the same production function and have access to the same technology, which requiresa homogeneous and well-connected socio-economic context.

Contrary to absolute convergence, we have conditional convergence in which the equilibrium differs across cantons, and each one approaches its own but unique, globally stable, steady state equilibrium because each one has its own production function and factors affecting long run growth. A third possibility accounts for the existence of club convergence (Durlauf and Johnson 1995), a concept related with the heterogeneity problem due to economic polarization, persistent poverty, and clustering. Club convergence is based on endogenous growth models and accounts for the possibility of multiple, locally stable, steady state equilibria in which the different equilibria depends on both structural characteristics and initial conditions. Economies converge to a common steady state if the initial conditions are in the "basin of attraction" of the same steady state equilibrium. When convergence clubs exist, one convergence equation should be estimated per club, corresponding to different regimes.

The standard OLS estimation of Eq. (18), which is in Table 2, shows that convergence is statistically significant and the rate[18] is around 2.72%. This confirms the findings of figure 7, but the probability that only absolute convergence is present is rather low because Ecuador is a heterogeneous and quite polarised context where there are various peripheral and unconnected cantons in which industrialisation level is still very low. The second motivation that leads to exclude the absolute convergence is the low R squared that means that the regression is misspecified.

At this regard, the aim of our analysis is not to deepen the analysis of the additional factors affecting the convergence path of Ecuadorian cantons, but to focus more in the application of the econometric technique. Anyway, it is necessary to highlight the limitations of our study that we intend to overcome in the future with other more comprehensive framework.

Table 2 - OLS estimate

Variable	
Constant	0.177(0.067) ***
log(GVA/person)	-0.025(0.009) ***
AIC	-580.945
R^2 (adj.)	0.038 (0.033)
F-test (p-value)	8.410 (< 0.01)
Moran's I on residuals (p-value)	0.167 (< 0.01)
Breush Pagan test (p-value)	8.052 (< 0.01)

Note: *Significant at 1%, ** significant at 5%, *** significant at 10%.Standard error in brackets.
Source: authors' elaboration on the basis of INEC.

In Table 2 we observe that the Moran's I is very significant pointing that the spatial dependence in residuals is present. Breush Pagan test on heteroskedasticity is significant too because the error variance could well be affected by the spatial dependence in the data. This implies that, in presence of spatial autocorrelation, tests for heteroscedasticity, in reality, reveal autocorrelations too.This implies that we need further investigation in order to understand which type of

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[18] The speed of convergence is calculated as: $\dfrac{-\left(1-e^{\beta T}\right)}{T}$

spatial regression is the most appropriate. The results of the specific-to-general approach are shown in Table 3. According to the LM tests we have that both spatial lag and spatial error models are eligible. This requires the robust versions of LM tests that exclude both spatial models. The test for Spatial Durbin, anyway, is the most significant leading to the choice of this model. The problem related to this outcome is that, as the spatial Durbin can be a derivation of spatial error model, it can be the best choice simply because it accounts for the possible misspecification of the estimated regression, a highly possible situation for what we explained in the previous section and for what shown by Fischer and LeSage (2008).

Table 3 - Specific-to-general approach

Test	
LM error	9.899(<0.01)
LM lag	8.931(< 0.01)
Robust LM error	1.357(0.244)
Robust LM lag	0.390(0.532)
LM SARMA	10.289(< 0.01)

Note: In brackets p-values.
Source: authors' elaboration on the basis of INEC.

The following step is to test which is the best model according to the general-to-specific approach (Table 4). We can surely exclude that the spatial Durbin model can be simplified to SLX model because it is the only significant test.The tests for spatial lag and spatial error are both not significant, pointing that spatial Durbin can be further simplified. The less significant test is the one for spatial error leading us to choose this one as the best model. The choice has to be done not only on the basis of the statistical tests but also in relation to the context and the previous literature. In this extent, we know that: i) it is highly possible that the absolute beta convergence model is misspecified, ii) Fingleton and López-Bazo (2006) point that authors that use absolute beta convergence models tend to prefer spatial error regressions, iii) Ecuador is not a homogeneous country, so global spillovers are not highly probable.

Table 4 - General-to-specific approach

Test	
LR lag	1.328(0.249)
Wald lag	1.341(0.247)
LR error	0.411(0.521)
Wald error	0.402(0.526)
LR SLX	9.441(< 0.01)

Note: In brackets p-values.
Source: authors' elaboration on the basis of INEC.

The results of the spatial regression models are in Table 5. Both the coefficients related to the spatial dependence are significant and around 0.025. The speed of convergence is 2.77% in the case of spatial error model and 2.53% for the spatial lag model. The comparison of the AIC with the OLS estimation shows that there has been a gain of efficiency in using spatial models, but the strongly significant presence of heteroskedasticity in the residuals points that misspecification problem is still present.

Table 5 - Spatial models

Variable	Spatial error	Spatial lag
Constant	0.179(0.067) ***	0.179 (0.067) ***
log(GVA/person)	-0.026(0.009) ***	-0.024 (0.008) ***
λ	0.253(0.080) ***	
ρ		0.238 (0.080) ***

AIC	-588.450	-587.410
Wald test (p-value)	3.16 (< 0.01)	8.936 (< 0.01)
Breush Pagan test (p-value)	8.974 (< 0.01)	7.835 (< 0.01)

Note: *Significant at 1%, ** significant at 5%, *** significant at 10%.In brackets p-values.
Source: authors' elaboration on the basis of INEC.

The results related to the rate of absolute convergence found in this study are comparable with some recent contributions summarised in Table 6.Previous studies refer mainly to provincial level, finding that convergence has been around 2.70% during the nineties. Then, there has been a reduction with values between 0.56% and 1.74% for period 2001-2007, associated to the series of economic crisis of 1999. The absolute convergence rate found by Mendieta (2015b) for period 2007- 2012, is around 1.83% for provinces, and 1.37% for cantons, lower than the 2.77% found in this study.

Table 6 – Reported convergence speed in somerecent studies about Ecuador

STUDY	VARIABLE	METHOD	PERIODS	ABSOLUTE B
PROVINCIAL LEVEL				
Ramón, 2009	GVA per capita (no oil)	Cross-section Linear OLS	1993 - 2000 2001 - 2007	1.22% 0.58%
Valdivieso, 2013	GVA per capita (no oil)	Cross-section Linear OLS	1993 - 2000 2001 - 2012	0.56% 1.84%
Mendieta, 2015a	GVA per capita (no provinces producing oil)	Cross-section Non-linear least squares	1994 - 1999 2001 - 2006 2007 - 2012	2.70% 1.74% 1.83%
CANTONAL LEVEL				
Mendieta, 2015b	GVA per capita (no cantones producing oil)	Cross-section	2007 - 2012	1.37%

Source: authors' elaboration on the basis of INEC.

These results suggest a process of absolute convergence at subnational level in Ecuador. Anyway, the question to which these studies do not answer is if convergence is present across the whole country. Or, in other terms, if convergence is something that characterises all cantons or only some groups (clubs).

The possibility of differentiated convergence clubs can be accounted using the Moran scatterplot in order to determine the cluster of cantons that show similar initial conditions in the fashion of Ertur *et al.* (2006). In this extent, each quadrant isrecognised as a convergence club because Moran scatterplot illustrates the complex interrelations between global spatial autocorrelation and spatial heterogeneity in the form of spatial regimes.

The regression analysis in Table 7 shows that the spatial autocorrelation is absent (quadrants 2 and 4) or very low (quadrants 1 and 3) and spatial regression analysis is not required according to LM tests. Only in quadrant 1 and 3, high-high and low-low, respectively, we have significant convergence rates. The first club converges at 6.22% rate, and the third at 5.73%. This is not a negligible result for at least two orders of reasons. The first concerns the fact that the cluster of more developed cantons in converging at a higher rate than the less developed, and the second is that 75 out of 214, the 35% is not converging opening a problem of sustainability of economic growth in the long-run within the country.

Table 7 - Spatial models

Variable	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Constant	0.404(0.195) **	0.021 (0.337)	0.231(0.193) *	-0.987 (0.222)
log(GVA/person)	-0.054(0.024) **	-0.003 (0.046)	-0.050(0.027) *	0.009 (0.038)
AIC	-141.480	-111.179	-242.084	-82.873
R^2 (adj,)	0.082 (0.065)	9.7e-05 (-0.028)	0.042 (0.030)	0.003 (-0.025)

Variable	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
F-test (p-value)	4.922 (0.031)	0.003 (0.953)	3.545 (0.063)	0.115 (0.736)
Moran's I on residuals (p-value)	0.201 (0.040)	-0.050 (0.525)	0.142 (0.055)	0.228 (0.102)
Breush Pagan test (p-value)	0.494 (0.482)	2.417 (0.120)	2.196 (0.138)	0.084 (0.772)
LM error	2.333 (0.127)	0.066 (0.798)	2.032 (0.154)	1.264 (0.261)
LM lag	1.550 (0.213)	0.066 (0.797)	2.393 (0.122)	1.365 (0.243)
Robust LM error	2.020 (0.155)	0.060 (0.806)	0786 (0.375)	2.301 (0.129)
Robust LM lag	1.236 (0.266)	0.061 (0.805)	1.146 (0284)	2.402 (0.121)
LM SARMA	3.569 (0.168)	0.127 (0.938)	3.178 (0.204)	3.666 (0.160)
Number of cantons	57	38	82	37

Note: *Significant at 1%, ** significant at 5%, *** significant at 10%. Standard error in brackets.In brackets p-values.
Source: authors' elaboration on the basis of INEC.

Conclusions

The analysis overviewed that theoretical and the empirical motivation for the inclusion of the spatial dimension in growth analysis at subnational level. The theoretical justification is mainly due to the possible knowledge spillovers caused by proximity in space, supported also from the empirical literature that finds that spatial autocorrelation matters for convergence. The results highlight that the spatial autocorrelation across Ecuadorian cantons is not very high but significant. The spatial distribution of Gross Value Added in 2007 and 2012 is quite persistent and heterogeneous. The average growth was also not widespread in space and, often, the cantons that growth at higher rates is located close to others already developed. The regression analysis shows that absolute convergence process is present and the convergence rate is a little bit higher than the correspondent OLS estimation. The results, in any case, have to be refined by adding further explanatory variables because the chosen spatial error model mightpoint to misspecification problems. The identification of convergence clubs through the Moran scatterplot allows the estimation of a single equation for each club. Convergence regards the clusters of most developed and less developed cantons, respectively, while the others are not able to converge opening various policy implications related to i) the capacity of cantons to take advantage from the positive dynamics of neighbours, ii) the persistence of development paths in some circumscribed areas, and iii) the spatial unbalanced development. These problems are very important if we consider that 35% of cantons do not converge and that this could inhibit the balanced growth in a country already characterised by persistent geographical dissimilarities and increasing territorial inequality.

References

[1] Alvarado, R. (2011). Measuring the competitiveness of the provinces of Ecuador. Universidad Católica del Norte. MPRA Paper No. 34244, posted 22.

[2] Anselin, L. (1988).Spatial econometrics: Methods and models. Kluwer Academic Publishers, Dordrecht.

[3] Anselin, L. (2003). Spatial externalities, spatial multipliers and spatial econometrics. *International Regional Science Review*, 26(2): 153-166. DOI: http://dx.doi.org/10.1177/0160017602250972

[4] Anselin, L., Rey, S. (1991). Properties of tests for spatial dependence in linear regression models. *Geographical Analysis*, 23(2): 112-131. DOI: http://dx.doi.org/10.1111/j.1538-4632.1991.tb00228.x

[5] Arbia, G., Battisti M. and Di Vaio G., (2010). Institutions and geography: Empirical test of spatial growth models for European regions. *Economic Modelling*, 27(1): 12-21. DOI: http://dx.doi.org/10.1016/j.econmod.2009.07.004

[6] Arrow, K.J. (1962). The economic implications of learning by doing, *Review of Economic Studies*, 29(3): 155-172. DOI: http://dx.doi.org/10.2307/2295952

[7] Baldwin, R.E. and Martin, P. (2004). Agglomeration and regional growth. In Henderson J.V., Thisse J.-F. (Eds.), *Handbook of Regional and Urban Economics*, 4: 2671-2712.

[8] Barrera Guarderas, A. (2007). Agotamiento de la descentralización y oportunidades de cambio en el Ecuador. InFernando Carrión M. (eds.), La descentralización en el Ecuador: opciones comparadas, FLACSO sede Ecuador, Quito: 175-206.

[9] Barro, R.J. and Sala-i-Martin, X. (1991).Convergence across states and regions. *Brookings Papers on Economic Activity*, 1: 107-82.

[10] Carrión, M.F. and Dammert, M. (2007). La descentralización en el Ecuador: un tema de Estado. In Carrión M.F. (eds.), La descentralización en el Ecuador: opciones comparadas, Quito, FLACSO sede Ecuador: 9-17.

[11] Crafts, N. (1996). Post-neoclassical endogenous growth theory': what are its policy implications? *Oxford Review of Economic Policy*, 12(2): 30-47. DOI: http://dx.doi.org/10.1093/oxrep/12.2.30

[12] Debreu, G. and Herstein, I.N. (1953). Nonnegative square matrices. *Econometrica*, 21(4): 597-607. DOI: http://dx.doi.org/10.2307/1907925

[13] Durlauf, S.N. and Johnson, P. (1995). Multiple regimes and cross-country growth behavior. *Journal of Applied Econometrics*, 10(4): 365-84. DOI: http://dx.doi.org/10.1002/jae.3950100404

[14] Elhorst, J.P. (2010) Applied Spatial Econometrics: Raising the Bar. *Spatial EconomicAnalysis*, 5(1): 9–28. DOI: http://dx.doi.org/10.1080/17421770903541772

[15] Ertur, C., Le Gallo, J., Baumont, C. (2006). The European regional convergence process, 1980-1995. Do spatial regimes and spatial dependence matter? *International Regional Science Review*, 29(1): 3-34. DOI: http://dx.doi.org/10.1177/0160017605279453

[16] Fingleton, B. (2001). Equilibrium and economic growth: Spatial econometric models and simulations. *Journal of Regional Science*, 41(1): 117-47. DOI: http://dx.doi.org/10.1111/0022-4146.00210

[17] Fingleton, B., Le Gallo, J. (2008). Estimating spatial models with endogenous variables, a spatiallag and spatially dependent disturbances: Finite sample properties. *Papers in Regional Science*, 87(3): 319-339. DOI: http://dx.doi.org/10.1111/j.1435-5957.2008.00187.x

[18] Fingleton, B., López-Bazo, E. (2006). Empirical Growth Models with Spatial Effects. *Papers in Regional Science* 85(2): 177-198. DOI: http://dx.doi.org/10.1111/j.1435-5957.2006.00074.x

[19] Florax, R.J.G.M., Folmer, H. (1992). Specification and estimation of spatial linear regression models. *Regional Science and Urban Economics*, 22(3): 405-432. DOI: http://dx.doi.org/10.1016/0166-0462(92)90037-2

[20] Glaeser, E.L., Kalla, I.H.D., Scheinkman, J.A., and Shleifer, A. (1992). Growth of cities. *Journal of Political Economy*, 100(6): 1126-1152. DOI: http://dx.doi.org/10.1086/261856

[21] Jacobs, J. (1969). *The economy of cities, Random House*, New York.

[22] Ketels, C. (2013). Recent research on competitiveness and clusters: what are the implications for regional policy? *Cambridge Journal of Regions, Economy and Society*, 6(2): 269-284. DOI: http://dx.doi.org/10.1093/cjres/rst008

[23] LeSage, J., Fischer, M. (2008). Spatial growth regressions: model specification, estimation and interpretation. *Spatial Economic Analysis*, 3(3): 275-304. DOI: http://dx.doi.org/10.1080/17421770802353758

[24] LeSage, J., Pace, K. (2008). Spatial econometric modeling of origin-destination flows. *Journal of Regional Science*, 48(5): 941-967.

[25] LeSage, J.P., Pace, K. (2009). *Introduction to spatial econometrics*. CRC Press Taylor & Francis Group, Boca Raton.

[26] López-Bazo, E., Vayà, E., Mora A. and Suriñch, J. (1999). Regional economic dynamics and convergence in the European Union. *Annals of Regional Science*, 33(3): 343-370. DOI: http://dx.doi.org/10.1007/s001680050109

[27] Mankiw, N.G., Romer, D. and Weil, D.N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107(2): 407-437. http://dx.doi.org/10.2307/2118477

[28] Moran, P.A.P. (1950). Notes on continuous stochastic phenomena. *Biometrika*, 37: 17-23. DOI: http://dx.doi.org/10.2307/2332142

[29] Moreno, R. and López-Bazo, E. (2007). Returns to local and transport infrastructure under regional spillovers. *International Regional Science Review*, 30(1): 47-71. DOI: http://dx.doi.org/10.1177/0160017606296728

[30] Marshall, A. (1890). *Principles of economics*, Macmillan, London.

[31] Martín Mayoral, F. (2012). El Desempeño de la economía Ecuatoriana durante el gobierno del Economista Rafael Correa. In Mantilla S. and Mejía SA. (eds.) *Balance de la Revolución Ciudadana*. Centro Latinoamericano de Estudios Políticos, Editorial Planeta del Ecuador. Quito: 237-266.

[32] Martin, R. and Sunley, P. (1996). Slow convergence? Post-neoclassical endogenous growth theory and regional development. *ESRC Centre for Business Research*.

[33] Martin, R. and Sunley, P. (1998). Slow convergence? The new endogenous growth theory and regional development. *Economic Geography*, 74(3): 201-227. DOI: http://dx.doi.org/10.1111/j.1944-8287.1998.tb00113.x

[34] Mendieta Muñoz, R. (2015a). *Remesas y disparidades económicas territoriales: El caso ecuatoriano*. 1st Edition. Miguel Ángel Porrúa y Universidad de Cuenca. México.

[35] Mendieta Muñoz, R. (2015b). La hipótesis de la convergencia condicional en Ecuador. Un análisis a nivel cantonal. *Revista Retos*, 9(1), 13-25. DOI: http://dx.doi.org/10.17163/ret.n9.2015.01

[36] Mideros M. A. (2012). Ecuador: Definición y medición multidimensional de la pobreza, 2006-2010. *Revista CEPAL*, 108: 51-70.

[37] Montresor E., Pecci, F. and Pontarollo, N. (2011).The Convergence Process of the European Regions: the Role of Regional Policy and Common Agricultural Policy. *Studies in Agricultural Economics*, 113(2): 167-177. http://dx.doi.org/10.7896/j.1112 .

[38] Pontarollo, N. and Ricciuti, R. (2015). Railways and the Productivity Gap in Italy: Persistence and Divergence after Unification, *CESIFO WORKING PAPER* NO. 5438.

[39] Porter, M. (1990). *The competitive advantage of nations*. Macmillan, London.

[40] Ramón Mendieta, M. (2009). Convergencia y divergencia regional en Ecuador. Universidad Nacional Autónoma de México.

[41] Rey, S. and Montouri, D. (1999). US Regional Economic Convergence: A Spatial Econometric Perspective. *Regional Studies*, 33(2): 143-156. DOI: http://dx.doi.org/10.1080/00343409950122945

[42] Romer, P. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, 94(5): 1002-1037. DOI: http://dx.doi.org/10.1086/261420

[43] Tobler, W. (1970). A computer movie simulating urban growth in the Detroit region. *Economic Geography*, 46: 234-240. DOI: http://dx.doi.org/10.2307/143141

[44] Valdiviezo, Ramón, C.d.R. (2013). Contribución del capital, trabajo y tecnología a la generación de procesos de convergencia en el Ecuador: 1993 – 2012. Universidad Técnica Particular de Loja.

*** CEPAL (2009). Economía y territorio en América Latina y el Caribe, desigualdades y políticas. Santiago de Chile, ONU.

*** Código Orgánico de Organización Territorial, Autonomía y Descentralización (COOTAD) (2010), published in the Registro Oficial N 303 de martes 19 de octubre del 2010.

Appendix A - cantons per quadrant

Quadrant 1			Quadrant 2		
Canton	GVA per capita 2007	GVA per capita 2012	Canton	GVA per capita 2007	GVA per capita 2012
Chambo	1939.30	1574.74	Archidona	986.26	1252.55
Chilla	1939.46	1586.11	Sigchos	1032.79	728.21
Zaruma	1995.83	2068.88	Muisne	1077.86	1159.73
Giron	2000.05	1237.65	Rocafuerte	1136.57	795.11
Echeandia	2007.31	1525.37	Palora	1156.72	1476.8
Atacames	2025.88	2306.9	Rioverde	1160.85	1414.25
Huaquillas	2036.70	2045.99	Jaramijo	1169.81	2442.92
Patate	2055.84	1260.74	Camilo Ponce E.	1201.63	851.89
Piņas	2059.07	2286.36	Saraguro	1249.93	1253.39
Chaguarpamba	2061.61	1627.64	Pimampiro	1317.74	1029.11
San Jacinto de Y.	2068.72	1527.86	Pucara	1345.93	827.13
Salcedo	2093.39	2098.77	Caņar	1395.52	1389.95
San Pedro De Pelileo	2111.51	1795.84	Tisaleo	1421.29	990.06
Pasaje	2111.92	2164.50	Cascales	1453.82	1507.14
Samborondon	2180.62	4901.32	Deleg	1464.53	1648.47
Buena Fe	2256.60	2109.35	Biblian	1474.34	1867.69
Santo Domingo	2281.88	2711.19	Daule	1504.94	2106.15
Catamayo	2294.3	1762.18	Gnral A. Elizalde	1535.33	1727.88
Arenillas	2355.96	2080.94	Cotacachi	1592.59	1894.96
San Fernando	2422.83	1693.49	Playas	1620.34	1503.09
Antonio Ante	2423.27	1934.35	Arajuno	1624.09	1844.42
Santiago De Pillaro	2437.02	1631.68	Las Lajas	1631.03	1329.34
Atahualpa	2446.18	1245.55	Mera	1633.38	1528.08
La Concordia	2454.19	2226.67	Alfredo B. M.	1649.88	1222.49
Carlos Julio ArosemenaTola	2459.22	1678.51	Cumanda	1650.75	1566.16
San Miguel de los Bancos	2492.01	1824.20	Loreto	1667.21	1799.89
Quevedo	2551.28	2873.43	Urdaneta	1680.09	1865.42
Duran	2565.64	3000.76	El Chaco	1686.06	2016.62
Ibarra	2566.95	3805.33	Naranjito	1694.66	1414.39
Balsas	2650.95	2581.78	Penipe	1695.24	1630.55
Paute	2747.26	2252.48	Caluma	1815.02	1718.32
El Triunfo	2773.09	2545.15	Santa Clara	1836.51	3101.65
Machala	2832.00	4414.48	Pedro Vicente M.	1866.52	1571.93
Pedro Moncayo	2990.60	4617.68	Otavalo	1873.89	2634.45
El Guabo	3017.80	3558.85	Espejo	1877.52	2089.85
Portovelo	3040.70	3044.45	Mira	1893.48	1579.65
Mejia	3096.32	3163.22	Milagro	1894.84	1819.78
Manta	3144.23	4796.00	Gualaceo	1924.66	1389.77
Valencia	3309.97	3314.45			
Santa Rosa	3377.79	2827.64			
Naranjal	3415.01	2696.63			
Guachapala	3511.81	1638.5			
Las Naves	3705.31	1366.91			
Simon Bolivar	3776.09	2276.9			
La Troncal	3784.08	3573.66			
Cuenca	3797.72	4613.43			
La Libertad	3886.59	2808.38			
Rumiðahui	3902.77	5083.75			
Tena	4361.19	2202.41			
Cayambe	4430.96	3555.98			
Quito	5070.96	5746.13			

Isabela	5810.61	3391.54				
Puerto Quito	6055.38	2262.67				
Santa Cruz	6656.51	4866.52				
Baños de Agua S.	7949.22	4303.69				
San Cristobal	8438.7	6018.61				
		Quadrant 3		Quadrant 4		
Canton	GVA per capita 2007	GVA per capita 2012	Canton		GVA per capita 2007	GVA per capita 2012
Taisha	498.94	802.68	Empalme		1990.68	1208.75
Jama	820.59	822.93	Palestina		1996.62	1487.93
Huamboya	821.95	1039.23	Olmedo		2014.49	1653.89
24 De Mayo	827.88	740.19	San Juan Bosco		2023.82	1933.82
Guamote	1036.62	877.30	Lomas De Sargentillo		2027.28	884.26
Paquisha	1043.33	1350.74	Puebloviejo		2033.22	2811.33
Chimbo	1043.82	1272.44	La Mana		2040.18	1631.61
Chillanes	1045.95	1017.59	Aguarico		2088.17	1889.62
Espindola	1052.03	1114.12	Nabon		2100.59	845.10
Santa Ana	1055.84	858.93	Ventanas		2138.24	2301.30
Pajan	1066.66	926.60	Bolivar		2233.38	1672.50
Salitre	1069.29	654.30	Puerto Lopez		2244.46	1359.97
Santa Lucia	1080.17	845.32	Azogues		2251.36	2912.21
Centinela Del Condor	1110.23	1067.12	Babahoyo		2255.07	2908.99
Palanda	1121.17	939.43	Tulcan		2270.93	2938.94
Gualaquiza	1125.39	1597.29	Portoviejo		2302.44	3007.03
Colta	1134.71	810.09	Riobamba		2329.14	2970.23
El Pangui	1160.51	1645.96	Zamora		2330.55	2969.24
Zapotillo	1169.69	1003.02	San Miguel De Urcuqui		2365.25	1943.62
Nangaritza	1180.73	1399.30	El Pan		2491.60	1674.68
Chinchipe	1181.31	1200.89	Quininde		2561.35	3159.02
Vinces	1220.57	1261.81	Santa Isabel		2589.12	1503.38
Palenque	1228.88	1487.96	Loja		2633.34	3598.72
Tiwintza	1233.04	1008.69	Latacunga		2701.48	3895.83
Pichincha	1236.80	863.17	Montalvo		2730.38	1970.53
Colimes	1239.72	1272.23	Salinas		2746.66	2798.05
Pedro Carbo	1240.08	896.45	Pablo Sexto		2881.04	1773.93
Calvas	1260.65	1194.79	Ambato		2905.36	3782.41
San Miguel	1261.05	1070.71	Marcabeli		3515.96	1547.53
San Lorenzo	1263.47	1032.02	Quijos		3899.67	3076.75
Gonzalo Pizarro	1277.26	1558.89	Balao		4289.51	3179.35
Chone	1289.31	1268.2	Guayaquil		4404.46	4794.36
Santa Elena	1294.91	2480.47	Junin		5149.61	5352.78
Eloy Alfaro	1303.24	1332.23	Esmeraldas		5272.77	3072.65
Pedernales	1319.70	1457.31	Pastaza		7536.87	10663.70
Yacuambi	1322.19	1191.64	Crnel. Marcelino Mariduena		9910.76	12691.62
Santiago	1328.53	1835.44	Lago Agrio		11324.79	7590.70
Olmedo	1335.96	892.55				
Paltas	1359.22	1236.52				
Flavio Alfaro	1361.37	1146.21				
Suscal	1368.80	1570.28				
Quero	1385.72	876.14				
Balzar	1401.33	1359.48				
Alausi	1410.29	895.99				
Jipijapa	1418.20	1118.86				
El Carmen	1427.41	1243.88				
Limon Indanza	1430.36	1752.71				
Sozoranga	1456.70	1118.80				
Gonzanama	1475.60	1545.74				

Saquisili	1492.17	1041.22			
Yantzaza	1507.28	1990.57			
Nobol	1509.57	1040.84			
Logroðo	1509.61	1631.14			
Mocache	1510.63	2453.38			
Isidro Ayora	1518.96	1439.67			
San Vicente	1534.34	1293.19			
Puyango	1548.15	1345.74			
Mocha	1553.34	1049.82			
El Tambo	1558.52	2673.08			
Chunchi	1573.25	1542.24			
Sucua	1573.62	1775.16			
Pujili	1579.42	1102.50			
Pangua	1597.86	1206.47			
Pallatanga	1603.84	850.07			
Bolivar	1610.77	1367.91			
San Pedro De Huaca	1616.81	1808.27			
Guano	1625.91	1181.33			
Guaranda	1626.46	1941.17			
Chordeleg	1637.67	952.62			
Macara	1663.46	1780.60			
Sucumbios	1669.99	1476.46			
Montufar	1706.35	1857.55			
Celica	1720.18	1189.93			
Tosagua	1759.97	1925.16			
Pindal	1763.33	1031.13			
Cevallos	1807.30	2002.90			
Baba	1808.19	2095.41			
Sigsig	1819.64	981.25			
Sucre	1839.96	1775.27			
Quilanga	1842.38	2324.91			
Oṇa	1873.28	1268.01			
Morona	1921.44	2531.28			

Source: authors' elaboration on the basis of INEC.

Methodological Approaches to Evaluation of Economic Security of Enterprise

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Abstract

At present, functioning of enterprises is takes place under the conditions of unstable market environment, which requires full evaluation of not only particular factors which influence the activities of enterprise but also leads to necessity for development of complex evaluation of economic security, which is very important for further development of enterprise and predetermines scientific interest to this problem. The purpose of this research is to study theoretical and methodological approaches to evaluation of economic security of enterprise, develop proprietary methodology of evaluation of economic security of enterprise, and test the offered methodology by the example of materials of specific enterprise. In order to achieve the set purpose, economic & statistical methods of research and economic & comparative analysis were used. Methodological and practical research was based on the following methods: complex and structural & logical, expert methods, methods of comparison and modeling. The conducted research determined high-priority indicators of economic security of enterprise which fully reflect the state of economic security of enterprise and actualiz threshold values of mandatory norms. The given indicators of economic security allow evaluating and quantitatively determining the level of economic security of enterprise. The developed methodology of complex evaluation of economic security of enterprise in view of macro-, meso-, and micro-economic factor, unlike the existing ones, allows receiving integral indicators of the level of economic security of enterprise and interpreting their meaning with the help of estimation scale. Recommendations which are formulated in the research can be used for solving issues related to increase of effectiveness of enterprise functioning and provision of economic security.

Keywords: economic security of enterprise, quality of labor life, economic security of enterprise.

JEL Classification: K22.

1. Introduction

Under the conditions of unstable state of economy and regularly recurring crises, results of functioning of enterprises of various spheres and various organizational & legal forms are uncertain and unpredicted. Economic activities of economic subjects are influenced by macro-economic factors (state of commercial law, political and socio-economic situation in the country, regional and international conflicts, level of criminalization of society, etc.) and micro-economic ones (personnel, sufficiency of capital, assortment, effectiveness of marketing and management). All of this aggravated the problem of provision of security of enterprise (Endovitskaya 2014).

Activization of study of the problems of economic security predetermined development of several main approaches, among which the following could be distinguished: systemic, normative & legal, resource, functional, and synergetic. Systemic approach to study of economic security is related to study of all economic processes of enterprise from the position of theory of dynamic systems. In this theory, security is viewed as attribute or state of enterprise, predetermined by cooperation of the system and micro-, macro-, and micro-environments of functioning. According to such approach, security is on the one hand, one of the most important indicators of the system, and, on the other hand, the function of the system, which reflects its essential content and is one of goals and conditions of its functioning. Sustainable and safe development of the system is viewed as specific form of movement, characterized by three parameters – quantity, quality, and structure.

Normative & legal approach is based on legislative acts in the sphere of economic security. The foundation of legal basis during development of principles of provision of economic security of enterprise consists of the Law "Concerning security" dated December 28, 2010 and Strategy of national security of the Russian

Federation until 2020, passed by the Decree of the President of the RF dated May 12, 2009. These documents contain conceptual ideas of security, main terms, and their definitions (Federal Law, 2010, Decree of the President of the RF, 2009). A key notion in existing definitions of security within normative approach is "protectability". Thus, security is understood as a state of protectability of economic item from negative phenomena and threats. The Law "Concerning security" shows a whole new level of Russian studies of the problem of economic security which takes into account interests of not only the state but of subjects of micro-economics (Federal Law 2010).

Resource approach treats economic security of enterprise as totality of resources and organizational capabilities. A top-priority task in provision of economic security is increase of sustainability, development of economic subject, and strengthening of its competitive position in the market. Functional approach to determination of the sense of economic security supposes presence of direct dependence between power of influence of any external or internal factor on activities of economic subject and result of this influence manifested as change of state of economic subject.

Issue of security is reflected in synergetics, where danger to economic subject is defined as dynamically stable state as to unfavorable influences, activities for protection from internal and external threats and for provision of internal and external conditions of its existence which guarantee possibility for stable development. According to such treatment, economic security of enterprise is determined by influence of external environment, which, under the market conditions, constantly changes and is never stable. This approach is popular in publications of Russian economists which view content of category of economic security of enterprise from positions of significant influence of external environment and means of protection from its negative influence (Bogomolov 2011).

On the basis of study of modern treatments of the term "economic security", we found that economic security of enterprise is the state which ensures the most effective use of enterprise resources for provision of stable functioning and development, at which it is capable for maximization of its cost with acceptable risk level. Russian and foreign experience of provision of economic security shows that effective resistance to totality of risks and threats requires well-balanced and targeted organization of the process of management of economic security. Organization of this process should be conducted by specialists and enterprise's administration and employees, which determined high significance of organizational aspect of this issue (Serebryakova, Sibirskaya, Stroeva and Petruchina 2014). The main purpose of economic security of enterprise is provision of its sustainable and most effective functioning at present and provision of high potential for development and growth in future (Bezuglaya 2010). Due to complexity and multidimensionality of content of this category, it should be viewed as a system. Russian scientists understand system of economic security of enterprise as an organized totality of special bodies, services, methods, and measures which provide protection of vital interests of personality, enterprise, and state from internal and external threats (Serebryakova, Sibirskaya, Stroeva and Lyapina 2014). At that, it seems that system of economic security includes totality of interconnected sub-systems: sub-system of monitoring, sub-system of indicators, objects of management, subjects of provision and tools and methods of management (Figure 1).
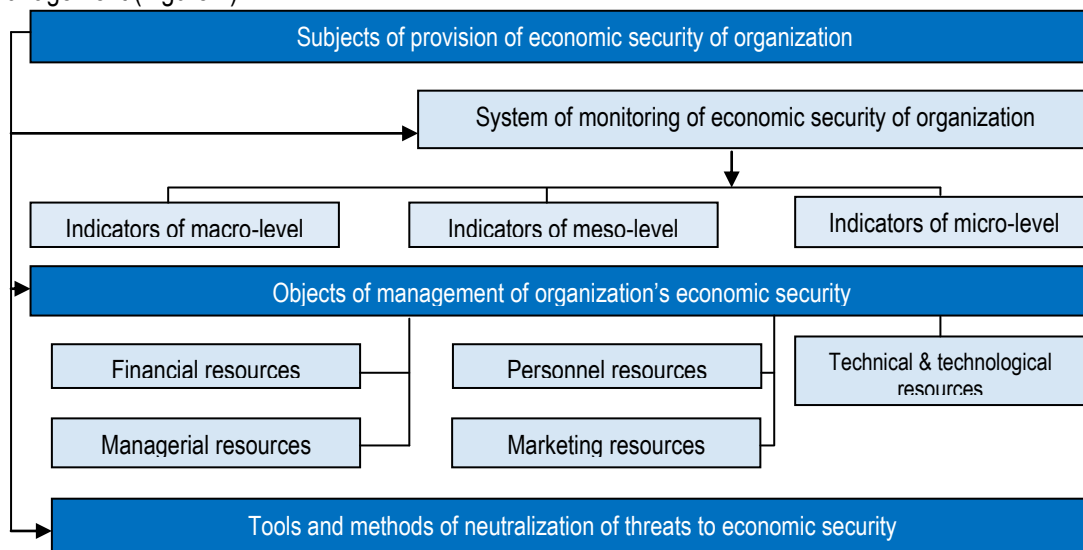

Figure 1– System of economic security of enterprise

Level of economic security of economic subject is determined in the process of cooperation of sub-systems and can be changed by subjects of provision of economic security. Constant monitoring of indicators, as well as correcting influence on objects, will allow providing economic security of enterprise (Alexander, Khorev, 2015). Leading goals of economic security of enterprise include:

- provision of effectiveness of work, financial stability, and independence of enterprise;
- provision of high competitiveness of enterprise;
- achievement of high effectiveness of management, formation of optimal and effective organizational structure of enterprise management;
- development of human capital at enterprise and achievement of high level of personnel qualification;
- minimization of negative influence of results of production & economic activities on the state of natural environment;
- legal protectability of all aspects of enterprise's activities;
- provision of protection of information and commercial secret, provision of achievement of necessary level of informational provision of work of all departments of enterprise;
- effective organization of security of enterprise's personnel, its capital, property, and commercial interests.

In our opinion, among the tasks of economic security, the most decisive are development of human capital and financial aspects, as, under market conditions, finances and personnel are the main "locomotives" of economic system.

The decisive factors of human capital development are not only corresponding level of qualification, but creativity, capability for generation of ideas, mobility (capability for adapting to quick and recurrent change of job), and self-education. Development and perfection of the stated capabilities are influenced by not only person, but by organization where he works (Serebryakova 2014). In view of the above, it should be noted that actual task of enterprise is development of human capital. In its turn, it stipulates not only personal development of employees, but allows the cost of organization to grow.

We consider that development of human capital requires provision of growth of quality of labor life of employees. It is possible to evaluate the quality of labor life from the position of hired worker and from employer's point of view. Evaluating the quality of living from the position of hired worker, the most important criteria are the following: level of satisfaction with labor, possibility for career growth and self-realization, psychological climate in work group, and other indicators. From the side of employer, the main components of labor life are the following– labor efficiency, turnover of staff, and number of conflicts at enterprise, labor discipline, and level of initiative of employees (Zhuravlev 2011). However, it is not advisable to view indicators of quality of labor life in an isolated manner (only from the position of hired worker or employer), as they are interconnected – so, integral evaluation is required. During evaluation of quality of labor life, it is important to take into account legal aspects of labor activities (legislative and normative acts, systems of payment and stimulation of labor, and process of HR selection). Technical factor should be considered as decisive factor in modern economy, as quality of labor life depends not as much on the above factors, as on the level of implementation of scientific achievements at enterprises, in particular, level of technical equipment (Tamoshina 2012).

One of components of labor life is motivation of employees. For modern employee, motivation is not limited by decent payment for labor; significant role belongs to nonmaterial stimuli (prestige, interesting job). Motivation urges employees for new labor achievements and stimulates growth of life quality (Yuriy and Salikov 2015).

Threats to stable functioning of enterprise predetermined necessity for use of corresponding methodological means of research of economic security of enterprise.

2. Research methods

One of the least studied, but possessing practical value, is the issue of evaluation of economic security of the enterprise. The results of evaluation are the basis for development of measures for managerial influences for stabilization of enterprise's activities. The truer and timelier is evaluation of economic security, the more substantiated and efficient are measures for its provision.

Generalization of the viewed theoretical and methodological issues of evaluation of economic security of enterprise allows conducting comparative characteristics of existing approaches, which allows evaluating possibilities and level of applicability of each approach (Table1).

Table1 – Comparative analysis of approaches to evaluation of economic security

Attribute for comparison	Resource approach	Systemic approach	Functional approach	Synergetic	Normative & legal
Content of economic security	ES–totality of resources	ES - state	ES–totality of functional types of security	ES - constant process of provision of security	ES – protectability from dangerous factors and threats
Evaluation object	Resources of economic subject	State of economic subject	Particular types of security	Process of security provision	Threats
Goal of evaluation	Increase of sustainability; strengthening of competitive position	Increase of sustainability	Increase of sustainability	Increase of sustainability	Sustainability of functioning
Tools of evaluation	Methods of strategic analysis, criteria of effectiveness, methods of factor analysis	Analysis and forecast of key indicators of economic subject activities.	Particular indicators of functional elements of economic subject activities	Indicators of efficiency of taken measures, criteria of measures effectiveness	Indicators of efficiency of functioning

Note: ES – economic security.

The viewed approaches have certain pros and cons, and the quality of evaluation of economic security, which is received on their basis, depends on many factors. Eventually, choice of approach depends on person who makes a decision and on his professional qualification, and is determined by pragmatic ideas.

The definition which is corresponds mostly to the offered treatment of economic security is the use of resource approach to its evaluation with clear strategic purpose and reflecting specific peculiarities of functioning of enterprise under the condition of threats and risks of modern market economy.

According to Gilfanov (Gilfanov 2013), as to system of economic security, the structure of threats includes three levels of influence: macro- , meso-, and micro-levels (Table 2).

Table 2 – Structure of key factors in system of economic security

Level of influence	Key factors	Characteristics of key factors
Micro-level	Financial	Provision with financial resources (own and loaned)
	HR	Provision with labor resources, level of qualification of employees
	Technical & technological	Correspondence of technical & technological infrastructure to needs of enterprise's development
	Managerial	Effectiveness of work of management bodies
	Marketing	Provision of constant activities, efficiency of sales work
Meso-level	Characteristics of sphere of work	Evaluation of intermediaries; peculiarities of development of sphere of activity
	Characteristics of territory	Resource provision of territory; infrastructural provision of territory; investment attractiveness of region
Macro-level	Political	Character of influence of decisions in political sphere
	Economic	Characteristics of macro-economic situation and of influence of macro-economic variables
	Social	Character of influence of changes of social direction on economic activities
	Technical and technological	Dynamics of innovations; Rates of scientific and technical development
	Institutional	Character of influence of specific changes in institutes on enterprise
	Ecological	Character of influence of ecological situation

Timely analysis and forecast of tendencies of influence of these factors are one of the main tasks of provision of economic security of economic subject. In order to get detailed evaluation of the level of economic security of enterprise, it is necessary to use a complex of indicators. Indicators of economic security are indicators which characterize the state of determinants of economic security of enterprise (Gilfanov 2013).

Indicators include data of macro-level which characterize the state of external environment (changes in law, level of macro-economic instability, etc.), meso-level (regional policy, resource provision of territory, etc.), and micro-level (provision with labor resources, quality of labor life, etc.). Not all indicators possess qualitative evaluation. Parameters of evaluation of macro-level indicators in the system of economic security of enterprise are shown in Table 3.

Table 3 – Indicators of economic security of macro-level and parameters of their evaluation

INDICATORS	CHARACTERISTICS	EVALUATION PARAMETER
1	2	3
Political	State and change of political situation and its influence on work of enterprise	− possibilities for changing the volumes of supplies for foreign intermediaries in case of change of political situation; − change in priorities of state policy (support for business activities)
Ecological	State and change of natural conditions and of ecological situation	− change of climatic conditions; − changes in parameters of ecological control
Economic	State and change of macro-economic parameters on functioning of enterprise	− macro-economic instability; − phase of economic cycle; − currency exchange rate; − interest rate
Social	State and change of consumer environment	− living standards of population; − volumes of consumption; − consumer preferences; − share of people with income lower than minimum wage
Technical & technological	Dynamics of innovations, rates of scientific & technical progress	− emergence of innovational technologies; − product's correspondence to modern requirements
Legal	Changes in laws	− changes in tax laws; − changes in laws which regulated business activities

In our opinion, main tendencies of influence on security of functioning of enterprise include political, ecological, economic, social, technical & technological, and legal factors. For each factor, corresponding parameters of evaluation are developed. Evaluation can be not only quantitative but qualitative and depends on peculiarities of specific indicator. Indicators of economic security allow determining problems and taking measures for solving them (Semenenko 2014).

Meso-level of the system of economic security can be studied in sectorial and territorial aspect. In sectorial aspect, the factor which poses threat may be characteristics of the sphere of functioning of business structure. From the position of territory, meso-level supposes characteristics of certain region as threats (Serebryakova and Pakhomova 2014). In this research the following indicators of expert evaluation of character of influence of meso-level threats will be viewed: characteristics of territory and sphere of activities, reflected in Table 4.

Table 4 – Parameters of expert evaluation of meso-level threats in the system of economic security

INDICATORS	CHARACTERISTICS	PARAMETER OF EXPERT EVALUATION
1	2	3
Characteristics of sphere of activities	characteristics of intermediaries; peculiarities of development of sphere of activities	- reliability of partners; - reliability of investors; - volume and perspectives of market development; - character of competition in market; - seasonal fluctuations; - innovational development of rivals; - attractiveness of business
Characteristics of territory	resource provision of territory; infrastructural provision of territory; investment attractiveness of region	- living standards of population; - investment attractiveness of territory - limits of sales market; - availability of resources; - transport and logistics infrastructure

Totality of indicators which reflect the state of indicators of economic security of micro-level is shown in

Figure 2. For the purpose of evaluation of economic security of enterprise, all indicators could be divided into three categories: production, financial, and social. In order to get general quantitative evaluation of the level of economic security of enterprise, it is offered to evaluate level of influence of all parameters in scores, and interpretation of evaluation results will allow making conclusions as to favorable or unfavorable situation at enterprise. On the basis of complex evaluation of economic security of enterprise, selection of corresponding tools for its provision is performed.

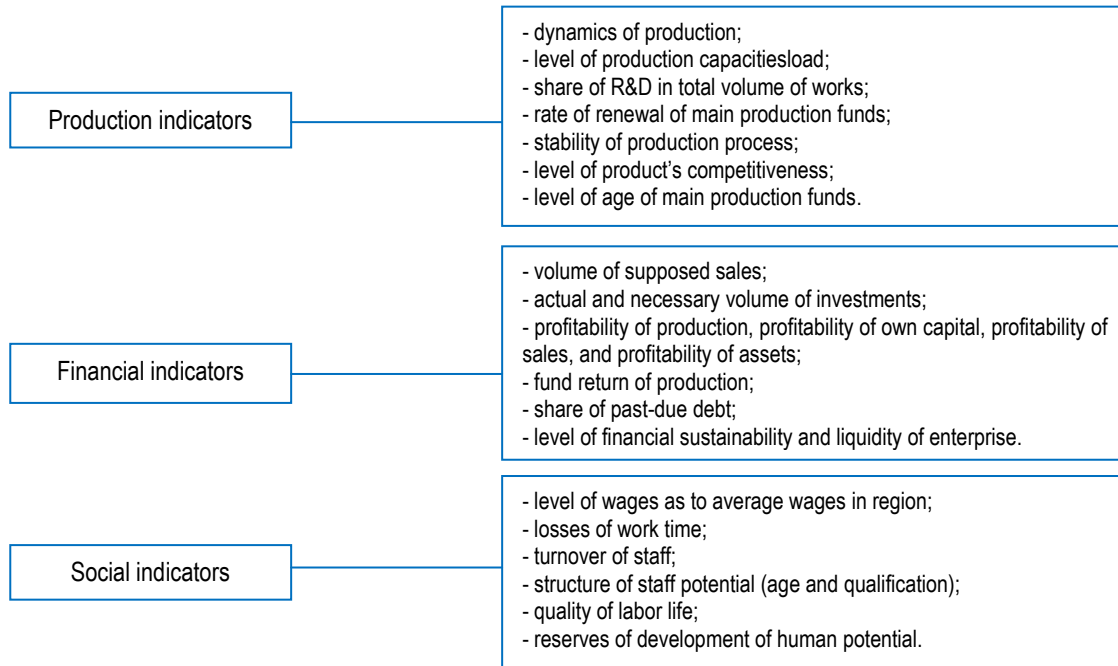| Production indicators	- dynamics of production; - level of production capacitiesload; - share of R&D in total volume of works; - rate of renewal of main production funds; - stability of production process; - level of product's competitiveness; - level of age of main production funds.
Financial indicators	- volume of supposed sales; - actual and necessary volume of investments; - profitability of production, profitability of own capital, profitability of sales, and profitability of assets; - fund return of production; - share of past-due debt; - level of financial sustainability and liquidity of enterprise.
Social indicators	- level of wages as to average wages in region; - losses of work time; - turnover of staff; - structure of staff potential (age and qualification); - quality of labor life; - reserves of development of human potential.

Figure 2 – System of quantitative and qualitative indicators of evaluation of micro-level economic security

Thus, on the basis of analysis and study of methodology of evaluation of economic security of enterprise, it is found that objective and full evaluation of economic security of enterprise requires taking into consideration the whole range of macro- and micro-economic determinants which influence the level of its economic security (Serebryakova, Ulchenko and Pankova 2015).

For the purpose of evaluation of economic security of enterprise, we developed an algorithm which is presented in Table 3.

Table 3 – Structure and succession of evaluation of economic security of enterprise

Stage	Content of monitoring stage
1	Identification of enterprise (economic subjects) — object of evaluation and specifics of its activities sphere
2	Formation of system of technical & economic indicators of evaluation of economic security of enterprise in view of specifics of its functioning.
3	Collection and preparation of information which characterizes state of evaluation object
4	Calculation of technical & economic indicators of enterprise for the whole forecasting period
5	Determination of factors which influence development of enterprise and evaluation of their influence level
6	Conduct of analysis of indicators of economic security of enterprise and their comparison with threshold values
7	Development of measures for prevention and neutralization of internal and external threats to economic security of enterprise

The given methodological approach to evaluation of the state of enterprise allows studying the whole range of determinants which influence economic security of enterprise and conducting economic substantiation of taken managerial decisions.

Precision of threats identification and right choice of indicators of their manifestation, i.e., system of monitoring indicators, influence the level of objectivity of evaluation of economic security of enterprise and choice of complex of necessary measures for prevention and elimination of threat, which correspond to scale and nature of threats. One of the most important tasks of monitoring of economic security of enterprise consists in diagnostics of its state according to system of indicators which reflect specific peculiarities of sector, characterize enterprise, and have a strategic significance for it (Panin 2014).

According to the chosen system of indicators, classification and evaluation of economic security of enterprise is conducted. Taking into account specifics of enterprise and compliance/non-compliance of factual and normative values of evaluation of its indicators and to the level of their deviation from threshold values of indicators, state of enterprise can be classified as:

- *normal* – indicators of economic security are within limits of threshold values, and the level of use of existing potential stays within technically reasoned norms of load of production areas and equipment;
- *pre-crisis* – barrier value of one of several indicators of economic security is exceeded, and other indicators occupy border position of threshold values, with enterprise not losing possibilities for perfection of production by using measures of preventive character;
- *crisis* – values of most of top-priority indicators of economic security are beyond the limits of threshold values, and there appear signs of irreversible decline of production and partial loss of potential due depletion of technical resource of equipment and areas, reduction of personnel;
- *critical* state is characterized by violation of all (or almost all) threshold values, which separate normal and crisis states of production development, partial loss of enterprise's potential is inevitable.

4. Analysis results

In order to get objective characteristics of the level of economic security of Tochka Zreniya LLC, let us conduct evaluation of security, taking into consideration influence of micro-, meso-, and macro-economic factors. As most of factors of external environment do not have quantitative form, lets us use score methods for evaluation. Maximal level of influence will be granted with 10 points, and absence of negative influence will be granted 0 points. Seventeen indicators will be evaluated – therefore, maximal sum of points will constitute 170. Level of influence of macro-economic factors will be evaluated with the help of the scale shown in Table 4.

Table 4 – Scale of evaluation of the level of influence of macro-economic factors in economic security of enterprise

NUMBER OF POINTS	STATE OF ECONOMIC SECURITY OF ENTERPRISE
0 – 50	normal
50 – 90	pre-crisis
91 – 110	crisis
111–170	critical

Evaluation of macro-economic indicators and level of their influence on activities and economic security of Tochka Zreniya LLC was conducted with the help of expert method (Table 5).

Table 5 – Macro-economic indicators and their score

INDICATORS	PARAMETER OF EVALUATION	SCORE
1	2	3
Political	− possibilities for changing volumes of supplies for foreign consumers in case of change of political situation; − possibilities of change of volumes of raw materials and resources received from abroad;	6 6
Ecological	− changes of climate conditions; − changes in parameters of ecological control	1 2
Economic	− macro-economic instability; − phase of economic cycle; − currency rate;	6 3 5

	− interest rate	3
Social	− living standards of population; − volumes of consumption; − consumer preferences; − share of people with income lower than minimum wage	6 7 7 4
Technical & technological	− emergence of innovational technologies; − product's correspondence to consumer requirements	2 4
Legal	− changes in tax law; − changes in laws which regulate business activities	2 3
TOTAL SCORE	67	

As is seen from the given data, influence of macro-economic factors in activities of Tochka Zreniya LLC and the level of influence are substantial, so the state of economic security of enterprise could be characterized as pre-crisis.

In a similar way, let us evaluate economic security of enterprise at meso-level. Table 6 shows scores of the level of economic security.

Table 6 – Parameters of expert evaluation of meso-level threats in system of economic security

INDICATORS	PARAMETER OF EXPERT EVALUATION	SCORE
1	2	3
- Characteristics of intermediaries; - Peculiarities of development of activities sphere	- reliability of partners; - reliability of investors; - volume and perspective of market development; - nature of competition in market; - seasonal fluctuations; - innovational development of rivals; - attractiveness of business	6 3 8 6 6 6 5
- Resource provision of territory; - Infrastructural provision of territory; - Investment attractiveness of region	- living standards of population in the region; - limits of sales market; - transport & logistics infrastructure	7 5 7
TOTAL		59

For evaluation of meso-level threats, 10 indicators were used; maximal influence is granted 100 points. As is seen from the given data, the largest influence on effectiveness of development and economic security of Tochka Zreniya LLC is conducted by the following factors:volume and perspectives of market development; nature of competition in the market; living standards of population in the region; transport & logistics infrastructure – their scores are 8, 6, 5, and 7, accordingly. Taking into account the influence of all viewed factors of meso-level, level of economic security of Tochka Zreniya LLC can be classified as pre-crisis. Table 7 shows indicators of economic security of micro-level and parameters of their evaluation.

Table 7 – Indicators of economic security of micro-level and criteria of their evaluation

Indicators of economic security	Indicator value
1	2
Financial indicators	
Coefficient of financial leverage	0-100%
Coefficient of stock provision and expenses of sources of funds	≥ 0.8 – ≤ 1
Share of debit debt in sales revenue	≥ 0.15 – ≤ 0.35
Coefficient of current liquidity	≥ 1 – ≤ 2
Production and sales indicators	
Performance of plan of production and product sales	≥ 0.7 – ≤ 1
Dynamics of growth of prices for raw materials and resources	0 – ≤ 0.1
Competition level	-
Coefficient of product quality	≥ 0.85 – 1
Observation of contract liabilities by partners	≥ 0.15 – ≤ 0.30

Indicators of economic security	Indicator value
Innovational activities	
Innovational activity of organization	0-40%
Internal expenses for R&D	≥ 0.05 – ≤ 0.3
Coefficient of inventive activity	0-≥3
HR indicators	
Level of personnel qualification	≥ 0.7 – 1
Personnel turnover	0.15 – ≤ 0.30

As most of micro-level indicators have quantitative form, Table 7 shows limits of indicators' values which reflect normal level of economic security of enterprise.

In our opinion, the following indicators of economic security of enterprise are of the top-priority (these indicators are assigned the largest share in system of evaluation):

- Indicators of dynamics of factors of economic effectiveness and profitability. The key among them are profitability of own capital ROE, where ROE = (Profit-taxes) / Own capital> 15% and profitability of assets ROA. Level of threshold value of ROA for enterprise corresponds to average indicator 1-2%. It should be noted that in the process of expansion of scale of enterprise's activities, it is necessary to track profitability of personnel (the larger the economic subject, the more probable the positive dynamics of personnel, including personnel which do not provide direct income, as well as increase of personnel in "discrete centers of expenses", where it is difficult to find out whether the expansion of staff is reasoned).
- Indicator of personnel turnover. While usual norm of personnel turnover for trade sphere is 3-5%, threshold value for enterprise is 10%. Personnel turnover which is higher than this value can be a sign of managerial problems in organization.
- Indicator of deviation of values of norms of financial sustainability and liquidity.

Conclusion

The conducted research and systematization of scientific approaches to issues of evaluation of economic security of enterprise allowed making the following conclusions. Effective work of any enterprise under the modern economic conditions is impossible without analysis of internal and external threats to its economic security and development of mechanisms of their elimination.

Evaluation of economic security of enterprise should be viewed as continuous process, based on systemic monitoring and analysis of indicators of economic security which allows receiving objective characteristics of the state of economic security of enterprise for the purpose of us of corresponding mechanisms of its provision (Serebryakova 2013). The main goal of evaluation of economic security of business subject to prevent damage from negative influence and to achieve effectiveness of activities, and the main tasks is to timely determine problem situations.

These article states only main indicators of economic security of business subject, but the given methodology allows transforming and complementing them, depending on specifics and sphere of activities of organization for fuller and truer evaluation.

References

[1] Bezuglaya N.S. (2010). Economic security of enterprise. Contents of economic security of enterprise. *Russian Entrepreneurship,* 4(1): 63-67.

[2] Bogomolov, V.A. 2011. Economic security: textbook / V.A. Bogomolov. - M.: UNITI-DANA, – 263 p.

[3] Endovitskaya A.V., Volkova T.A., Baliashvili D.U. (2014). Theoretical and methodological approaches to determination of contents of economic security of enterprise and its evaluation, *Modern economy: problems and solutions*, 10 (58): 62-68.

[4] Gilfanov, M.T. (2013). Organizational and methodological instrumentarium of evaluation of determinants of provision of enterprise economic security, *Socio-economic Phenomena and Processes*. 8: 16 -32.

[5]   Khorev, A.I., Salikov, Y.A., Serebryakova, N.A. (2015). Conceptual Features of the Balanced Development of Business Organizations. *Asian Social Science*, 11(20): 22-29.

[6]   Panin, A.U., Semenenko, S.V., Sinyukova, V.A. (2014). Economic security of enterprises: organizations, functioning, development. Voronezh.

[7]   Salikov, Y.A., Kolomytseva, O.Y., Pakhomova, T.A., Grishchenko, N.V. (2015). Actual Issues of Planning of Well-Balanced Development of Innovative & Investment Activities. *Asian Social Science*, 11(20): 193-206.

[8]   Segebryakova, N.A. (2013). Conceptual foundations of organization and conduct of managerial consultation for provision of organization of organization's management. *Theoretical and Applied Issued of Economics and Service Sphere*, 5: 37-48.

[9]   Semenenko, S.V. (2014). Theoretical substantiation of structure of trade organization competitive potential. *Bulletin of Belgorod University of Cooperation, Economics and Law*, 1(49): 185-199.

[10]   Serebryakova, N., Sibirskaya, E., Stroeva, O., Lyapina, I. (2014). The Contents and Structure of Innovative Activity in the Russian Economy. *Asian Social Science*, 10(23): 51-59.

[11]   Serebryakova, N., Sibirskaya, E., Stroeva, O., Petruchina, E. (2014). The Need of the Uniform Information Platform "Innovations of Russia" Formation, *Asian Social Science*, 10(23): 78-85.

[12]   Serebryakova, N.A. (2014). Perspective directions of development of innovational activity of food industry enterprises. *Theoretical and Applied Issued of Economics and Service Sphere*, 8: 19-22.

[13]   Serebryakova, N.A. and Pakhomova, T.A. (2014). Monitoring of innovational and investment activities of economic systems. *Theoretical and Applied Issued of Economics and Service Sphere*. 2: 27-42.

[14]   Serebryakova, N.A., Ulchenko, T.Y. and Pankova, N.M. (2015). Risks management at macro- and micro-levels. *Bulletin of Voronezh State University of Engineering Technologies*. 2 (64): 237-242.

[15]   Shlykov, V.V. (2013). Complex provision of economiuc security of enterprise, SPb.: Aleteya, 91 p.

[16]   Tamoshina G.I. *et al.* (2012). Public welfare and mechanisms of its formation: monograph. Voronezh: NauchnayaKniga Publ. 121 p.

[17]   Zhuravlev, Y.V., Smolyanova, E.L., Matuzov, Y.I. and Semenenko, S.V. (2011). Management of innovational changes at enterprise. Moscow.

*** Federal Law dated December 28, 2010 No. 390-FZ Concerning security (December 28, 2010) No. 390-FZ. – URL: // www.consultant.ru/

*** Federal State Statistics Service -http://www.gks.ru (Date of access: 12.07.2015).

*** On Strategy of national security of the RF until 2020 (E-source): Decree of the President of the RF dated May 12, 2009. No. 537. URL: http://www.consultant.ru

Vulnerability of the European Deposit Guarantee Schemes and the Banking Resolution Mechanism

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Abstract:

The new directives of the European Parliament and the European Council issued in 2014 define unified expectations regarding deposit guarantee schemes and banking resolution mechanism to be applied in territory of each EU member state. Moreover, the so called Single Resolution Fund must be implemented by euro zone member states in order to finance the resolution processes. The article introduces the main rules of the unified systems as well as deals with their financial background. It provides evidence for vulnerability of deposit guarantee schemes supposing such situation where clients of a large bank are to be compensated. Furthermore, it proves that the target total asset level of the Single Resolution Fund declared by European Commission is underestimated.

Keywords: resolution, banking union, deposit guarantee schemes, DGS.

JEL Classification: G20, G21, G28, G38.

1. Introduction

Herman Van Rompuy the former President of the European Council recommended numerous measures in order to stabilize the European economic and monetary union in 2012. The recommendations were given for the European Commission (hereinafter Commission), the Euro group and the European Central Bank. One of the recommendations was compiled with the intention of establishing an integrated financial system which is nowadays called simply as Banking Union. (Council of the European Union 2012)

Pillars of the Banking Union are defined in more regulations and directives in the European Union. The European Parliament approved the proposals of the Commission concerning European Single Supervisory Mechanism in 2013. From November 2014, it brought significant changing in the banking supervisory activity. Participation is compulsory for each euro zone member state but others from the European Union could also join to the system. (European Parliament and of Council 2013a)

2. Main rules of the unified deposit guarantee schemes and resolution mechanism, literature overview

2.1. Main rules of the unified deposit guarantee schemes and resolution mechanism

After regulating the banking supervision, two new pillars were created in the frame of Banking Union in 2014. The first one is related to the bank deposit guarantee scheme (hereinafter DGS) and the second one deals with banking resolution: the European Parliament and the European Council issued their common directive on the banking deposit scheme in April and one month later they issued their directive on recovery and resolution of credit institutions and investment firms (European Parliament and of Council 2014a, 2014b, 2014c). The directives give framework for issues concerning bank deposit guarantee as well as banking resolution and define the rules based on which the financial background of the systems are to be created.

The Parliament and the Council also issued a regulation that defines uniform rules and procedures concerning resolution of credit institutions and certain investment firms registered in territory the euro zone. It must be note that generally a regulation of the European Parliament and the European Council automatically takes effect in each member state but in this particular case the regulation itself narrows its territorial effect. It must be used only in the euro zone. According to this regulation the so called Single Resolution Fund is to be created. This fund will embody the financial background of the banking resolution.

2.1.1 Deposit guarantee schemes

The directive of the European Parliament and Council disposes the expectation to implement at least one deposit insurance system in each member state. According to the analysis of the European Commission made in 2013, generally one system works in the member states, but there are some exceptions. There are 5 systems in Austria, in Germany 4 systems operate and 2-2 schemes are maintained in Italy, Cyprus and Portugal (European Commission 2007, 2009, 2013). Nevertheless, inthe Capital Requirement Directive issued also by the European Parliament and Council a credit institution allowed taking deposits in a member state if this institution is member

of a guarantee scheme. Therefore, a credit institution is allowed to take deposits in a member state even if this institution is not member of the guarantee scheme of the country in question. (European Parliament and of Council 2013b)

According to the directive of the deposit guarantee scheme, the deposit and the related compound interest is protected up to 100.000 euro. If a parent bank from a non EU member state establishes branch in an EU member state, the authority of this EU state must check the deposit guarantee system of the non EU member state the parent bank belongs to. The protection of deposits must be the same in that case. If it is not fulfilled, the branch must join to the DGS of an EU member state. Let's see an example! Suppose a Canadian parent bank establishes a branch in Croatia. In this case, the Croatian authority checks the Canadian DGS. Among other things it examines if the deposits are protected at least up to 100 000 euros in the Canadian system. In other words, the authority must make sure whether the Canadian deposit fund pays decent amount in reasonable cases or not. If the answer is no, the branch has to join to the Croatian DGS (or DGS of any EU member state).

2.1.2. Resolution mechanism

In the practice applied before implementing the new resolution rules, significant bank in financial difficulties was bailed out by taxpayers' money of the sovereign it belonged to. However, on the one hand this solution was not applicable in case of significant European banks, since their balance sheet total was (is) too large to be able to bail out them. On the other hand, earlier if a government intended to bail-out a financial institution jeopardizing the financial stability of the country, the financial background of the rescue was provided by the tax payers. According to the new rules, applying the bail-in method the owners and the creditors (except for the owners of the covered deposits) become the payers of the resolution.

The maintenance of the critical function of the credit institution, avoidance of the unfavourable effect jeopardizing the financial stability and protection the depositors are the main purposes of the resolution mechanism. Nevertheless, more preconditions must be fulfilled in order to implement transparent resolution process.

At first, a resolution authority is needed to be independent from the supervisory authority. Nevertheless, the supervisory authority also participate in the resolution processes, it has predefined tasks during the resolution.

Also, credit institutions are obliged to compile their own recovery plan that must be updated annually. This plan must be sent to the supervisory authority. The authority examines the appropriateness of the plan, for example it investigates the capital and financial structure of the bank or checks if the plan contains proper measures for different unfavourable scenarios. The supervisory authority also has to examine whether there is any obstacle in implementation of the measures defined in the recovery plan. If the plan appropriate, the supervisory authority hands over the plan to the resolution authority. Based on the data of the recovery plan, the resolution authority makes resolution plan.

An internationally active bank could jeopardize the financial stability of the whole region within which the bank operates. In order to avoid this trap, an internationally active bank must compile group-wide recovery plan that must be submitted to the consolidated supervisory authority (in case of significant banks in the euro zone it is the European Central Bank). This plan (if appropriate) is passed to the group-level resolution authority, the related supervisory authorities and the related resolution authorities. That is, decision must be made on consolidated level.

The supervisory authority is also entitled to use different tools in the early interventional phase (pre-resolution phase). For example the authority might require the management body of the institution to implement one or more measures specified in the recovery plan, the authority is entitled to convene the meeting of the shareholders in order to decide on certain measures or the authority is entitled to require one or more members of the management body or senior management to be removed or replaced.

The resolution directive defines the circumstances when resolution must be initiated. If in the opinion of the supervisory authority the credit institution is close to the bankruptcy, neither further supervisory measures, nor additional investor financial support could help, the resolution process must be initiated. When governing the resolution, the authority has to take such principal into consideration according to which the shareholders of the institution under resolution must be the first and the creditors must be the second loss bearers of the resolution. This rule can be evaluated as the most important changing in the process of the bank resolution.

When initiating the resolution, the management body and senior management of the institution under resolution must be replaced. Moreover, it must be examined whether natural and legal persons are responsible for failure of the bank or not.

During the resolution process the sale of the business, usage of bridge institution, asset separation and the bail-in tools are available for the resolution authorities. These tools can be combined or can be applied separately. If the sale of business or usage of bridge institution tools are employed and only part of assets, liabilities and right handed over, the residual institution must be wound-up under normal insolvency proceeding. When using the sale of business tool, the resolution authority has right to sell the shares, assets, rights and liabilities of the institution under resolution procedure. The purchaser must be dealt as successor. During usage of the sale of business tool the resolution authority must fulfil numerous criteria. The conflict of interest rules must be kept, the transparency of the transactions must be ensured, the unduly favour or discrimination between potential purchaser must be excluded as well as the need of quick resolution and the purpose of the price maximizing must be taken into account.

The resolution authority entitled to apply bridge institution in the resolution process. Doing so, the authority has right to transfer the assets, rights, liabilities, shares possessed or issued by the institution under resolution to a bridge institution without consent of the shareholders. The bridge institution must be owned by one or more public authority, which is controlled by the resolution authority. Receiving and holding some or all of the shares or some or all of the assets, rights and liabilities of the institution under resolution with a view to maintain the critical functions and to sell the institution are the main purposes when funding bridge institution. The resolution authority appoints the management body of the bridge institution and specifies the risk profile of the institution. The management should pursue to maintain the critical function of the credit institution and to sell the bridge institution under the possibly best condition. When taking over the assets and liabilities, the value of the assets has to be higher than the liabilities. That is, only a certain part of the liabilities is taken over by the bridge institution. This solution ensures the viability of the bridge institution.

When applying the asset separation tool, the resolution authority has right to hand over the assets, rights and liabilities of the credit institution under resolution procedure or to hand over the bridge institution to an asset management vehicle. The asset management vehicle shall be a legal person that wholly or partially owned by a public authority and is controlled by the resolution authority. While holding the critical function is the main purpose of the bridge institution, the price maximising through sales or orderly wind-up are the goals of employing the asset separation tool.

As it mentioned above, the cost of keeping alive the credit institution in difficult financial situation was paid by the taxpayers earlier. However, by virtue of the new directive, the owners and the creditors are the primer payers of the resolution cost of the credit institutions. This mechanism is fulfilled by deleting or dilution of the shares, by reducing the principal amount of claims or debt instruments or by converting claims to shares.

The measures mentioned can be applied in case of any liability (hereinafter eligible liability) except for covered deposits, secured liabilities, liabilities with a remaining maturity of less than seven days and salary liabilities, that is, the owners and the creditors must finance the resolution of the bank. In order that the bail-in tool might be applied, the credit institution should meet the minimum criteria of the own fund and eligible liabilities. That is, the

$$IM < \frac{OF + EL}{OF + EL + OL}$$ (1)

must be fulfilled, where:

IM — institute-specific minimal requirement
OF — own fund,
EL — eligible liability, this liability might be taken into account when applying the bail-in tool,
OL — other liability, this liability is not taken into account when applying the bail-in tooland
EL+OL — expression embodies the total liabilities.

The value of the IM is specified by the resolution authority and depends on numerous criteria. There is no a predefined value, it is different in case of different institutions. When applying the bail-in tool, write down or conversion of capital instruments, the following sequence must be kept by the resolution authority: common equity Tier 1 items, additional Tier 1 items,Tier 2 instruments,subordinated debts,rest of eligible liabilities.

An instrument could be reduced if the liability being on higher rank in the abovementioned hierarchy has already been reduced to zero. Therefore, the cost of the resolution is primarily paid by the owners and such creditors who have receivables related to eligible liabilities of the bank under resolution procedure.

Let's see an example! Suppose the resolution authority decides writing down 1124 units. The remaining values of the liabilities are the following:

Table 1 - The sequence of the write down of liabilities (fictive data)

Liability	The value of the liability before using the bail-in tool (unit)	Write down (unit)	Compound write down (unit)	The value of the liability after using the bail-in tool
Common equity Tier 1 items	702	702	702	0
Additional Tier 1 items	209	209	911	0
Tier 2 instruments	104	104	1015	0
Subordinated debts	402	109	1124	293
Rest of eligible liabilities	7 105	0	1124	7 105
TOTAL	8 522	1 124		7 398

Source: fictive data

2.2. Literature overview

Numerous articles deal with the disadvantage and advantage of the integrated financial system. Ensuring the financial stability of the Union is the main goal of the Banking Union. Nevertheless, stability cannot be achieved by separated national efforts. Schoenmaker proves that maintaining the financial stability, strengthening the financial integration and enforcing national financial policies are incompatible. Any two of the three could be combined but they make the third impossible. It is the so called financial trilemma which is observable in the practice: the risk of cross-border banking and investment service cannot be managed by national policies either the financial stability or the financial integration hurts (Schoenmaker 2011). Since one of the elements of the financial stability management is raised from national to European mutual level, as it happened in case of introduction the single supervisory mechanism, deposit guarantee and resolution the trilemma of Schoenmaker has been partly broken.

The result of Claessen at al. research is the same. The national authorities make decision by taking the local interest into account during a crisis and they do not deal with the cross-border activity of the institution in financial trouble, which refers also to one of the ingredients of the financial trilemmadefined by Schoenmaker (Claessen *et al.* 2010).

According to Engineer, Schure and Gillis the different interest of the local, national authorities of the member states of the European Union is the reason for fragmented system of deposit guarantee schemes (Engineer, Schure and Gillis 2012).

In Micossi, Bruzzone and Carmassi opinion when building up the Banking Union the resolution procedure was unreasonably emphasized and the intention of unifying the deposit guarantee schemes was neglected (Micossi, Bruzzone and Carmassi 2013).

In research of Pisani-Ferry *et al.* the authors deal with the same issue by calling attention on the risk of deposit guarantee schemes managed by sovereigns. In their opinion remaining under sovereign management the effectiveness of the mechanisms could be undermined. (Pisani-Ferry *et al.* 2012)

Gros and Schoenmaker recommend implementing a European deposit insurance and resolution authority. (Grosand Schoenmaker 2014)

3. Financial background of the new systems, vulnerability of the guarantee schemes and the underestimated total asset value of the Single Resolution Fund

3.1 Financial background and vulnerability of the guarantee schemes

The banking annual contribution is the main source of the deposit guarantee schemes. The target level is 0.8% of the covered, guaranteed deposits that must be reached by the member states by 3 July 2024.

The deposit guarantee institutions should invest the fund diversified manner in low risk assets. The assets of the deposit guarantee funds must be primary used in order to compensate the deposit owners. However, during low risk environment, member states might allow that the systems use the available assets for alternative purposes.

The DGSs have remained under national management. Mutual deposit guarantee fund is not created by the member states of the euro zone, either. As a result of it, there is no such mutual fund that could be used in critical financial situation. Though, DGSs are allowed to finance each other in the directive, the implemented system does provide proper protection for different sovereigns.

Receiving deposits and providing loans is the main and base activity of the banks. In the practice, there are other activities in the credit institutions (for example investment service) and therefore there are other incomes that raise the profit of the bank. However, the main profit source of the financial institutions should be basically the net interest income originated from base activity. Profit will be realised if the interest income is higher than the interest expense. Naturally, it will be attained if the deposits are provided for borrowers and the cumulated deposit interest is lower that the cumulated interest income.

As a result of pursuing the base activity of the bank, that is disbursing loans based on the deposits received, cash in a bank is not enough in a certain moment to pay back the whole deposit portfolio. Since banks have no possibility the require back the provided loans earlier than as it contracted, sudden emerged cash back claim cannot be satisfied by credit institutions. For example this situation could occur if unfavourable information is disclosed about the bank or the whole banking system, and as a result of it the depositors feel risky their deposit return. In that case depositors' mass claims back their fund.

In order to mitigate the effect of these situations, sovereigns have deposit guarantee schemes operated. Since the DGSs have remained under national management and there is no a mutual deposit guarantee fund having enough sources that could intervene in critical financial situation, sovereigns should manage the crisis within their territory. The following chart shows the significant difference between the received deposits and the available cash as at the end of 2014 as per European Union member states.
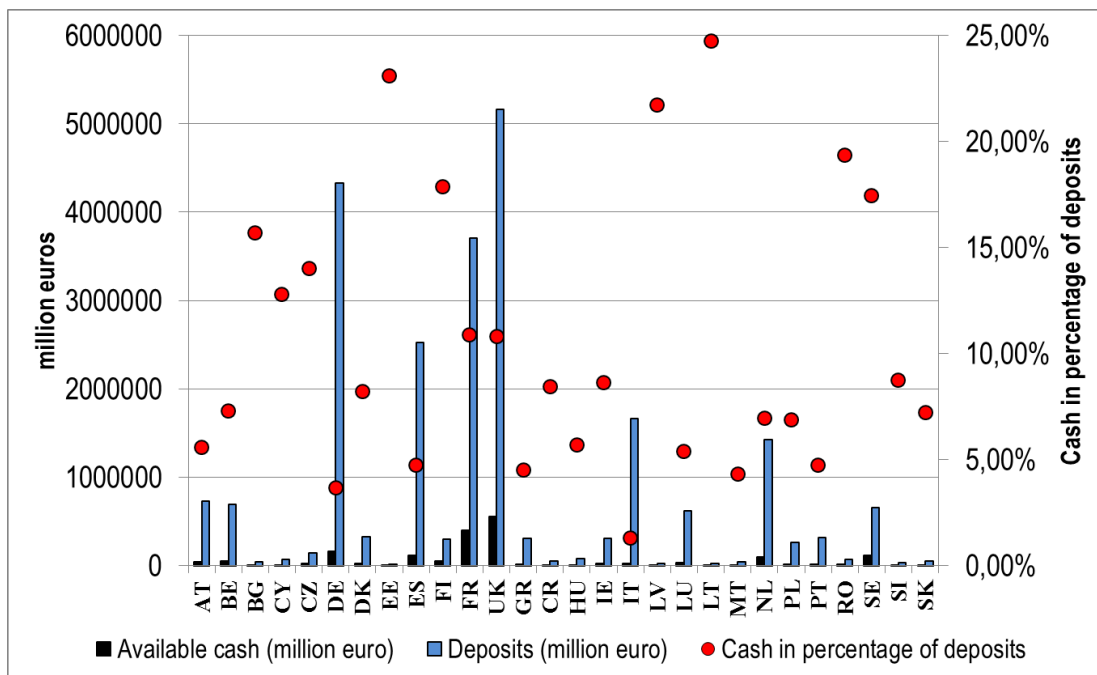
Source: European Central Bank, own calculation

Figure 1 - Cash and deposits in the banking sector of European Union as at 31/12/2014

It is well observable that the cash portfolios are significantly lower than the deposit liabilities in each country. In order to get detailed picture on risks hidden in the implemented systems three guarantee schemes and three large banks belonging to one of the guarantee institutions were selected. During the analysis suppose that the selected bank is not able to fulfil its whole deposit cash back payment obligation and liquid assets of the bank sold in order to partly satisfy the cash back claims. Furthermore, suppose that the cash and the cash inflow from selling the liquid assets are paid to depositors as well as value of cash and liquid asset portfolio is equal to the cash and liquid portfolio in the annual financial report made as at 31/12/2014. Since liquid assets (financial instruments at fair value through profit or loss, available-for-sale financial assets, shares) are not able to be sold within short time, let three scenarios for success of selling the liquid assets. Suppose that in the first scenario 30 percent, in the second scenario 50% and in the third scenario 100% of the financial assets can be sold within

short time period.The value of the guaranteed deposits of a particular bank is not disclosed but their value could be forecasted based on the research made by the European Commission (European Commission 2007, 2009, 2013). Keeping the above listed presumptions in mind, the following institutions and banks were selected as well as the following guaranteed deposit to total deposit ratios were applied in the calculation:

Table 2 – Banks and deposit guarantee institution in the sample

Member states	Selected deposit guarantee institution	Selectedcredit institution	Guaranteed deposits to total deposits ratio
FRANCE	Garantifonden for Indskydere og Investorer	Danske Bank A/S	63,20 %
DENMARK	Fonds de Garantie des Dépôts et de Résolution	BNP Paribas SA	69,96 %
GREECE	Hellenic Deposit and Investment Guarantee Fund	Pireaus Bank S.A	59,87 %

Source: own research

The essence of the analysis is to make sure whether the deposit guarantee scheme disposes enough assets to compensate the depositors based on data as at 31/12/2014.

The assets of the Danish Garantifonden for IndskydereogInvestorer institution is composed by deposits in banks and at the National Bank, government bonds, receivables from institutions, receivables from institutions connected to guarantees, forecasted guarantee fees derived from loss, forecasted dividend, assets from wound-up procedures and other assets. According to the annual report of Garantifonden for IndskydereogInvestorer the value of assets is amounted to 11,114 million Danish kroner as at 31/12/2014. The value of deposits at Danske Bank is 794,027 million Danish kroner as at 31/12/2014, therefore the calculated guaranteed deposit portfolio is amounted to 501,825 million Danish kroner (63.20%). The cash and liquid portfolio to be paid for deposit cash back, the remaining part of the guaranteed deposit of Danske Bank to be compensated by the DGS as well as the uncompensated part of deposits is the following as at 31/12/2014:

Table 3 - The uncompensated part of the deposits as per scenarios – Denmark (million Danish kroner)

ASSETS	As at 31/12/2014	Scenario 1	Scenario 2	Scenario 3
Cash	16,789	16,789	16,789	16,789
Other liquid assets	738,093	221,428	369,047	738,093
Total cash and liquid assets	754,882	238,217	385,836	754,882
Remaining part of the deposits		555,810	408,192	39,145
Calculated guaranteed deposits (63.2%) to be compensated by the DGS		351,272	257,977	24,740
Guaranteed but uncompensated deposits		340,158	246,863	13,626

Source: Annual report of Danske Bank 2014 and Danish Garantifonden for Indskydereog Investorer

Even in case of the most favourable scenario the assets of the Garantifonden for Indskydereog Investorer DGS institution does not enough to entirely compensate the depositors.

The assets of the Fonds de Garantie des Dépôts et de Résolution institution is composed by tangible and intangible assets, short term receivables, convertible securities and cash amounted to 3146 million euros as at 31/12/2014. The value of deposits of BNP Paribas is amounted to 387007 euros as at 31/12/2014, therefore the calculated guaranteed deposit portfolio is amounted to 270750 million euros (69.96%). The conclusion is the same as it was interpreted as at Danish case: even in case of the most favourable scenario the assets of the DGS does not enough to entirely compensate the depositors. The calculation of the deposits to be compensated by the DGS is the following, taking the financial data as at 31/12/2014 into account.

Table 4 - The uncompensated part of the deposits as per scenarios – France (million euros)

ASSETS	As at 31/12/2014	Scenario 1	Scenario 2	Scenario 3
Cash	88,765	88,765	88,765	88,765
Other liquid assets	272,268	81,680	136,134	272,268
Total cash and liquid assets	361,033	170,445	224,899	361,033
Remaining part of the deposits		216,562	162,108	25,974
Calculated guaranteed deposits (69.96%) to be compensated by the DGS		151,506	113 ,411	18,171
Guaranteed but uncompensated deposits		148,360	110,265	15,025

Source: Annual report of BNP Paribas 2014 and Fonds de Garantie des Dépôts et de Résolution

The assets of the Hellenic Deposit and Investment Guarantee Fund is composed by cash, short term receivables, securities with fixed interest, long term receivables, tangible and intangible assets, advanced payments and accrued incomes amounted to 4577 million euros as at 31/12/2014.Amount of deposits provided by clients of Pireaus Bank is 50,240 as at 31/12/2014. Consequently, the calculated guaranteed deposit portfolio is amounted to 30,079 million euros (59.87%). As it was well observable in former both cases the assets of the deposit guarantee institution are not enough to entirely compensate the depositors.The calculation of the uncompensated deposits is listed below.

Table 5 - The uncompensated part of the deposits as per scenarios – Greece (million euros)

ASSETS	As at 31/12/2014	Scenario 1	Scenario 2	Scenario 3
Cash	2,864	2,864	2,864	2,864
Other liquid assets	18,985	5,695	9,492	18,985
Total cash and liquid assets	21,849	8,559	12,356	21,849
Remaining part of the deposits		41,681	37,884	28,391
Calculated guaranteed deposits (59.87%) to be compensated by the DGS		24,954	22,681	16,998
Guaranteed but uncompensated deposits		20,377	18,104	12,421

Source: Annual report of Pireaus Bank 2014 and Hellenic Deposit and Investment Guarantee Fund

### 3.2. Financial background and the underestimated total asset value of the Single Resolution Fund

According to the directive to be used in the member states of European Union, the resolution authority has right to use the money of the fund for the followings: warranty or loan granting for the institution under resolution, buying the assets of these institutions, supporting the activity of the bridge institutions, asset management vehicle, lending to other financing arrangements or combination of the previously mentioned. However, the fund cannot be applied for capitalizing institutions in critical financial situation.

The target level of the fund is one percent of the covered, guaranteed deposits that must be reached by the member states by the end of 2024. Due to this rule, the compound target is 1.8% together with the fund to be uploaded for depositguarantee assurance. However, while the deposit guarantee schemes remain under member states management, the contribution paid for resolution mechanism is gathered in a common fund in case of euro zone member states. This fund is the so called Single Resolution Fund.Financial institutions registered in the euro zone have to pay proportional contribution in order to fulfil the target level of the fund. The contribution of an institution has to be paid based on the amount of the uncovered liabilities in the bank compared with the uncovered liability portfolio in the member state in question. The highest level of uncovered liabilities the highest level of contribution.

The European Commission declared in its statement in 2014 the target level of the Single Resolution Fund which is amounted to 55 billion euros which must be reached by 2024 (European Commission 2014a). However, according to the following calculation it is underestimated, the forecasted level is higher. The calculation is partly based on survey made by the European Commission in 2013. The survey was made in 2007 at first but was

repeated in 2009 and 2013. Data were provided by bank deposit guarantee schemes of the member states (European Commission 2007, 2009, 2013). Since the survey made by the Commission is related to the covered deposits and contribution to the resolution fund depends on their level (1%), the level of the funds (in case of euro zone member states it is the Single Resolution Fund) can be forecasted.

Lots of discussion and negotiation were necessary among member states to implement a mutual resolution fund. Though, the operational mechanism is defined in the resolution regulation, the contribution of the member states to the common fund is not determined. Only, an intergovernmental agreement (Council of the European Union 2014) regulates the measure of contribution of the member states. According to the agreement, participation in implementation of the Single Resolution Fund is compulsory for euro zone member states but others could also join. In the first year 40% of the available financial asset paid by the banks for resolution is to be transferred to the mutual resolution fund by the counterparties. In other words, 40% of the contribution paid by the banks operating in the territory of a euro zone member state could be used for mutual resolution of an institution operating in other country of the euro zone and 60% of the contribution might be spent on resolution of institution operating in the member state in question. In the second year additional 20% of the available sources must be transferred and after that this portion will be increased by 6 2/3 %. As a result of it, 8 years is needed to reach the 100%. Taking the survey of the Commission into consideration made in 2013, according to which the amount of the covered deposit portfolio was 5 212 705 euros million in the euro zone at the end of 2012 and suppose it is not changing as well as suppose the Single Resolution Fund will be uploaded by equal amounts, the following level of the funds showed in the chart will be available for mutual resolution in the euro zone in the transitional period.
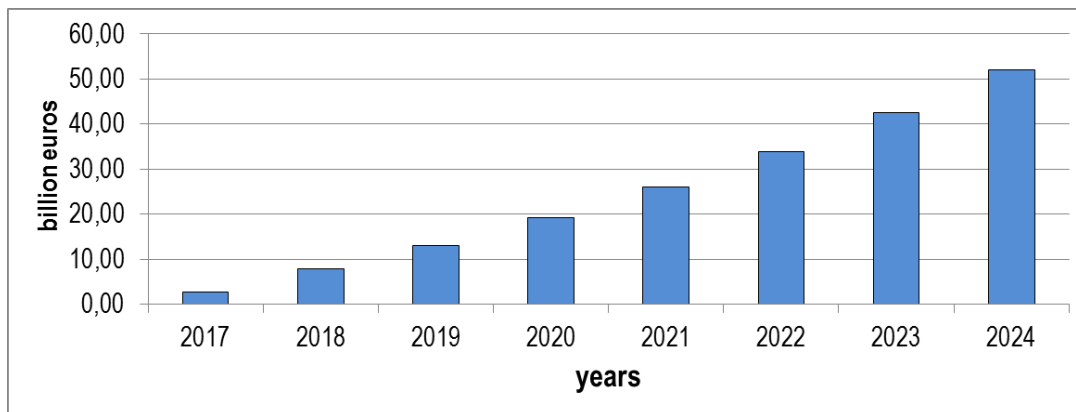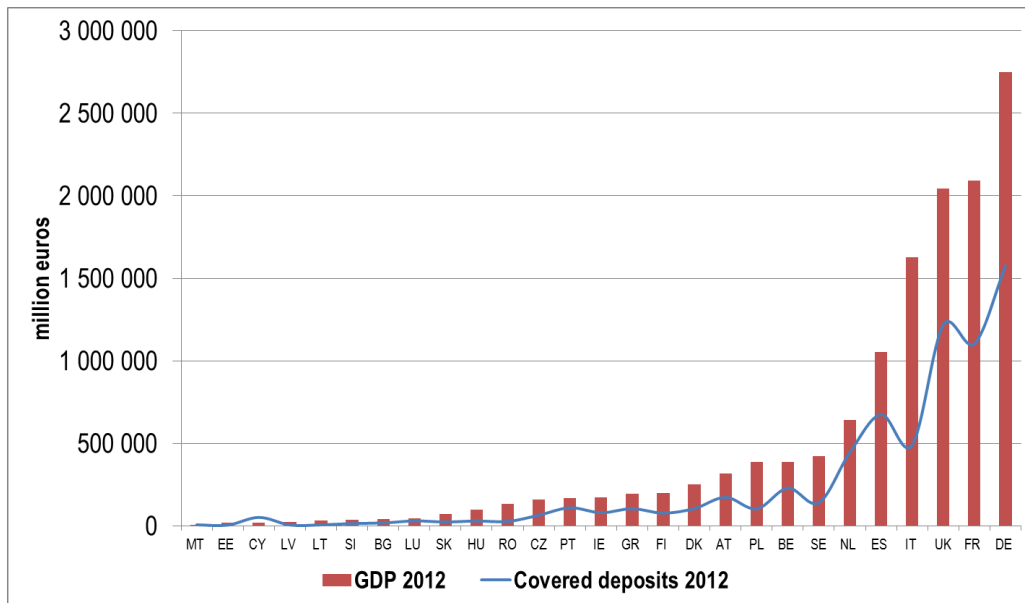

Source: European Commission, own calculation

Figure 2 – Forecasted mutual fund available for resolution of euro zone institution if the level of covered deposit does not change (billion euros)

Accepting the assumptions, the forecasted mutual resolution fund will be 52 billion euros at the end of 2024. Independently of the territorial location within the euro zone, this fund will be available for guarantee or loan granting for euro zone institutions under resolution procedure, buying assets of these institutions, financing the activity of the bridge institutions, asset management vehicle. In period 2017-2024 the total assets of the mutual fund will increase continuously up to 52 billion euros if the level of covered deposits remains unchanged. However, the portfolio of covered deposits is continuously changing. The portfolio changing of the covered deposits depends on numerous factors.

The size of the population, the level of the national GDP, the unemployment rate, the abroad activity of the credit institutions etc. could have effect on the level of covered deposits belonging to one member state. In order to simplify our calculation compare the GDP of home country with the covered deposits reported in the Commission's survey as for 2012.

Source: European Commission and Eurostat, own calculation

Figure 3 – The GDP in 2012 and the covered deposits of the member states as of 31/12/2012

In order to make the connection well visible, the values of the covered deposits are indicated with a curve in the chart but these values are discrete. The chart indicates tight connection. As the national GDP grows the covered deposit level also grows.

Taking the continuous changing in the covered deposits into account, the level of covered deposits after 2024 is determinable by using linear regression model where the level of covered deposits is dependent variable of the national GDPs. In that case, using data of the recent euro zone member states, the equilibrium of the linear regression line is the following:

$$\hat{y} = 3394 + 0.5222x \qquad (2)$$

The value of the coefficient of determination (R^2) is definitely high ($R^2 = 0.95$) in "(2)" which shows strong relation regarding national GDPs and covered deposit level of banks belonging to the different sovereigns. The equilibrium expresses that when the GDP of a sovereign increases by 1 euro the covered deposit portfolio of the banks belonging to the country in question increases by 52.22 eurocents. In other words, higher level of GDP generates higher level of covered deposits.

Calculating the forecasted value of the GDPs of the member states, based on "(2)" the value of covered deposits, thus the value of total assets of resolution funds is determinable (one percent of the covered deposit is the target level of Single Resolution Fund).

The European Commission made GDP forecast for period 2005-2006 as per member states (European Commission 2014b). Accepting this forecast as well as making four scenarios for period 2017-2024 where four different average GDP growths supposed, the following forecasted covered deposit level and total asset of Single Resolution Fund is calculated:

Table 6 - The forecasted level of deposits as at 31/12/2024

DATA in million euros	SCENARIO 1 (0% average GDP growth in period 2017-2024)	SCENARIO 2 (1% average GDP growth in period 2017-2024)	SCENARIO 3 (2% average GDP growth in period 2017-2024)	SCENARIO 4 (3% average GDP growth in period 2017-2024)
Forecasted covered deposits	5 443 917	5 889 627	6 367 323	6 878 951
Forecasted total assets of Single Resolution Fund (1% of the covered deposits)	54 439	58 896	63 673	68 790

Source: European Commission, own calculation

Since the target level is determined as one percent of the covered deposits in the resolution regulation, data given in the above table show practically the forecasted level of the Single Resolution Fund. It is observable that the level expected by the Commission (55 billion euros) will be fulfilled even if there is no GDP growth after 2017 (in case of euro zone member states). However, its value will likely be significantly higher. In other words, the one percent proportion of the covered deposits defined in the abovementioned regulation ensures significantly higher level of the Single Resolution Fund comparing with the expected 55 billion euros.

Conclusion

Creation and implementation of deposit guarantee schemes is direct consequence of the banking base activity. Having received deposits, banks provide funds for their clients. Therefore, the received deposits at a given moment are physically not available at the banks because the loans are paid back during the contracted period. In order to mitigate the risk, among other measures, deposit guarantee institutions ensure the provided deposits up to 100000 euros in the European Union. Selecting a sample, it was proved that the value of the total assets of deposit guarantee institutions being in the sample is not enough to entirely compensate clients of large banks belonging to the insurance institution in question.

The new resolution mechanism provides new framework of process of resolution of the banks. During the resolution process the sale of the business, usage of bridge institution, asset separation and the bail-in tools are available for the resolution authorities. These tools can be combined or can be applied separately. In order to make the process more prudent the euro zone member states have to upload the mutual resolution fund. The European Committee declared the target level of total asset of the mutual resolution fund which is 55 billion euros to be reached by 2024. The linear regression model employed and the revealed connection of covered deposits in member states of the European Union and their GDP provides evidence for forecasting higher total asset level of the Single Resolution Fund as for 2024.

References

[1] Claessens, S., Herring, R., Schoenmaker, D. and Summe, K. (2010). A Safer World Financial System: Improving the Resolution of Systemic Institutions. Geneva Reports on the World Economy 12.

[2] Engineer, M., Schure, P. and Gillis, M. (2012). A Positive Analysis of Deposit Insurance Provision: Regulatory Competition among European Union Countries. *Journal of Financial Stability*, 9(4): 530-544, http://dx.doi.org/10.1016/j.jfs.2013.10.001

[3] Gros, D. and Shoenmaker, D. (2014). European Deposit Insurance and Resolution in the Banking Union. *Journal of Common Market Studies*, 52(3): 529-546. http://dx.doi.org/10.1111/jcms.12124

[4] Micossi, S., Brizzone, G. and Carmassi, J. (2013). The New European Framework for Managing Bank Crises. *Centre for European Policy Studies*, 304: 1-21.

[5] Pisani-Ferry, J., Sapir, A., Véron, N. and Wolff, G. (2012). What kind of European Banking Union? *Bruegel Policy Contribution*, 12: 1-20

[6] Schoenmaker, D. (2011). The Financial Trilemma. Duisenberg School of finance, Tinbergen Institute Discussion Paper, TI 11-019/DSF 7:1-9. http://dx.doi.org/10.2139/ssrn.1340395

*** BNP Paribas (2014). Annual Report https://invest.bnpparibas.com/sites/default/files/documents/ddr2014_gb.pdf

*** Council of the European Union (2012). Towards a genuine Economic and Monetary Union – report by President of the European Council, Herman Van Rompuy. http://ec.europa.eu/economy_finance/crisis/documents/131201_en.pdf

*** European Commission (2007). Investigating the efficiency of EU Deposit Guarantee Schemes. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC48944/jrc%20s%26t%20dgs%20eff.pdf

*** European Commission (2009). JRC Report under Article 12 of Directive 94/19/EC as amended by Directive 2009/14/EC. http://ec.europa.eu/internal_market/bank/docs/guarantee/jrc-rep_en.pdf

*** European Commission (2013). Updated estimates of EU eligible and covered deposits. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/updated-estimates-eu-eligible-and-covered-deposits?search

*** European Commission (2014a). Statement - Finalising the Banking Union: European Parliament backs Commission's proposals (Single Resolution Mechanism, Bank Recovery and Resolution Directive, and Deposit Guarantee Schemes Directive). http://europa.eu/rapid/press-release_STATEMENT-14-119_en.htm

*** European Commission (2014b). European Economic Forecast, Autumn 2014. European Economy series 7|2014: 1-192

*** European Parliament and of Council (2013a). 2013/36/EU directive on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC, 2013 június 26. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2013:176:FULL&from=HU

*** European Parliament and of Council (2013b). 575/2013/EU regulation on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2013:176:FULL&from=HU

*** European Parliament and of Council (2014a). 2014/49/EU directive on deposit guarantee schemes. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0049&from=EN

*** European Parliament and of Council (2014b). 2014/59/EU directive on establishing a framework for the recovery and resolution of credit institutions and investment firms and amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No 1093/2010 and (EU) No 648/2012, of the European Parliament and of the Council. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0059&from=EN

*** European Parliament and of Council (2014c). 806/2014/EU regulation on establishing uniform rules and a uniform procedure for the resolution of credit institutions and certain investment firms in the framework of a Single Resolution Mechanism and a Single Resolution Fund and amending Regulation (EU) No 1093/2010. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&rid=3

*** Fonds de Garantie des Dépôts et de Résolution (2014). Annual Report https://www.garantiedesdepots.fr/sites/default/files/rapport_fgd_2014_anglais_site.pdf

*** Council of the European Union (2014). Agreement on the Transfer and Mutualisation of Contribution to the Single Resolution Fund. ECOFIN, Brussels.

*** Danish Garantifonden for Indskydere og Investorer (2014). Annual Report http://www.gii.dk/Files/Files/Garantifonden/%C3%85rsrapporter/2014Annual%20Report_UK_WEB.PDF

*** Danske Bank (2014). Annual Report https://www.danskebank.com/Documents/Publication.html?id=b9b0d3f8

*** Hellenic Deposit and Investment Guarantee Fund (2014). Annual Report http://www.teke.gr/images/teke%20docs/teke%20english/docs/Annual_Report_2014_EN.pdf

*** Pireaus Bank (2014). Annual Report http://www.google.hu/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=3&ved=0ahUKEwikidifr6HKAhVHcRQKHSyvDIAQFggyMAI&url=http%3A%2F%2Fwww.piraeusbankgroup.com%2F~%2Fmedia%2FCom%2F2015%2FFiles%2FInvestor-Relations%2FFinancial-Data%2FAnnual-Reports%2FAnnual_Report2014_En.pdf&usg=AFQjCNFg1vhWoxoahubeyXLA2XUZA7UkNg

Exploring Consumer Behaviour by Classification Methods

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Abstract:

This article deals with classification in area of customers' behaviour. The goal was to find a possibility how to classify respondents according to their personal information into classes based on their answers to factors from marketing survey. For classification are used sixty methods from Weka. In paper is described the process of classification and improvement of results by reduction of input variables and adjusting of parameters of particular methods. The article also discusses results which were achieved by application of these methods. For best classification cases closer analysis was performed.

Based on the results of this paper can say, that use of classification methods in marketing research is reasonable because it can bring interesting information and reduce entropy.

Keywords: classification, data processing, knowledge discovery, marketing research, consumer behaviour.

JEL Classification: M31, C38.

1. Introduction

The current business world is undergoing consistent change. To survive in the current competitive environment companies have to be able to respond to such changes (Antlova 2009). The perception of information and communication technology has been gradually transformed from something rather unique, bringing a competitive advantage in the market, to the necessity of conditioning the existence or not existence of business between the competitive business organizations (Chalupova and Motycka 2008). With computers introduction in the office, administrative functions have got a new generation of these tools for information processing and communication. (Capek 2013)

The area of customer behaviour is explored in the field of Customer Relationship Management (CRM). CRM uses marketing research as a strong tool to explore consumer behaviour. Marketing research is a process of collecting and using information for marketing decision making (Boone and Kurt 2013). Customer Relationship Management can be seen as a holistic framework for interaction of organizations with their customers (Darena 2008). At first, CRM looks for the answer how to get closer to the customer by using data stored in large databases. After that the company usually transforms itself into customer-centric organizations with great focus on customer profitability as compared to line profitability (Ogwueleka, Misra, Colomo-Palacios *et al.* 2015). Tools to simplify phases of marketing research, particularly data collection and its analysis can be more effective through the use of data mining techniques (Bradly 2007). As a part of a Marketing Information System (Darena, 2007) such tools provide decision makers with a continuous flow of information relevant to their area of responsibility (Boone and Kurt 2013). The desire for forecasting to support the decision-making occurs not just in corporate financial performance (Hajek, Olej and Myskova 2014) but also in CRM.

Birciakova, Stavkova and Soucek (2014) describe today's consumer society by many distinctive features: increasing consumer activities, the new phenomenon of recreational shopping, strongly location-based consumption, strengthening customers' role on the market, developing IT and its impact on consumer behaviour in the form of broader and more varied selection and availability of products and services, and easier access to information from both the supply and demand side. The issue of customer satisfaction became one of the important themes of marketing in the late 1970s. One of the main reasons was the increasing importance of services where quality became much more important (Vildova, Martincik, Tluchor *et al.* 2015). There are a lot of factors which influence customer behavior (Turcinkova, Stavkova, Skalova and Birciakova 2014; Hajko, Birciakova and Stavkova 2014). Factors that influence the consumer behaviour are very important for businesses because they can focus clearly their business policy based on these factors, which should lead to better business results. (Novotny and Duspiva 2014, Turcinkova and Stavkova 2012)

Observing behaviours, trends, and patterns on multivariate time series has been broadly used in various application domains (Ngan and Brodsk 2013). Collecting particular data from many sources successfully and for a long period brings a hard additional problem. People cannot, due to the data volume, process the data manually within an acceptable time (Darena, Zizka and Prichystal 2014).

This paper presents results of applied data analyses on data collected via questionnaire survey on the sample of 1127 Czech respondents with its structure close to the representative sample of population in the Czech Republic (data collection took place in 2011). It focuses on problems how to recognize the importance of selected factors of consumer behaviour based on personal information of the customer.

2. Characteristic of the problem

The described survey contained a large number of questions about importance of factors which had affected customer behaviour when shopping for meat products. This paper focused just to one part of the survey where customers used a Likert scale from 1 to 5 to mark how important were following factors for them when selecting a particular outlet for shopping for meat products (where 1 = completely unimportant and 5 = very important). The list included these 21 items:

- Prefer to go shopping less often and make larger purchases.
- Before the purchase I like to get inspired by offers in leaflets of retailers.
- I enjoy shopping for meat products.
- I buy private label meat products.
- I am always interested in the composition of meat products I am buying.
- I prefer stores that are closest to place where I live (work), I don't like to travel too far to do shopping.
- I select the stores where I can also buy complementary goods.
- Price is the most important factor for me when selecting a place of my purchase.
- I prefer Czech products to foreign ones.
- When buying meat products, I prefer local (regional) products.
- I take advantage of loyalty programs the retailers provide.
- Even when I am not fully satisfied with a grocery store, I keep doing my shopping there.
- I pay a lot of attention to affairs with poor quality or expired meat products.
- When buying meat products, I prefer the ones that are packaged.
- I can hardly imagine my diet without meat products.
- When buying meat products, I am influenced by the quality labels.
- Main place of purchase of meat products is the same for me as for all the groceries.
- I consider meat products (incl, cured and smoked meat products) as unhealthy.
- I buy organic meat products.
- On the Czech market there is a rich and sufficient supply of meat products, I am completely satisfied.
- I have my favourite brands of meat products, which I primarily purchase.

The aim of this work was to find a possibility how to classify customers which answer the questionnaire according to their personal information to classes based on their answers related to the above mentioned factors which influence their consumer behaviour.

3. Classification

Customers' classification is a key point in the area of Customer Relationship Management. There are many methods used for it, such as Neural Net, association rules, SOM model, etc. (Li, He and Liatsis 2010). Classification is one of the most common behaviour prediction tools in behaviour informatics to predict group membership for data instances. It has been widely used for support of CRM (Tsai, Chen and Chien 2013).

The classification problems typically include patterns containing a single, well-defined dependent variable (category); that is, an observation is assigned to one and only one category (Spangler, May and Vargas, 1999). CRM classification brings usually some problems and challenges such as heterogeneous data, high feature dimension, severe data anomaly, imbalanced classification, data scrambling (Tu and Yang 2013).

Classification can be used in various areas and consumers' behaviour is not an exception (Chalupova 2009, Weinlichova and Fejfar 2010, Konecny, Trenz and Svobodova 2010, Turcinek and Motycka 2013, Bohac *et al.* 2011). Comparison of learning algorithms can be found in (Skorpil and Stastny 2008, Stencl and Stastny 2010, Popelka, Hrebicek, Stencl *et al.* 2012).

Classification methods can be divided into several groups such as neural networks, decision tree, logistic models etc. Given that each classification method has its strengths and limitations and the fact that real world problems do not always satisfy the assumptions of a particular method, one approach is to apply all appropriate methods and select the one that provides the best solution (Kiang 2003).

4. Methodology

Weka software (2015) was used for classification. There are several categories such as functions, decision rules, bayes etc. in Weka of classification algorithms. Sixty available classification methods in Weka were used in the first step. The classification was based on personal information about respondents. The goal of it was to classify them into classes of all 21 factors. That means for all 21 factors we classify respondents into 5 classes according to their answer on a Likert scale. We look for percentage of correctly classified instances.

There were always 5 classes to classify into. Without any knowledge about the problem based on the probability we should get about 20% of correctly classified instances. Any better result can be considered as a success. However if there is a piece of knowledge what is the mostly chosen class, we can insert all instances into this class and we should gain greater success. As a successful classification, we considered the one that had more correctly classified instances than if we had included all instances into the class with the highest number of instances.

As the last stage of this work we looked closely at the best case having the number of correctly classified instances significantly higher than the number of instances in the most numerous classes. Our goal was to find out whether the reduction of input variables (personal information) and adjusting the used method could improve the classification results.

5. Results

As mentioned in the methodology 60 suitable classification methods were used in Weka (2015) as the first phase. Table 1 represents the results of this step. The first column shows factors which they were classified into. The second column shows the percentage of correctly classified instances if we classify all instances into the most numerous classes. The third one represents the number of successful classification cases (better than the result in the second column). There can be found the percentage of correctly classified instances in the best case in the fourth column. The last column shows the difference between the second and fourth column, the improvement when the classification algorithm is used. The factors are listed in descending order based on the last column.

Table 1 - Summary of the first step

FACTORS	Based on the most numerous class [%]	Successful classification cases	The best case [%]	Improvement [%]
Before the purchase I like to get inspired by offers in leaflets of retailers.	23.1523	47	31.8789	8.7266
Price is the most important factor for me when selecting a place of my purchase.	27.0703	26	31.1665	4.0962
When buying meat products, I prefer local (regional) products.	29.7513	22	33.7478	3.9965
I am always interested in the composition of meat products I am buying.	25.8929	26	28.9286	3.0357
I select the stores where I can also buy complementary goods.	33.3037	16	36.1037	2.8000
On the Czech market there is a rich and sufficient supply of meat products, I am completely satisfied.	34.4029	12	37.0766	2.6737
I enjoy shopping for meat products.	29.0925	21	31.7616	2.6691
When buying meat products, I am influenced by the quality labels.	30.0357	3	32.4421	2.4064
I consider meat products (incl, cured and smoked meat products) as unhealthy.	29.5374	24	31.8505	2.3131
I have my favorite brands of meat products, which I primarily purchase.	32.5290	17	34.7632	2.2342
Prefer to go shopping less often and make larger purchases.	26.1333	3	28.1778	2.0445

| FACTORS	Based on the most numerous class [%]	Successful classification cases	The best case [%]	Improvement [%]
I pay a lot of attention to affairs with poor quality or expired meat products.	27.4510	17	29.1444	1.6934
I prefer Czech products to foreign ones.	32.8889	8	34.3111	1.4222
Main place of purchase of meat products is the same for me as for all the groceries.	39.0179	9	40.2679	1.2500
I can hardly imagine my diet without meat products.	29.8932	16	30.9609	1.0677
I prefer stores that are closest to place where I live (work), I don't like to travel too far to do shopping.	37.1886	2	37.7224	0.5338
When buying meat products, I prefer the ones that are packaged.	31.5179	1	31.7857	0.2678
I buy organic meat products.	58.5192	1	58.6084	0.0892
I buy private label meat products.	36.4203	0	36.4203	0.0000
I take advantage of loyalty programs the retailers provide.	36.3069	0	36.3069	0.0000
Even when I am not fully satisfied with a grocery store, I keep doing my shopping there.	43.1495	0	43.1495	0.0000

Source: own

At first we focused on the factor: Before the purchase I like to get inspired by offers in leaflets of retailers. We tried to find out if reduction of input factors would bring even a better solution. When we left out any of the input factors and tried to classify based on the seven remaining factors we received worse results. Then we tried to classify concentrated just on one input factor. Even that did not yield better results. These results can be found in Table 2.

Table 2 - Reducing input factors

Input factor	Without [%]	Just this one [%]
How do you assess the income of your household in terms of coverage of your needs and quality of life?	30.8994	24.9332
Gender	31.6118	26.4470
How old are you?	30.7213	31.0775
What is the highest level of completed education?	30.8103	26.0908
How big is the town of your residence?	31.0775	23.4194
In what region do you live?	31.4337	22.7961
In what household category do you live?	30.8103	29.2965
What is your predominant occupation?	30.5432	30.9884

However when we continued with reduction by combining different input factors, we managed to find a better solution than the use of all input factors together. When we used factors: *How old are you? What is the highest level of completed education?*, *In what household category do you live?* and *What is your predominant occupation?* We received 33.1256% success rate of classification which brought another 1.2467% improvement.
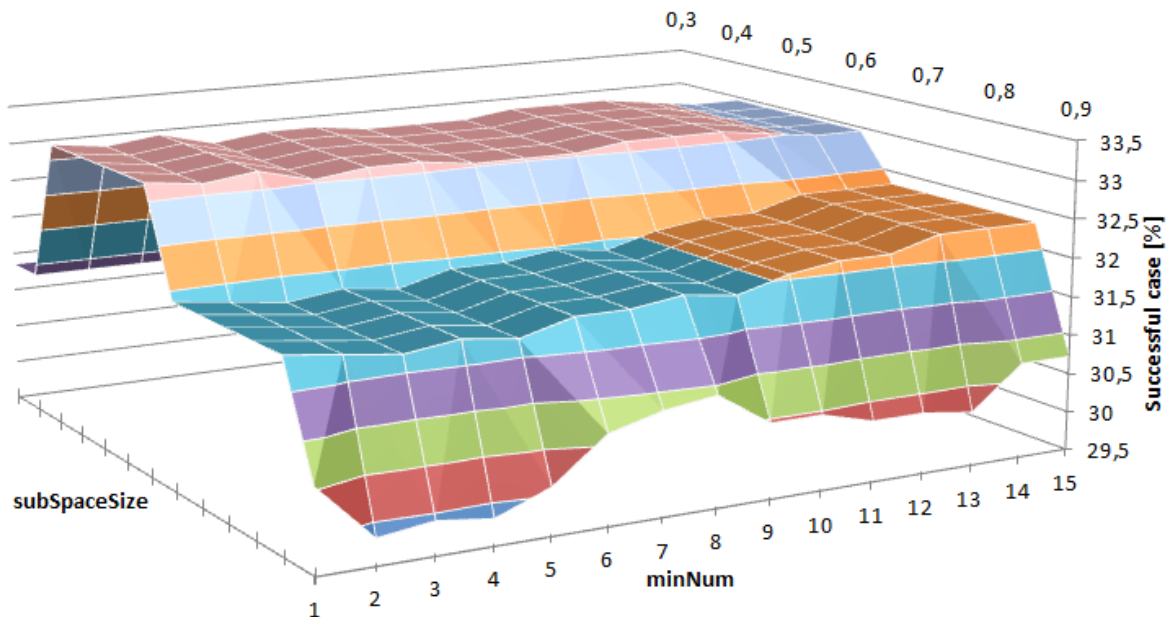
Source: own

Figure 1 - Adjusting of parameters of *RandomSubSpace* method

Method *RandomSubSpace* constructs a decision tree based classifier that maintains the highest accuracy on training data and improves on generalization accuracy as it grows in complexity (Weka 2015). It can use different algorithms. As a default one there was used *REPTree*. When we changed the algorithm we did not get better results. The algorithm *REPTree* can be parametrized. We changed all parameters, but only the parameter *The minimum total weight of the instances in a leaf (minNum)* brought improvement. Method *RandomSubSpace* has also parameters. However only adjusting of *subSpaceSize* (Size of each subSpace: if less than 1 as a percentage of the number of attributes, otherwise the absolute number of attributes) (Weka 2015) changed the results.

An implicit setting of parameter is *minNum=2* and *subSpaceSize=0.5*. As you can see in the Figure 1 by adjusting of these parameters we improved the result 33.2146% which is another 0.89%. Best result is achieved when *minNum=1* or *minNum=3* and *subSpaceSize* is between 0.4 and 0.6.

Reducing input attributes and adjusting parameters of the method we can state that the use of this method brings 10.0623% improvement compared to the case when we include all instances into the class with the highest number of instances.

Conclusions

The aim of this work was to find a possibility how to classify respondents according to their personal information to classes based on their answers to the above mentioned factors. We tried to find a better solution than to classify all respondents into the mostly chosen class. Except the three factors we always found a better solution by at least one of the classification methods. The summary can be seen in Table 1.

In our closer analysis we reduce the number of input factors which improved the classification result. With adjusting parameters of the used method we got an even better solution. These results can be compared with the study of Netopil, Antosova and Turcinkova (2014) where they reach similar results based on a different research data set.

References

[1] Antlová, K. (2009). Motivation and Barriers of ICT Adoption in Small and Medium-Sized Enterprises. *E+M Ekonomie a Management*, 12(2): 140–155.

[2] Birciakova, N., Stavkova, J., Soucek, M. (2014). How Marketing Instruments Affect Consumer Behavior in Times of Economic Turbulence. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 62(6): 1257–1263. http://dx.doi.org/10.11118/actaun201462061257

[3] Bohac, M., Lysek, J., Motycka, A. and Cepl, M. (2011). Face Recognition by Means of New Algorithms. MENDEL 2011 - 17th International Conference on Soft Computing. Brno University of Technology, 504–509.

[4] Boone, L.E. and Kurt, D.L. (2013). *Contemporary Marketing*. Mason: Cengage Learning.

[5] Capek, J. (2013). Information Systems and Information Chaos. Strategic Management and Its Support By Information Systems, 10th International Conference, 44–55.

[6] Chalupova, N. (2009). Prediction of customer behavior through datamining assets. *Acta Universitatis agriculture et silviculture Mendelianae Brunensis*, 57(3): 43–54.

[7] Chalupova, N., Motycka, A. (2008). Situation and trends in trade-supporting information technologies. *Acta Universitatis agriculture et silviculture Mendelianae Brunensis*, 56(6): 25–36.

[8] Darena, F. (2007). Global architecture of marketing information systems. *Agricultural Economics*, 52(9): 432–440.

[9] Dařena, F. (2008). A research on CRM systems in the Czech Republic. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 56(2): 29-34.

[10] Darena, F., Zizka, J., Prichystal, J. (2014). Clients' freely written assessment as the source of automatically mined opinions. In 17th International Conference on Enterprise and the Competitive Environment (ECE), pp. 103-110, Brno, Czech Republic, March 2014. http://dx.doi.org/10.1016/S2212-5671(14)00325-6

[11] Hajek, P., Olej, V., Myskova, R. (2014). Forecasting corporate financial performance using sentiment in annual reports for stakeholders' decision-making. *Technological and Economic Development of Economy*, 20 (4): 721–738. http://dx.doi.org/10.3846/20294913.2014.979456

[12] Hajko, V., Birciakova, N. and Stavkova, J. (2014). The trends in the income distributions in the EU-27 countries: Measuring the differences. Conference Proceedings of the 32nd International Conference Mathematical Methods in Economics, 245-250.

[13] Kiang, M.Y. (2003) A comparative assessment of classification methods. *Decision Support Systems*, 35(4): 441–454.

[14] Konecny, V., Trenz, O. and Svobodova, E. (2010). Classification of companies with theassistance of self-learning neural networks. *Agricultural Economics - Zemedelska Ekonomika*, 56(2): 51–58.

[15] Li, X., He, C. and Liatsis, P. (2010). A new robust classification method for CRM. APWCS 2010 - 2010 Asia-Pacific Conference on Wearable Computing Systems. 70–73.

[16] Netopil, T., Antosova, V. and Turcinkova, J. (2014). Retirees: How do they choose their grocery store? How do they shop? 17th international conference enterprise and competitive environment 2014, *Book Series: Procedia Economics and Finance*, 12:480–488. http://dx.doi.org/10.1016/S2212-5671(14)00370-0

[17] Ngan, C.K. and Brodsky, A. (2013). Optimal event monitoring through internet mashup over multivariate time series. *International Journal of Decision Support System Technology*, 5(2): 46–69. http://dx.doi.org/10.4018/jdsst.2013040104 .

[18] Novotny, J. and Duspiva, P. (2014). Factors Influencing Consumers' Buying Behavior and their Importance for Enterprises. *E+M Ekonomie a Management*, 17(1): 152–166.

[19] Ogwueleka, F.N., Misra, S., Colomo-Palacios, R. *et al.* (2015). Neural Network and Classification Approach in Identifying Customer Behavior in the Banking Sector: A Case Study of an International Bank. *Human Factors and Ergonomics in Manufacturing & Service Industries*, 25(1): 28–42, http://dx.doi.org/10.1002/hfm.20398

[20] Popelka, O., Hrebicek, J., Stencl, M. *et al.* (2012). Comparison of different non-statistical classification methods. Proceedings of 30th International Conference Mathematical Methods In Economics, PTS I AND II, 727–732.

[21] Skorpil, V. and Stastny, J. (2008). Comparison of Learning Algorithms. 24th Biennial Symposium on Communications. Kingston, CANADA, pp. 231–234.

[22] Spangler, W.E., May, J.H. and Vargas, L.G (1999). Choosing Data-Mining Methods for Multiple Classification: Representational and Performance Measurement Implications for Decision Support. *Journal of Management Information Systems*, 16 (1): 37–62.

[23] Stencl, M. and Stastny, J. (2010). Neural network learning algorithms comparison on numerical prediction of real data. MENDEL 2010, 16th International Conference on Soft Computing. Brno University of Technology, 280–285.

[24] Tsai, C.-Y., Chen, C.-J. and Chien, C.-J. (2013). A time-interval sequence classification method. *Knowledge and Information Systems*, 37(2): 251–278. http://dx.doi.org/10.1007/s10115-012-0501-1

[25] Tu, Y. and Yang, Z. (2013). An enhanced Customer Relationship Management Classification Framework with Partial Focus Feature Reduction. *Expert Systems with Applications*, 40(6): 2137–2146. http://dx.doi.org/10.1016/j.eswa.2012.10.028

[26] Turcinek, P. and Motycka, A. (2013). Knowledge discovery on consumers' behaviour. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*. 61(7): 2893–2901. http://dx.doi.org/10.11118/actaun201361072893

[27] Turcinkova, J. and Stavkova, J. (2012). Does the Attained Level of Education Affect the Income Situation of Households? 3rd *International Conference On New Horizons In Education* - INTE. http://dx.doi.org/j.sbspro.2012.09.595

[28] Turcinkova, J., Stavkova, J., Skalova, D. and Birciakova, N. (2014). Changes in Consumer Behavior in the EU after its Enlargement and due to the Economic Crisis. *Recent Advances in Economics, Management and Marketing*, 78-85.

[29] Vildova, E., Martincik, D., Tluchor, J. *et al.* (2015). Measuring Customer Satisfaction and Loyalty in Spa Companies. *E+M Ekonomie a Management*, 18(1): 151–168. http://dx.doi.org/10.15240/tul/001/2015-1-012

[30] Weinlichová, J. and Fejfar, J. (2010). Usage of self-organizing neural networks in evaluation of consumer behavior. *Acta Universitatis agriculture et silviculture Mendelianae Brunensis*, 58 (6): 625–632.

[31] Weka (2015). Weka 3: Data Mining Software in Java. [on-line], Available at: http://www.cs.waikato.ac.nz/ml/weka/ on-line [cited 2015-12-11]

Techoparks as an Actor of Regional Development: An Evaluation on Turkey

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Abstract

Technological advances are undoubtedly the playing the most significant and crucial role in today's competitive circumstances. For the last century, technology, along with land, labor, capital and entrepreneurship, has embedded itself in factors of production. Other than that, it has gained outweighed power on the other factors. To become a global competitive actor, regions need to produce high value created products by using their own technological power and innovativeness. Therefore, replicating or importing the existing technology is, to some extent, a consequence for developing countries to fall behind in development process in the long-run. In order to establish a sustainable development strategy, inventing the latest technology is inevitable. Technoparks are the intermediaries which transfers the university based research and educational power to the market needs and technology intensive industries. Thus, their importance on regional development in Turkey is examined and further recommendations are discussed.

Key words: technology, technoparks, regional development.

JEL Clasification: E61, E66.

1. Introduction

First and second world wars obviously have shown that struggle among nations for having the vast portion of global welfare depends heavily on the technological advantage. In addition to that, aftermath of wars dramatically pave the ways of developing new technologies intensely in rising of nations.

In the preceding century the impact of technology- together with land, labor, capital and entrepreneurial abilities- embeds itself to the factors of production and radically reduce the significance of other factors. Workforce substitute with machinery and robotics and computers replaced human brain activities.

Regions compete globally to have the latest improvements because of previously mentioned motives. Therefore, technological advances and knowledge are needed to be conveyed among organizations, industries and regions. In literature, technology transfer is defined as the transferring of the technical knowledge which is absent or scarcely found in developing regions for setting up new businesses or production facilities which generate the technology into new products, processes, goods and services or applications.

2. Technology and development

Technological advancements unveil not only having the comparative advantage and acquiring the global welfare relatively high amounts, but also fostering overall welfare of the countries. Technological improvements cause efficiency by reducing the amount of usage of factors of production while augmenting the mass of production, increasing its quality and reducing the cost of production. Furthermore, it contributes the environmental protection issue which is a hot debate due to global warming threat in last two decades. Besides, luxury durable goods such as Led TVs, computers, cars, and mobile phones are far more attainable comparatively low prices than before. Consequently, technology is regarded as a factor of production which increases the production and quality of production (Presidency of Turkish Republic State Supervisory Board Report: 2009).

Previous literatures have referred technology transfer as the conveyance of know-how to outfit local conditions, with efficient absorption and diffusion both within and across regions (Chung 2001). More contemporary scholars Autio and Laamanen (1995) argues a wide-ranging definition that the transmission involves goal-oriented and deliberate interaction among two or more enterprise or region which technological

knowledge stays stable through the transfer. Earlier studies generally define the technology transfer as the diffusion of knowledge as a continuum (Wahab, Rose and Osman 2012). It involves the process how an organization or a region relocate scientific or technological attainments, new uses for technology, designs, and the technical knowledge that can be used in production of goods and services (Chun 2007). Technological advances may be transferred from a university to an enterprise (Solo and Rogers 1972). Changing over does not only involve the process of knowledge transmission but also is about to human resources engaged in production activities. A deeper and broader knowledge accumulation ultimately should be acquired at the end of the process (Shiowattana 1991) and these processes are called horizontal transfers which are defined broadly as movements of established technologies from one region to other region. Technology transfer has different kinds of importance in terms of suppliers and recipients. For recipients, producing technology is extremely expensive.

On the other hand, generally these regions are those which are developing ones and most probably they do not have adequate resources to produce technology and for this reason, technology transfer is an important mediator by which developing regions have access the ones that are new for them. Acquiring the latest technology is playing a crucial role in rapid technological and economic development of related country (Audretsch and Keilbach 2005). However, benefitting from the latest technology is contingent on the learning and domestic capabilities of that region. Social and economic benefits of technology come only with technological learning efforts. Thus, there are wide-ranging discrepancies between regions and industries within regions. As a result, it is not guaranteed that transferring vast amount technology lead to higher economic and technological development.

At the supplier side, vendors of technologies, have a propensity to see the transfer as a profit oriented activity. Suppliers have the advantage of both making profit from direct selling of technology and exporting products which are the complementary of related technology. There are various types of technology transfer means such as imports of investment goods, foreign direct investment, joint ventures, turn-key projects, industrial cooperation agreements, technical aid projects, foreign expertise employment, conferences, exhibitions, fairs, imitations and copying, license agreements. To transfer the technology some intermediaries emerge. Well-known ones are USA based Office of Technology Commercialization in Maryland University in 1986 and Swiss centered Unitectra in 1999 is a collaboration of Bern and Zurich Universities.

The other mean to have the technology is to produce it. Unlike horizontal transfer which refers to the transfer of technical knowledge and physical hardware from one geographic area to another, vertical way of producing technology, originates from research and development (R&D) activities and innovation.

Innovation denotes the processes and results of the processes which are capable of responding social and economic needs of existing market conditions and can also create new demands and markets. The term includes new goods, services, application, managerial style and business models and also contains totally new or significantly improved product or its new way production process in order to have commercial benefits. Novel ideas and thinking trigger the innovation endeavors that lead to a completely new or significantly improved product. If a successful implementation of innovation heavily done by technology, than it may called technological improvement. In that period, R&D, which is the most significant and integral part of innovation, plays a complementary part and without entrepreneurial abilities, the impact of R&D activities can not be converted into commercialized successes. R&D activities are categorized under two main sections that are called basic and applied research. Basic research attempts mainly to expand knowledge not for creation or invention of something. Basics research activities generally do not end up with a novel discovery or commercial value. On the other hand, applied research endeavors are heavily designed to solve a specific problem by mostly using the knowledge originated from basic research activities with intention of commercial benefits at the end.

High-technology industries are needed to be allured due to this sector's fast expansion and its job-creating prospective. Moreover, technology-based industries are credited as the major strength in the reinforcement of underdeveloped regions and they are heavily assumed a fundamental source of innovative ideas, products and processes whichare essential to economic competitiveness and modernizing older industries. As a result, business development and economic diversification within the region is expected to improve while level of unemployment declines.

3. Regional development and technoparks

Regional development is broadly defined as the general efforts and endeavors to moderate discrepancies among regions that are contemporarily explained as functional economic areas where integration of extension of labor, capital, commodity and technology flow is common within and outside specific geographic units by the actors such as public authorities (policy-makers), entrepreneurs and enterprises and educational and research

institutions (universities, technology development centers, technoparks). The main R&D policy actors and role and responsibilities on the issue of technoparks and university-industry partnership in Turkey are shown (Table 1)

Table 1 - Main industrial R&D policy actors and role and responsibilities

Research and Development policy actors	Role and responsibility
Supreme Council of Science and Technology (SCST)	Top level of policy making
State Planning Organisation (SPO)	Policy making, planning, project support
The Scientific and Technological Research Council of TURKEY (TUBITAK)	Project support, Conducting research, policy making
Ministry of Science, Industry and Technology (MoSIT)	Policy making, project support
Under secretariat for Foreign Trade (UFT)	Provide financial resources
Under secretariat for Treasury (UoT)	Provide financial resources
Small and Medium Sized Enterprises Development Organization (KOSGEB)	Project support, Incubator services
Turkish Technology Development Foundation (TTGV)	Project Support, Finance
Turkish Academy of Sciences (TUBA)	Policy making
Research Centers of Ministry of Agriculture and Rural Affairs (MARA)	Policy making
Turkish Patent Institute (TPI)	Industrial and intellectual property rights
TUBITAK Marmara Research Center (TUBITAK-MAM)	Contract research for industry and development of innovative products
National Metrology Institute (UME) Measurements	Training and consultancy
Turkish Atomic Energy Authority	Policy making and project support

Source: Yanıktepe and Çavuş 2011.

These actors use institutional based (development agencies, regional development plans, operational programs and SWOT analysis), economical based (regional aid schemes, organized industrial areas, industrial parks, venture capitals) cultural based (conferences, fairs, exhibitions, recreation and theme parks, alternative tourism activities, natural parks and cultural centers) and social network based (cooperational centered; technology centers, innovation relay centers, business conglomerates, private and public joint ventures, regional industrial networks, entrepreneurial centered: business incubators, business angels or angel investors, seed capital centers and technoparks) models and the regional development models and actors are highly interrelated as it is presented in the Figure 1 below.
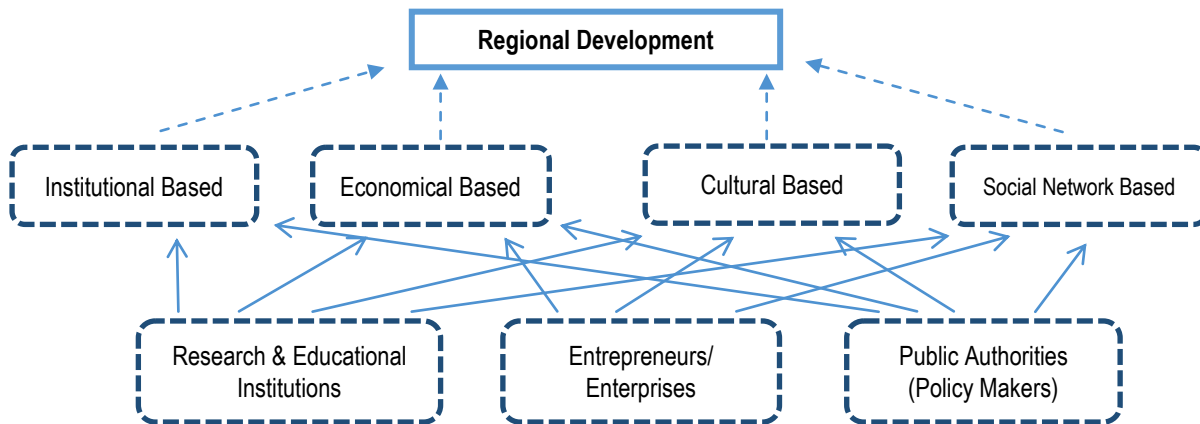
Source: Adapted and adjusted from Cornett 2009, Naudé *et al.* 2008; Audretsch and Keilbach, 2005.

Figure1 - Regional Development Process

For promoting economic development, commercializing new technologies, wealth creation, new job opportunities and novel solutions to problems of society it is highly needed to transfer technological innovations to response industrial needs and requirements.Technoparks are one of the most significant groups of intermediaries that make this conversion possible. They make universities' research and educational power congruent with industrial resources and as a result of that, human resource necessities and regional development policies are satisfied according to sustainable development plans (Audretsch and Keilbach 2004). As it is seen at the below (Table 3), the regulations and laws that are applied by Turkish government are given referring to their descriptions and incentives.

Technoparks stated as for supporting the business model, through which technology transfer, incubation, innovation and finally industrialization process take place. Varieties of R&D practices are developed in techno parks and in industry sectors to motivate the research based industrialization. By enticing new firms to locate within or in their region and forming clusters, technoparks can create substantial agglomerative effects for the regional economy and can also be beneficial in increasing the exports, high valued product production, diminishing the outsourcing needs for high tech products for the country, foundation of high-tech organizations, transforming the relations among universities and industrial firms, R&D activities supporting the local economic development, bringing foreign funds to region, creating modernization, creating entrepreneurship and job opportunities for well qualified people.

Table 2 - Comparision of regulations and laws

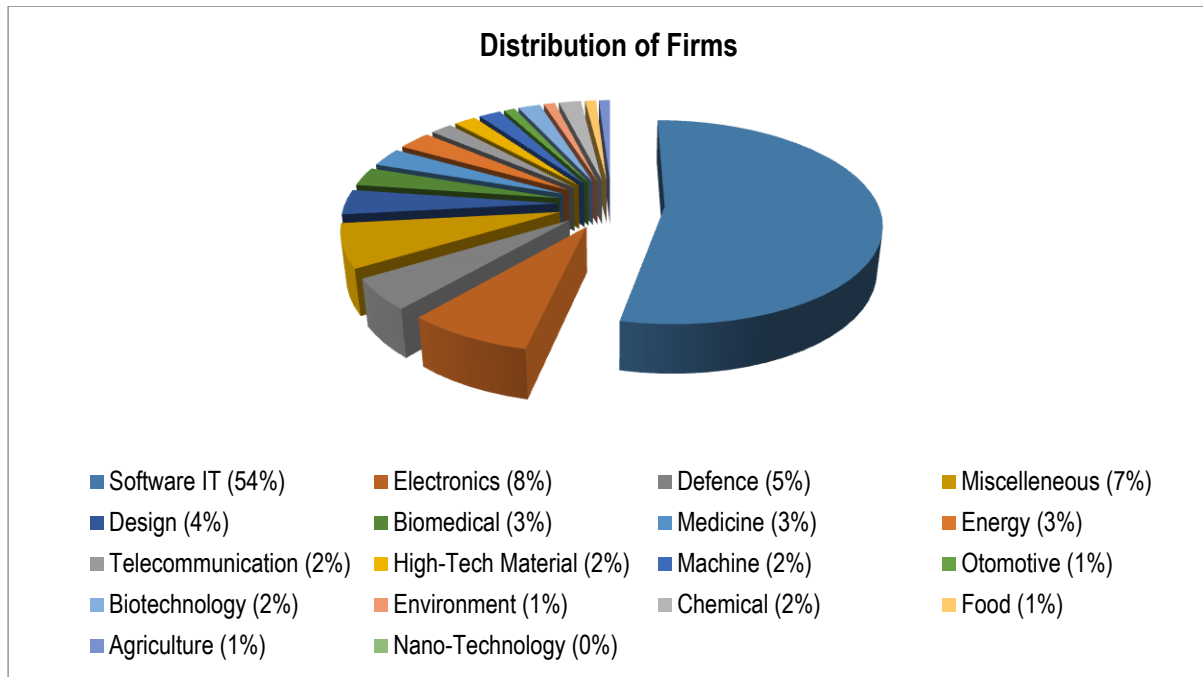| DEGREE/ LAW	Law on Technology Development Zones Law No:4691/ 26.06.2001	Decree on KOSGEB Supports Official gazette No: 25795/ 24/4/2005	R&D Law (No: 5746), February 2008	San-Tez Regulation in the Official Gazette No.26573/July 5, 2007
SHORT DESCRIPTIONS	▪ sets the incentives and the rules for the establishment and operations of the TDZs.	▪ sets down the rules for the supports provided by KOSGEB for SMEs.	▪ provides tax incentives for the R&D activities of private sector especially and encourages FDI in R&D.	▪ supports masters and/or PhD theses, productions and increases international competitiveness.
SUPPORTS AND INCENTIVES	▪ Incomes out of the R&D and software development activities of companies in the Technoparks designated by the MoIT are exempted from income and corporate taxes, and income of the R&D staff working in those companies is exempted from all taxes untill the end of 2023. ▪ The measure also allows the companies to work directly with the academicians, which lowers their costs since there are no payments for the revolving funds of the universities.	▪ Finance in the mode of grants is available through the program. For the year 2008, the upper limit for project support is approximately US$103,230/ year. ▪ Maximum duration for the projects i s 36 months. There are three calls for proposals during the year for which the last day for application i s determined by the Science Board of TUBITAK. Duration for project assessment is around 4 months.	▪ There will be tax deduction for R&D&I expenditures. ▪ R&D allowance has been increased up from 40% to 100 %. ▪ There will be tax exceptions for staff. ▪ Half of the employer's social security contribution shall be paid by MoF for 5 years. ▪ An ad hoc capital support shall be granted by the Public Institutions within the central administration ▪ These payments will have an annual limit. ▪ There will be stamp duty deduction.	▪ Eligible projects are provided with grant financed up to 75 percent of the project budget. The rest is financed by the private sector while test and laboratory services are covered by the universities where the projects are being carried out. ▪ The project duration could be maximum 3 years. Additional 6 months could be given according to the requirements of the project.

Source: Yanıktepe and Çavuş 2011.

In Turkey, technopark applications go back to middle of 1980s with the cooperation of İstanbul Technical University (ITU) and İstanbul Chamber of Commerce (ITO). This technopark operated in 1986 and in following years, an agreement among ITU and small and medium enterprises development organization (KOSGEB) has changed the name of the technopark to technology development center (TEKMER). In 1990, United Nations Development Program (UNDP) led the program of establishment of technoparks in Turkey and then, in 1992, The Scientific and Technological Research Council of Turkey (TUBITAK) and Marmara Research Center (MAM) have established a technology development center. Later on, TUBITAK-MAM technopark become the first approved one by KOSGEB which is the responsible organ of Ministry of Science, Industry and Technology. Thereafter, varieties of technoparks also known as technology development zones start to establish in 2001enacted by law 4691 with an aim of creation of technological knowledge and transferring it to commercialized activities, increasing quality and standards in products and production processes, developing of new innovations to enhance efficiency while reducing cost of production, making it easy to facilitate and adopt small and medium enterprises (SMEs) to new technological improvements, attracting new ventures and entrepreneurs that bring foreign direct investment and high-tech infrastructure and overall to amplify industrial competitiveness in global area. Currently there are 49 technoparks in Turkey and 6 of them are in Ankara, 5 of them is in İstanbul, in Kocaeli and İzmir 4 and 3 of them are established respectively and the rest of them in Konya, Antalya, Kayseri, Trabzon, Adana, Erzurum, Mersin, Isparta, Gaziantep, Eskişehir, Bursa, Denizli, Edirne, Elazığ, Sivas, Diyarbakır, Tokat, Sakarya, Bolu, Kütahya, Samsun, Malatya. Urfa, Düzce, Çanakkale, Kahramanmaraş, Tekirdağ, Van, Çorum, Manisa and Niğde.Technoparks' yearly distribution is presented in Figure 2.
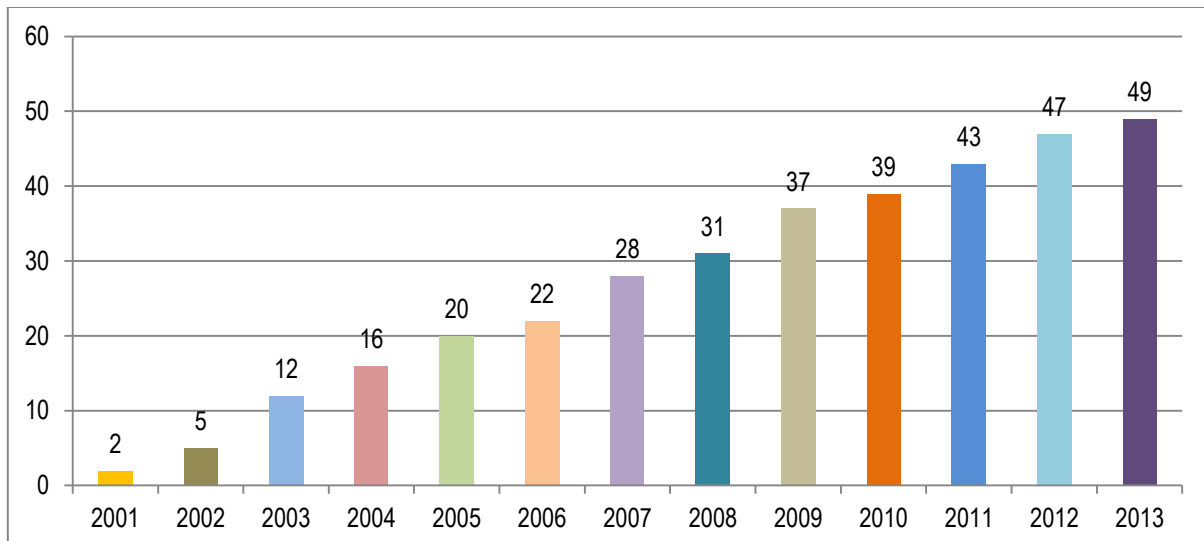
Source: Ministry of Science Industry and Technology, 2014

Figure 2 - Cumulative Distribution of Technoparks (2001-2013)

In 49 technology development zones, virtually 2114 technology oriented firms are actively operational and approximately 55% of them are in software and information technology oriented production, 8% is in electronics business where 5% of the firms are in defense and miscellaneous activities, 4% of the firms are in industrial design focused, 3% of the firms are in biomedical, medicine and energy centered operations, 2% of the firms are in high-tech material, machine and automotive industry related activities and lastly, 1% of the operations are comprised of nano-technological, biotechnological, chemical, nutritional and agricultural activities of the firms as it is shown in Figure 3. Cumulatively, 17828 staff employed and projects are held by regions reach 5400. Moreover, in actively operated regions, technoparks contribute to 657 million dollar of exports to United States of America, Japan, Israel, United Kingdom and Germany.

Distribution of Firms

- Software IT (54%)
- Electronics (8%)
- Defence (5%)
- Miscelleneous (7%)
- Design (4%)
- Biomedical (3%)
- Medicine (3%)
- Energy (3%)
- Telecommunication (2%)
- High-Tech Material (2%)
- Machine (2%)
- Otomotive (1%)
- Biotechnology (2%)
- Environment (1%)
- Chemical (2%)
- Food (1%)
- Agriculture (1%)
- Nano-Technology (0%)

Source: Ministry of Science, Industry and Technology

Figure 3 - Sectorial Distribution of Regional Firms in Technoparks

Numerous advantages are provided to firms and entrepreneurs in technoparks. Administrator and entrepreneur firms are tax exempted until 31.12.2013. Researchers, software programmers and R&D personnel in technoparks are also omitted from income tax. In addition to these, faculty members are allowed to be employed in technoparks so as to utilize their academic research to be commercialized and academicians are also permitted to establish their own firms or join the existing ones. Incomes of public or academic personnel are also exempted from universities' trading capital and other taxes. Totally, 1.4 billion TL is given up by government and granted as incentives in order to promote technology and innovation.

Approximately 70 foreign or foreign partnership firms occupy in Turkish technoparks and investment level of them reach virtually 683 million American dollar and the main dynamics of patent production is rooted by this foreign direct investment. Patents are one of most significant factors and indicators for determining the regional development, global competitive power and social welfare level of that zone. Scientific and technologic practices are in some extent useless unless they are transformed in commercial products or production processes which become patents eventually. The firms in technoparks have acquired 322 patents since 2001.

Further recommendations

Administrator firms' presidents should be selected among groups who hold a minimum engineering or economics and administrative science bachelor degree with 2 years of experience of R&D financing. Presidents who are first time employed should be included to an orientation program by KOSGEB, TUBITAK and Technology Development Foundation of Turkey (TTGV). To encourage R&D implications and innovation, university-industry relationship empowerment and stimulate R&D and innovation projects for constructing a supply-demand dynamic within region as well as outside the region, administrator firms can give counseling services to private and public sector. Funding the new ideas and processes is in the responsibility of administrator firm. Thus, they need to be established with satisfied amount of initial capital. Providing cash to a project worth 50 million dollars with an administrator firm whose total asset value is 19 million dollars do not seem logical. Consequently, regional administrator firms should be established at least 600.000 dollars.

In Turkey, even though technoparks have a strong auto-control mechanism it is not easy to say that they have sufficient supportive mechanism. Particularly in early development phase, technoparks face with critical drawbacks due to limited financial support provided by ministry of science, industry and technology. Moreover, in incubation centers there is not also enough financial aid for novel and unique ideas. KOSGEB offers financial supports via TEKMER for R&D oriented firms however, coordination among KOSGEB and technoparks is needed to be urgently improved.

Practical innovative business ideas should be supported by venture capital and for further developing phase of the project, core capital service providers are needed to be established to afford monetary support. Innovative entrepreneurs prefer to cooperate with foreign investors outside the region and causes brain migration. For this reason, technoparks are financially needed to be more fortified. Inadequate supportive mechanisms can have serious consequences over sustainable regional development policies in long-run. Last but not least, mass production of a fruitful R&D project can encounter with impediments. According to incentive laws, R&D practices are only tax exempted in their initial development phase. After a successful result -which is a prototype- is produced, tax exclusions are terminated and results in a failure to commercialize. However, tax exclusions are not valid for software firms and 55% of their portion in is not coincidental in this context but, for mass production a successful project still requires incentives and regulations.

References

[1] Audretsch, D. and Keılbach, M. (2005). Entrepreneurship capital and regional growth, *The Annals of Regional Science*, 39 (3): 457-469.

[2] Audretsch, D. and Keılbach, M. (2004). Entrepreneurship capital and economic performance, *Regional Studies*, 38 (8): 949-959.

[3] Autıo, E. and Laamanen, T. (1995). Measurementand Evaluation of Technology Transfer: Review of Technology Transfer Mechanisms and Indicators, *International Journal of Technology Transfer Management*, 10 (6): 643-664.

[4] Chun, C.L. (2007). Modeling theTechnology Transfer toTaiwan from China, *International Research Journal of Finance and Economics*, 7: 48-66.

[5] Chung, W. (2001). Identifying Technology Transfer in Foreign Direct Investment: Influence of Industry Conditions and Investing Firm Motives, *Journal of International Business Studies*, 32 (2): 211-229.

[6] Cornett, A. (2009). Aims and strategies in regional innovation and growth policy: A Danish perspective, *Entrepreneurship and Regional Development*, 21 (4): 399-420.

[8] Naudé, W., GrıesT., Wood, E. and Meıntjıes, A. (2008). Regional determinants of entrepreneurial start-ups in a developing country, *Entrepreneurship and Regional Development*, 20 (2): 111-124.

[10] Shıowattana, P. (1991). Transfer of JapaneseTechnologyand Management tothe ASEAN Countries. Tokyo: University of Tokyo Press.

[11] Solo, R.A. and Rogers, E. M. (1972). Inducing Technological Change for Economic Growth and Development East Lansing, Michigan State University Press.

[12] Yanıktepe, B. and Çavuş, M.F. (2011). Investigation of policy and incentives on the industrial research and development in Turkey, *African Journal of Business Management* 5(22): 9214-9223.

[13] Wahab, A., Rose, C. and Osman, S. (2012). Definingthe Concepts of Technology andTechnology Transfer: A Literature Analysis, *International Business Research*, 5(1): 61-71.

*** Ministry of Science Industry and Technology, General Briefing. (2013). http://sagm.sanayi.gov.tr/ServiceDetails.aspx?dataID=107 (29.04.2013).

*** Presidency of Turkish Republic State Supervisory Board Report, (2009). Evaluation of Law no. 4691 for Technology Development Zones and Development of Solutions in Application Process.

Sustainability of Market Performance: Moderating Effect of Sustainable Competitive Advantage, Ownership Structure and Financing Decision - Evidence Privatized State-Owned Enterprises in Indonesia

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Abstract:

This study examines the effect of ownership structure on sustainability of market performance, the effect of financing decision on sustainabilitay of market performance, the rule of sustainability competitive advantage as moderating effect ownership structure on sustainability of market performance and the rule of sustainability competitive advantage as moderating effect financing decision on sustainability of market performance. The method used in this research was saturted sampling in Indonesia's privatized soes period 2010-2014. This research results using SmartPLS were: 1) ownership structure had not significant influence to the sustainability of market performance; 2) financing decision had not significant influence to the sustainability of market performance, 3) sustainable competitive advantage as pure moderation influence ownership structure on sustainability of market performance, 4) sustainable competitive advantage as not moderation influence financing decision on sustainability of market performance.

Keywords: ownership structure, financing decision, sustainability competitive advantage (SCA), sustainability of market performance.

JEL Classification: G32.

1. Introduction

Privatization of state-owned enterprises has become a major phenomenon in the developed and developing countries. This causes significant changes in the ownership structure of companies worldwide (Boubakri *et al.* 2005). According to D'Souza *et al.* (2005) a fundamental change as a result of privatization is the change of ownership. Change of ownership led to changes in corporate governance. According to Jensen, and Meckling (1976), the structure of corporate ownership has a relation with the corporate governance and affecting it positively or negatively. The ownership structure of Go Public State-owned enterprise consists of State ownership and public ownership. The possibility of public ownership can be in the form of employee ownership, foreign ownership, institutional ownership, or managerial ownership.

Previous studies about the effect of state-owned enterprises privatization on the market performance are carried out by Boutchkova, and Megginson (2000) and Boubakri, and Hamza (2007). The findings prove that privatization may result in the improvement of corporate's market performance. Research conducted by Megginson, and Sutter (2006) finds that governments of emerging market countries will launch a privatization program through the sale of shares as a way to develop the capital market. On the other hand, the contrary result found by Vera, and Ugedo (2007), Bhaumik *et al.* (2010) they meet a negative relationship between the ownership structure to the company's financial performance. Other researchers found that ownership structure does not significantly influence the market performance (Lubis 2010).

The Privatization of State-Owned Enterprises through the sale of shares to the capital market is expected to improve financial performance, which in turn will become a source of creation of conditions for a sustainable competitive advantage (SCA). The previous researchs of SCA are conducted by Barney (1991), Rose, and Thomsen (2004). These findings indicate that good corporate reputations will have intangible asset characteristics. When the company has had the resources and capabilities that are irreplaceable and can't be replicated, the company will select and implement strategies to earn above-average profits. Other resource needed by SCA is funding. The financial decision concept has become important for companies in determining the sources of funding, as it will affect the pattern of financing in company's activity.

Each financial decision taken will affect other financial decisions that will impact on the value of the company (Fama and French 1998) in the end. Some theories have emerged to explain the differences in funding

decisions for any company. The most famous Capital structure theory is the asymmetric information and signaling theory, the pecking order theory and the trade-offs theory. Empirical researchs on the effect of funding decisions on the value of the company still haven't shown a consistence result. As (Bernadi 2007, Hasnawati 2005a, 2005b) concluded that the funding decisions have a significant and positive effect on firm value. But other studies such as Sudjoko (2007), Umrie *et al.* (2010), Yuliani (2011) concluded that the funding decisions do not significantly affect the value of the company. These contradictory results are referenced in financial research such as Fama, and French (1997), which explained that the debt has a negative correlation to the value of the company. The preceding study of Modigliani and Miller (1958) proposes some propositions concluding that the capital structure is irrelevant in affecting the value of the company.

2. Literature review

2.1. Agency theory

Agency theory (Jensen and Meckling 1976) explains that the status separation between the owners and managements of companies will create a problem called agency problems. The emergence of agency problems will be followed by the rise of the cost that so-called agency cost as expenses for monitoring the activities of the management, the expenditure to create an organizational structure that minimizes the unwanted managements' actions, as well as opportunity costs arising from the conditions in which the manager can't take an immediate decision without shareholder approval. Important implication of agency theory is regarding to the companies' financial policy mainly use debt or equity. The conflict of interests between management and shareholder happen in assumption that the owner (shareholder) and the management (agent) each want a high return on investment projects, but with different interests to the risk (Jensen 1986, Ammihud, and Lev 1981, Lane *et al*. 1998) The risk difference is described by Ammihud and Lev (1981) that the shareholder is more concerned about the systematic risk, while management is more concerned about the unsystematic risk.

Pecking order theory dan trade off theory

The company financing decision can be explained by two main theories that are often called as grand theory in the capital structure topic or using funding decisions in this research. The first theory is Pecking Order Theory (POT) developed by Myers (1984). Important points of this theory are related to the presence of asymmetric information between managements and investors about the company's investment opportunities. The manager would prefer funding that comes from internal sources in the form of retained earnings as the first alternative. If these resources are not sufficient, then the manager will use an external source in the form of debt and if it is still not sufficient, managers will issue new shares. Referring to the POT, managements in funding the company's operational activities should rank the fund sources. To be firm, managements see that if a company is profitable or able to record high profits, then there will be a small portion of debt in the financing decisions.

The second theory is the trade-off, which states that the optimal capital structure can be determined by the balance of costs and benefits associated with debt funding sources. The benefits of using this debt, it can bring tax savings because the tax is paid after paying a fixed liability in the form of interest payments. But if the funding is using external funding sources, it would create risks and conflicts of interest between managers and shareholders. The support from the trade-off is more beneficial for the company with the addition of debt that will give the company benefits from the tax savings.

Resources based theory

The company's internal side aims to analyze the company's ability to grow, so that we may know the strengths and weaknesses of the firm (Barney 2002). Further in the growth of the firm theory developed by Wernerfelt and Montgomery (1988) through a paper entitled "A Resource-Based View of the Firm". Furthermore, this theory is developed by Rumelt (1974) and Barney (1991) into a new concept of approach, namely the Resource-Based View (RBV) which is currently known as The Resource-Based Theory (RBT), which became one of the most dominant approaches to SCA.

RBT views that the resources of the company are much more important than the structure of the industry in acquiring and maintaining assets and capabilities. There is no other exactly the same company because each company has their own experience, assets and capabilities, and different culture of organizations. According to David (2010) RBT approach is used to gain a competitive advantage which believes that internal resources are more important than external factors in an effort to achieve and maintain a competitive advantage. RBT believes that the resources actually help companies to seize opportunities and neutralize threats. The Key of RBT model is

based on those three resources which is the major foundation in discovering and developing core competencies. Core competence is regarded as a capability or expertise within the business of a company. Pearce and Robinson (2011) this resource is separated into three so-called core resources as the foundation for special competence.

Signalling theory

One of theories that focus on asymmetric information problem in the market is signaling theory, which is developed by Ross (1977). Related with funding decisions, this theory explains that with the addition of corporate debt explicitly gives a signal to the market. Manager be like wants to communicate to investors that his company is a company that has good prospects and trustworthy as the company's ability to pay interest. In this case managers tend to use debt in large amounts as a credible signal. With those positive signals, the investor will invest funds in the company, so it is important for companies to convey a positive signal to investors.

3. Method

3.1. Data

The analytical unit of this research is go public state-owned companies within the research period of 2009-2014. The population is all go public state-owned companies listed on the Indonesian Stock Exchange (BEI) amounted to 14 companies with census sampling techniques so called the study of population. Companies that are used in the analysis shown in the following table:

Table 1 - List of Research's Samples (Go Public State-Owned Enterprise)

N	Emiten	Code	N	Emiten	Code
1	PT. Semen Gresik Tbk	SMGR	8	PT. Bank Mandiri Tbk	BMRI
2	PT. Tambang Timah Tbk	TINS	9	PT. BRI Tbk	BBRI
3	PT. Telekomunikasi Ind. Tbk	TLKM	10	PT. Pers. Gas Negara Tbk	PGAS
4	PT. BNI Tbk	BBNI	11	PT. Adhi Karya Tbk	ADHI
5	PT. Aneka Tambang Tbk	ANTM	12	PT. Wijaya Karya Tbk	WIKA
6	PT. Kimia Farma Tbk	KAEF	13	PT. Pem. Perumahan Tbk	PGLI
7	PT. Tambang Batu Bara Bukit Asam Tbk	PTBA	14	PT. Jasa Marga Tbk	JSMR

The data used in this research is secondary data sourced from financial statement published in the Indonesia Stock Exchange, ICMD Annual Report 2008-2014, and Annual Report from 2008-2014. As for the definitions of the research operational variables are:

Table 2- Operational Variable Definition

Variable	Indicator	Measurement	References
Ownership Structure/OS (x_1):	Public Ownership (PO)	$$\frac{Public\ Owned\ Shares}{Total\ Outstanding\ Shares}$$	Grosffeld (2006); Wahyudi, and Pawestri (2006)
Financing Decision FD(x_2):	*Book Debt to Equity Ratio* (BDE) (x_{21})	$$\frac{Total\ Debt}{Total\ Equity}$$	Hanafi (2004:44); Kallapur, and Trombley (1999)
	Long Term Debt to Equity Ratio (LDE) (x_{22})	$$\frac{Total\ Long\ Term Debt}{Total\ Equity}$$	
Sustainable Comparative Advantage/SCA (x_3):	*Net Income Growth* (NIG)(x_{31})	$$\frac{net\ income_t - net\ income_{t-1}}{net\ income_{t-1}}$$	Rose, and Thomsen (2006); Lubis (2010)
	Return On Assets (x_{32})	$$\frac{Net\ Income}{Total\ Assets}$$	
	Return On Equity (x_{33})	$$\frac{Net\ Income}{Total\ Equity}$$	

Market Performance Sustainability/MPS (y):	*Trade Frequency* (TF) (y₁₁)	*Frequency of State-owned Enterprise Traded within research period.*	Suta (2005:43-44); Lubis (2010)
	Trade Value Percentage (TVP) (y₁₂)	$\dfrac{\textit{Shares' Trading Value}}{\textit{Shares' Capitalization Value}}$	

The inferential statistic in this research is using the causality analysis Structural Equation Model (SEM) based on component or variance that is well known as Partial Least Square (PLS). The linearity test, outer model test and hypothesis test with determination of alpha ($p < 0.05$), the structural equations model based on hypotheses are:

Market Performance Sustainability = a + β_1OwnershipStructure + β_2FinancingDecision +ε

Market Performance Sustainability =+β_1OwnershipStructure+ β_2FinancingDecision+
β_3SustainableCompetitiveAdvantage * OwnershipStructure+
β_4SustainableCompetitiveAdvantage*FinancingDecision + ε

3.2. Analysis and findings

Analysis

To determine whether the model obtained is appropriate or not in describing the relationship between variables so that can be categorized into good or fit model, we have to use the basic test namely curve estimation method in SPSS software. The decision whether the relation between variables is linear or not is using $\alpha = 5\%$. Referring to Table 3 it appears that all forms of relationships between variables in the structural model is linear. Thus the assumption of linearity in the structural model has been fulfilled.

Table 3 - The Result of Liniearity

Exogenous Variable	Endogenous Variable	Result (α=0.05)	Sig	Decision
OS		All Model is Significant	0,003	Linier
FD	MPS	All Model not Significant	0,315	Linier
SCA		All Model not Significant	0,467	Linier

*Sources***:** Processed by Secondary Data

The characteristic of this research is that all indicators are in quantity data (hard data) and not the perception. While the unit of analysis is panel (pooling data) obtained from BEI. The data used in this research is secondary data; therefore, it doesn't need any research instruments associated with this condition. It is not necessary anymore to interpret the validity and reliability test. The checking of the measurement models is by using the interpretation of the outer loading destined for reflective indicator to measure the most powerful or dominant indicator or in this research using fit. The checking of reflective indicator is based on outer loading and then compared with p value at alpha 5%. This check is done to identify indicators of what is most important and dominant or fit in reflecting the respective latent variables. Here are the results of measurement models with software Ver 2.0 SmartPLS M3:

Table 4 - Research Variable Indicator Test Result

Variable	Indicator	*Outer Loading*	Decision
OS	Public Ownership (PO)	1,000	Fit
FD	*Book Debt to Equity Ratio* (BDE)	0,985	Fit
	Long Term Debt to Equity Ratio (LDE)	0,558	Fit
SCA	*Net Income Growth (*NIG)	0,719	Fit
	Return On Assets	0,009	Not Fit
	Return On Equity	-0,772	Not Fit
MPS	*Trade Frequency* (TF)	0,701	Fit
	Trade Value Percentage (TVP)	-0,739	Not Fit

*Sources***:** processed by secondary data

Based on the results of measurements of the outer model shown in Table 4, several indicators are declared as not fit as the outer loading value smaller than 0.5 and a negative result, therefore three indicators are not used in the research hypothesis testing. For the test 'goodness of fit model' it is found that Q^2 = 0.292 or 29.2%, so it can be stated that this research model can only be used to predict the sustainability of the market performance by 29% and the rest is contained in other variables that have not been included in this study. Referring to Tabel 5 it is found that only one accepted hypothesis, stated that H3 with the statement that sustainable competitive advantage is able to reinforce the influence of the ownership structure towards the sustainability of market performance while the H1, H2 and H4 are rejected.

Table 5 - Hyphotesis Test Result

Variable	Original Sample	T Statistic	P Value	Decision
OS → MPS	-0,068	0,619	0,538	Rejected (H1)
FD → MPS	0,082	0,696	0,489	Rejected (H2)
OS*SCA→ MPS	-1,346	2,148	0,035	Accepted (H3)
FD*SCA → MPS	-0,132	0,995	0,323	Rejected (H4)

Sources: Output SmarPLS

Findings

Hyphotesis 1: The higher the ownership structure, the higher market performance sustainability

The result shows that H1 is rejected. The findings of this research indicate that public ownership structure does not able to contribute to the market performance of Go Public State-owned Enterprise. Measurement of the ownership structure in the research as a proxy with public ownership is the ownership invested by society. Referring to the descriptive statistics, public ownership of go public state-owned companies amounted to 34.61% on average, the highest value is 78.84% and the lowest is 5.99%. Referring to the data, it shows that public ownership of go public state-owned company has a relatively high composition. The higher the proportion or composition in the public possession will be decisive in the decision-making in General Meeting of Shareholders (AGM). This research does not have enough evidence to accept the proposed hypothesis so that it can be stated that although the proportion of public ownership is relatively high but it has no effect on the decision-making so that the market performance is not increasing. The insignificant findings indicate that in the go public state-owned company, agency problem doesn't exist. Traditionally, the researchers that specifically examine about the ownership structure stated that there will be a conflict of interest between shareholders and managers (Yermack 1996, Shleifer and Visny, 1997). Shareholders in the research are based on public ownership. It means that Agency Theory, especially for a company with go public state-owned enterprises ownership, does not exist.

The ownership structure that based on the owner's perspective consists of managerial, institutional and public. Public that buy shares of go public state-owned enterprises will see the market performance sustainability, which in this research using two indicators: stock trading frequency of go public state-owned enterprises and the trading value percentage. The market performance sustainability of go public state-owned enterprises is reflected in the how frequent the shares traded during the observation period 2009-2014. The more it is traded, the higher prospect of the go public state-owned company according to investors' point of view. PT. Kimia Farma Tbk is a state owned company that is most traded as many as 1,881 times while PT Tambang Timah Tbk is the least traded as many as 12.16 times. But on average, the company's shares trading frequency of go public state-owned enterprises are as many as 160 times during the period observation.

This research's result is contrary from some previous researches such as Slovin, and Sushka (1993), Leech, and Leahy (1991), Boutchkova and Megginson (2000), Grosffeld (2006), Wahyudi and Pawestri (2006) in which the previous researchers found that the influence of ownership structure is significantly positive. Differences in these findings with previous studies happened because the previous researchers tend to use managerial and institutional ownership, while this particular research uses public ownership. The findings of this study reached the same conclusion with the object of observation in emerging markets, that ownership structure does not significantly influence the market performance (Lubis 2010).

Hyphotesis 2: The higher the debt proportion in financing, the higher market performance sustainability

Based on test results, the influence of funding decisions on the sustainability of the market's performance is found to be insignificant (H2 Rejected). The findings indicate that there is not enough empirical evidence to prove that the increase in the debt funding decisions will improve the sustainability of market performance in go public state-owned enterprise. It means that go public state-owned companies must maximize the internal

financing compared to the use of additional debt in improving market performance. Based on the outer model test, it appears that the dominant indicator as reflective of funding decision is the Book Debt to Equity Ratio (BDE) with a loading factor of 0.985. The measurement of BDE is by comparing the total debt to total equity indicates how much the state-owned companies are financed by external funding sources in its operations. The high value of loading factor that is approaching one indicates that the funding decision variables that are reflected in the indicators BDE as the dominant indicator of these variables.

The descriptive statistics show that on average the use of debt in financing decisions is 168% with a standard deviation of 205%. This shows that the total debt go public state-owned enterprise has smaller portions so, it can be concluded that the liquidity ratio is healthy because it is less than 200%. The higher the usage of debt in financing decisions will affect to the company's performance in general but it contains a financial risk. The other side of the usage of debt can give a positive signal to investors as the company has the capability to pay duty. In accordance with the theory of signal (signaling theory) that the use of debt as a signal delivered by the company to the trading market because it has confidence that the company's prospects are good that the company communicates it to investor. The insignificant findings in this study explicitly stated that in increasing the sustainability of market performance, the go public state-owned company should not add the debt that is proved by the descriptive statistics, on average BDE less than 200%. So, it can be concluded that the state-owned company in financing its operation should prefer internal funding sources. This empirical study proves that the funding strategy embraced by go public state-owned company is using pecking order theory which states that the company that has great profits tend to have small amount debt, it is because that the company uses internal funding sources in financing its operations.

These findings still raise contradiction to the findings from previous studies such as Chevalier (1995), Hasnawati (2005a, 2005b), Bernadi (2007), Dalbor *et al*. (2007), Siahaan (2013), Ambarwati and Wisdom (2014), Ediningsih *et al.* (2014) concluding that the funding decisions have a significant influence on the company's value. The finding of the research on the Stock Exchange showed the same results, that the effect is not significant between funding decisions on market performance and value of companies in general according to Sudjoko (2007), Umrie *et al.* (2010), Yuliani (2011), Setiadi and Gandakusuma (2015).

Hyphotesis 3: Sustainable competitive advantage can reinforce the influence of ownership structure to market performance sustainability

The impact of moderating variables of sustainable competitive advantage related to the structure of ownership and sustainability is found to be significant (H3 accepted). This study proves empirically that the variables of sustainable competitive advantage are able to reinforce the influence of public ownership structure of the sustainability performance of the market as reflected in the go public state-owned company's shares trading frequency within the observation period 2009-2014. Based on the nature, the moderating variable is pure moderation or interpreted as pure moderation would indeed strengthen relation of the public ownership structure and sustainable market performance. Pure moderation is clear on the findings because of the direct influence of public ownership structure doesn't have significant effect on the sustainability of the market performance. These findings can be interpreted that the new ownership structure will improve the sustainability of market performance when go public state-owned enterprise pays attention on its competitiveness. Referring to the descriptive statistics, on average, the structure of public ownership of 34.6% with a sustainable competitive advantage on average 20.8% is able to improve the sustainability of market performance by an average of 82%. If we refer to the outer loading, it is found that Net Income Growth (NIG) as a dominant indicator for sustainable competitive advantage variables. Based on this empirical fact that the go public state-owned company in the increase NIG will end up giving a signal to the investors to make decisions and see the prospect of a go public state-owned company.

The findings of this study is appropriate with the ownership structure of the firm theory in which the role of Sustainable Competitive Advantage (SCA), which is based on the Resource Based Theory (RBT), resources and capabilities can improve the sustainability of market performance because go public state-owned company posts a more than average profit. The improved financial performance that is finally able to become a source of SCA through privatization. The purpose of privatization of state enterprises in the capital market is to expect enhanced financial performance. Barney (1991) explains if the company has SCA and the strategy of value creation that are not applied by a competitor, the state-owned companies will get above average return. This finding is supported by researches from Barney (1991), Wallace and Cravens (1997), Rose and Thomsen (2004), Hovey (2005), Sujono (2013), Murwaningsari (2014) saying that if the role of the ownership structure that is supported by high

SCA, then you will get a strong relationship between ownership structure and market performance. This study's finding is different from the findings of Yuliani, and Muizuddin (2014).

Hyphotesis 4: Sustainable competitive advantage can reinforce the influence of financing decision to market performance sustainability

The result of hypothesis testing about the role of the sustainable competitive advantage variable as a moderating influence of the funding decision on the sustainability is not significant, so refuse H4. The findings of this study provide empirical evidence that financing decisions supported by SCA are not able to improve the market performance sustainability. Referring to the descriptive statistics, on average, the financing decision of 168% with a sustainable competitive advantage on average 20.8% is able to improve the sustainability of market performance by an average of 82%. It means that if there is an increase in the debt financing decisions without being accompanied by an increasing sustainable competitive advantage, this research prove there is no any increase in market performance. Based on the results of the outer model, it shows that the dominant indicator of sustainable competitive advantage is reflected in the increase NIG but doesn't give any signal to investors to act either buy or sell the shares of go public state-owned companies.

Other argument from these findings is, the debt increase in the financing decision is not followed by increasing SCA. Then according to Barney (1991) the company will not be able to earn above-average profits. Comparison of total debt towards total equity of go public state-owned companies that is small showed that managerial uses POT by financing the company's activities using internal funding sources. But smaller debt ratio in the financing decision makes public state-owned companies very careful so that the tendency to SCA is not optimal. The findings of this study differ with the views Barney (1991), RBT theory that the addition of debt in financing decisions of a company will give the company the resources to increase the company's performance. On the other hand, financing decisions that are supported by a sustainable competitive advantage haven't been able to contribute to the improvement of market performance.

Conclusion

Based on test results throughout the hypothesis, then the overall research is only able to prove the role of sustainable competitive advantage as pure moderation between the public ownership structure and market performance sustainability. Therefore the change in the public ownership structure followed by a sustainable competitive advantage can improve the market performance sustainability. Moderation role of sustainable competitive advantage toward financing decisions and market performance sustainability is found as not significant, so do the direct influence between the ownership structure, financing decisions towards market performance sustainability.

References

[1] Ambarwati, S.D.A., Himah, K. (2014). Hubungan Struktur Kepemilikan, Tingkat Utang, Dividen dan Nilai Perusahaan dalam Mengurangi Konflik Keagenan di Indonesia. *Jurnal Keuangan dan Perbankan*. 18(1): 29-39.

[2] Amihud, Y. and Lev, B. (1981). Does Corporate Ownership Structure Affects Its Strategy Towards Diversification? *Strategic Management Journal*, 20 (11): 1063-1069.

[3] Barney, J. (1991). Firm Resources and Sustained Competitive Advantage, *Journal of Management,* 17(1): 99-120.

[4] Barney, J. (2002). Gaining and Sustaining Competitive Advantage, Second Edition, Prentice Hall.

[5] Bernadi, K.J. (2007). Analisis Pengaruh Cashflow dan Kebijakan Pecking Order Terhadap Leverage dan Investasi serta Dampaknya Terhadap Nilai Perusahaan (Studi Pada Perusahaan-Perusahaan Sektor Manufaktur). Disertasi. Program Pascasarjana Universitas Brawijaya.

[6] Bhaumik, S.K, Driffield, N. and Pal, S. (2010). Does Ownership Structure of Emerging-Market Firms Affect Theiry Outward FDI? The Case of the Indian Automotive and Pharmaceutical Sectors, *Journal of International Business Studies*, 41: 437-450.

[7] Boubakri, N., Cosset, J-C., Fischer, K. and Guadhami, O. (2005). Privatization and Bank Performance in Developing Countries, *Journal of Banking & Finance*, 20(8-9): 2015-2041.

[8] Boubakri, N. and Hamza, O. (2007). The Dynamics of Privatization, the Legal Environmental and Stock Market Development, *International Review of Financial Analysis*, 16(4): 304-331.

[9] Boutchkova, M.K. and Megginson, W.L. (2000). Privatization and the Rise of Global Capital Markets, *Financial Management*, 29(4): 31-76.

[10] Chevalier, J.A. (1995). Capital Structure and Product-Market Competition: Empirical Evidence fro the Supermarket Industry*, The American Economic Review*, 85(3): 415-435.

[11] David, F.R. (2010). *Strategic Management: Concepts and Cases.* 8th Edition, International Edition, Prentice Hall Pearson Education, Inc. Upper Saddle River: New Jersey.

[12] D'Souza, J., Megginson, W. and Nash, R. (2005). Effect of Institutional and Firm-specific Charactaristics on Post-Privatization Performance: Evidence from Developed Countries, *Journal of Corporate Finance*, 11(5): 747-766.

[13] Ediningsih, Sri. I., Nilmawati, Sukendro, J. (2014). Utang dan Pengaruhnya terhadap Kinerja Perusahaan, *Jurnal Keuangan dan Perbankan*, 18 (1): 52-62.

[14] Fama, E. F. and French, K. R. (1998). Taxes, Financing Decisions, and Firm Value, *The Journal of Finance.* 53(3): 819-843.

[15] Fama, E. F. and French, K. R. (1997). Industry Costs of Equity, *Journal of Financial Economics*, 43: 153-193.

[16] Grosffeld, I. (2006). Ownership Concentration and Firm Performance: Evidence from an Emerging Market, *Social Science Research Network Paper Collection*. http://www.ssrn.com/Abstract-id924588

[17] Hanafi, M. (2005). *Manajemen Keuangan.* Edisi 2004/2005. BPFE: Yogyakarta.

[18] Hasnawati, S. (2005a). Implikasi Keputusan Investasi, Pendanaan dan Dividen Terhadap Nilai Perusahaan Publik di Bursa Efek Jakarta. *Usahawan Indonesia*, No.09 TH XXXIV: 33-41.

[19] Hasnawati, S. (2005b). Dampak Set Peluang Investasi Terhadap Nilai Perusahaan Publik di Bursa Efek Jakarta, *Jurnal AAI.* 9(2): 117-126.

[20] Hovey, M. (2005). Corporate Governance in China: An Analysis of Ownership Changes after the 1997 Announcement. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=811105

[21] Jensen, M. C. and Meckling, W.H. (1976). Theory of the Firm: Managerial Behavior, Agency Cost and Ownership Structure. *Journal of Financial Economics,* 3 (4): 305-360.

[22] Jensen, M. C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Take overs. *American Economic Review*, 76(2): 323-329.

[23] Lane, P., Cannelta, J., Lubatkin, A.A., Michael, H. (1998). Agency Problem as Antecedents to Unrelated Mergers and Diversification: Amihud and Lev Considered. *Strategic Management Journal*, 19(6): 555-578.

[24] Lubis, T.A. (2010). Pengaruh Struktur Kepemilikan Terhadap Kinerja Finansial dan Operasional, Keunggulan Daya Saing Berkelanjutan Berdasarkan Reputasi Ukuran Akuntansi, dan Kinerja Pasar (Studi pada BUMN Tbk). Ringkasan Disertasi, Program Doktor Ilmu Manajemen Universitas Brawijaya: Malang.

[25] Kallapur, S. and Trombley, M. A. (1999). The Association between Investment Opportunity Set Proxies and Realized Growth, *Journal of Business Finance & Accounting*, 26 (3 & 4): 505-519.

[26] Leech, D. and Leahy, J. (1991) Ownership Structure, Control Type Classifications and the Peerforance of Large British Companies, *Economic Journal*, 101(409): 1418-1437.

[27] Megginson, W.L. and Sutter, N.L (2006). Privatisation in Developing Countries. *Corporate Governance: An International Review.* 14(4): 234-265.

[28] Modigliani, F. and Miller, M.H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment, *The American Economic Review*. 48(3): 261-297.

[29] Murwaningsari, E. (2014). Kepemilikan Institusional dan Kualitas Audit terhadap Pengungkapan Informasi dan Future Earnings Response Coefficient, *Jurnal Keuangan dan Perbankan*, 18 (2): 161-171.

[30] Pearce, J. A. and Robinson, R.B. (2011). Strategic Management: Formulation, Implementation and Control. Sixth Edition Irwin, The McGraw-Hill Companies, Inc.

[31] Porter, M. E. (1980). *Competitive StrategyTechniques for Analyzing Industries and Competitors.* The Free Press. New York.

[32] Porter, M. E.. (1990). Competitive Strategy. Agus Maulana MSM (Penerjemah). Strategi Bersaing Teknik Menganalisis Industri dan Pesaing. Erlangga.

[33] Rose, C. and Thomsen, S. (2004). The Impact of Corporate Reputation on Performance: Some Danish Evidence, *European Management Journal*, 22(2): 201-210.

[34] Rumelt, R. P. (1974). *Strategy, Structure, and Economic Performance*. Harvard Business School Classic.

[35] Setiadi, R. K. and Gandakusuma, I. (2015). Analisis Determinan Struktur Modal Perusahaan Sektor Properti dan Real Estate, *Manajemen Usahawan Indonesia,* 44(1): 1-17.

[36] Shleifer, A. and Vishny, R. W. (1997). A Survey of Corporate Governance, *The Journal of Finance*, 52 (2): 737-783.

[37] Siahaan, F. O.P. (2013). Struktur Perusahaan dan Profitabilitas pada Industri *Real Estate* dan *Property* di Indonesia. *Jurnal Keuangan dan Perbankan,* 17(2): 192-199.

[38] Slovin, M.B. and Sushka, M. E. (1993). Ownership Concentration, Corporate Control Activity, and Firm Value: Evidence from the Death of Inside Blockholders, *The Journal of Finance,* 48(4): 1293-1321.

[39] Solimun (2010). Analisis Multivariat Pemodelan Struktural Metode *Partial Least Square-* PLS. Penerbit CV. Citra: Malang.

[40] Sujoko (2007). Pengaruh Struktur Kepemilikan Saham, Strategi Diversifikasi, Leverage, Faktor Intern dan Faktor Ekstern terhadap Nilai Perusahaan. Ringkasan Disertasi. Program Pascasarjana Universitas Brawijaya.

[41] Sujono (2013). Determinan Struktur Modal, Inovasi dan Nilai Perusahaan (Studi pada Industri Manufaktur di Bursa Efek Indonesia). Ringkasan Disertasi. Universitas Brawijaya, Malang.

[42] Suta, I. P. G. A. (2005). Kinerja Pasar Perusahaan Publik di Indonesia: Suatu Analisis Reputasi Perusahaan. Disertasi telah diterbitkan. Penerbit Yayasan SAD Satria Bhakti. Jakarta: Indonesia.

[43] Umrie, HS. R., Yuliani and Cahyadi, A. (2011). Analisis Kebijakan Dividen dan Kebijakan Hutang terhadap Nilai Perusahaan Go Publik di Indonesia, *Jurnal Manajemen & Bisnis Sriwijaya,* 9(17): 13-32.

[44] Vera, A.M., Ugedo, J.F.M. (2007). Does Ownership Structure Affect Value? A Panel Data Analysis for the Spanish Market, *International Review of Financial Analysis*, 16(1): 81-98.

[45] Wallace, W.A. and Cravens, K.S. (1997). Evaluating Control Risk from a Corporate Governance Perspective, *Managerial Finance*, 23(12): 22-37.

[46] Wahyudi, U. and Pawestri, H.P. (2006). Implikasi Struktur Kepemilikan terhadap Nilai Perusahaan: dengan Keputusan Keuangan sebagai Variabel Intervening. *Simposioum Nasional Akuntansi 9*: Sumatera Barat, Padang.

[47] Wernerfelt, B. and Montgomery, C. A. (1988). Tobin's q and the Importance of Focus Performance, *The American Economic Review*, 78(1): 246-250.

[48] Yermack, D. (1996). Higher Market Valuation of Companies with a Small Board of Directors, *Journal of Financial Economic,* 40 (2): 185-211.

[49] Yuliani (2011). Leverage, Size and Age Mediating Business Diversified to Financial Performance: Empirical Studies of Secondary Sectors in Indonesian Stock Exchange. *Proceeding of The 2nd International Conference Indonesian Management Scientists Association.* Pekan Baru Riau. 2-4 December, pp. 195-212.

[50] Yuliani, Muizuddin (2014). Kepemilikan *Blockholder, Investment Opportunity Set,* Rasio Likuiditas dan Nilai Perusahaan, *Jurnal Keuangan dan Perbankan*, 18 (2): 223-232.

Evaluating the Effectiveness of Investment in the Regional Infrastructure from the Perspective of Infrastructure Marketing

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Abstract

The article describes the methodological approach for evaluating investments in the regional infrastructure from the perspective of infrastructure marketing, which in contrast to the existing approaches allows to consider the development of infrastructural components of the region taking into account an appropriate strategy of territorial marketing as a driving or "binding" force of the competitiveness of the region and its investment attractiveness. The necessity of the use of the infrastructure marketing as a tool of strategic planning in the region is defined. The method of assessment of infrastructural components of the region is suggested; the method was tested on the materials of the Republic of Buryatia. The causal relationship between investments in infrastructure components and their impact on the socioeconomic situation of the region was also defined.

Key words: investments, infrastructure components, territorial marketing, infrastructure marketing, socioeconomic situation of the region.

JEL Classification: E22, F21, P45.

1. Introduction

Recent changes in the international economic and political systems form new conditions for further development of the economy in the country as a whole and regions in particular, thereby focusing on finding new ways to ensure its competitiveness. The implementation of this task is impossible without a comprehensive approach to assessing the strategitizing of socioeconomic development of the region, which includes the selection of the regional development strategy based on a strategic analysis that takes into account the specifics, advantages and disadvantages, as well as opportunities in the region aimed to improve its competitiveness and investment appeal.

It may be noted that the region is competitive if it has properties that create its advantages as the subject of the national market through the effective use of all territorial resources, in order to achieve sustainable economic growth, increase in the level and quality of life. Under these conditions, one of the important factors contributing to the further development of the regional economy (in this case, the Republic of Buryatia) will be the attraction of investments that determine economic growth and improve the competitiveness of its economy.

The issue of evaluation of investment attractiveness of the region should be considered from the perspective of territorial marketing. The territorial marketing serves as an advanced tool to identify, support and develop the existing strengths determined by the competitiveness of the region's economic sectors, industries, and formed clusters in terms of their territorial location (proximity to external borders, presence of air and rail links, etc.), which gives them an advantage.

It should be noted that the viability and sustainability of the regional socioeconomic system are determined by the level of development of its infrastructure, as well as its reliability. Of course, the issue of development of infrastructure components, such as manufacturing, resource and raw material, institutional, cultural, social and market attracts a lot of attention, but nevertheless achieving the performance targets of socioeconomic development of the region is impossible without due attention to them in terms of infrastructure marketing. The current stage of development of economic science is characterized by a lack of theoretical, methodological and

practical approaches to the study of infrastructure marketing. Most authors consider infrastructural complex as an integral system, without singling out and analyzing its componentwise composition. In addition, the current literature lacks uniform approach to the evaluation of the infrastructure complex of the socioeconomic system of the region, and there are virtually no approaches to evaluating the effectiveness of the regional infrastructure marketing. We propose to assess the effectiveness of application of the regional infrastructure marketing through the evaluation of the effectiveness of investments in the regional infrastructure.

2. Theoretical basis

Currently, the issue of improving the competitiveness of the region is paid enough attention, and the presence of many different creative approaches and points of view should be noted. In our study, we would like to draw attention to the application of the territorial marketing, in particular the infrastructure marketing, in the strategic planning of the territorial development of the region. To do so, it is necessary to consider the theoretical aspects of the concept in the first place. Economic science has developed a variety of approaches to the interpretation of the "territorial marketing" concept.

For example, the founder of modern marketing P. Kotler believes that the territorial marketing expresses the idea of a comprehensive approach to identifying and addressing the problems of the territory. In this case, marketing strategic planning, which is implemented by all management entities, including representatives of public authorities, the business community and residents of the area, plays the leading role. According to him, the objective function of marketing in this case is the search for the factors that ensure the adaptation of the territorial community to the ongoing market transformation. At that, the strategic territorial marketing contributes to achieving a state of society in which the needs of all key public institutions would be satisfied. Therefore, according to P. Kotler, the key objectives of the territorial marketing are: 1) identification of the needs of the residents of the territory; 2) search of existing problems and the reasons for their emergence; 3) development of alternative scenarios to overcome problematic situations without compromising the interests of the residents of the territories in the light of accumulated experience and available resources; 4) long-term phased investment in the region. (Volkov 2014)

At the same time, the main objectives of marketing of the region, according to A.P. Pankrukhin, may be represented as follows: 1) improving the competitiveness of industrial and servicing enterprises located in the region; 2) increasing the share of citizens who define themselves and self-identify themselves with this territory; 3) search and attraction of new business entities to the region; 4) raising awareness and image of the region (Pankrukhin 2002). To achieve the objects of the territorial marketing, the following strategies can be used: attraction marketing, image marketing, infrastructure marketing and marketing of the population. Here the strategy of infrastructure marketing plays a key role. For example, according to the findings of the study from World Bank presented in the report of Sharipova E. named "How to start a conveyer of long-term investment in infrastructure? Role of institutional investors", the growth of investments in infrastructure by 10% provides about 1% of future economic growth. Investments in infrastructure have a significant impact on economic development, productivity growth and employment. In addition, the investments in the infrastructure development programs contribute to the competitiveness and further diversification of the economy (Sharipova 2013).

Professor A.P. Pankrukhin defines this strategy as "infrastructure marketing". "Infrastructure marketing" refers to activities to improve the attractiveness of the relevant territory for business. The author defines the main features of the application of infrastructure marketing as the focus on business processes and entrepreneurs, availability of sufficiently civilized market relations in the territory. At this, the concept of "infrastructure marketing" can be interpreted as providing the infrastructural attractiveness of a particular territory. Since the region as a territory is defined by a corresponding set of infrastructure components that determine the normal functioning of its socioeconomic system, the concepts of "infrastructure marketing" and "marketing of infrastructure" will be identical to each other in our study.

Another important issue is evaluation of investments attracted to the infrastructure components of the region. The approach presented in the work of Korochenko, based on the identification of the relationship between investment activity and the growth of gross regional product by correlation and regression analysis, was chosen as a methodological approach to the evaluation of investments in infrastructure in the region (Korotchenko 2010). This approach determines the causal relationship between the change in the gross regional product and indicators reflecting the investment activity in the region: investment in fixed capital and foreign investment. This revealed the relationship between investment and changes in the economic situation in the region. However, in our case, we study the relationship between investment in the components of infrastructure and the gross regional product, since we take the view that the development of each infrastructure component

can cause economic and social development of the region from the perspective of infrastructure marketing. This approach will also allow determining the effectiveness of investments in the related infrastructure components from the perspective of the region's immediate and deferred nature of the influence through its use in correlation and regression analysis of time lags.

3. Methodology

The methods of correlation and regression analysis are used to evaluate the effectiveness of investments in the regional infrastructure from the perspective of infrastructure marketing. The study expects to reveal the closeness and direction of the relationship between investment flows into components of infrastructure and gross regional product, which can both create an instant impact on the change in the GRP and have the time delay effect. Also, the study will identify causal relationships and build the regression models that will allow evaluating the sensitivity of the value of the gross regional product to changes in the volume of investments in the structural elements of the regional infrastructure complex. The study plans to develop the existing forecasting and analytical tools based on these methods and approved by us to some extent.

In particular, it is proposed to select the basic infrastructure components of socioeconomic system in the region (on the example of the Republic of Buryatia) that will allow forming the relevant toolkit for infrastructure marketing.

Further, the proposed toolkit for infrastructure marketing through the use of correlation analysis will be used in the respective models of the impact of infrastructure investment on GRP, providing a comprehensive account of the major factors affecting it, and will also allow quantifying the strength of these factors. Using a retrospective analysis of the dynamics of selected model parameters, the timeframe of the effect obtained from the infusion of investment in infrastructure on the GRP (immediate and delayed effects) will be specified. In addition, this study will extend the knowledge about the features of the development of infrastructure components at the expense of investments in GRP.

The methods of regression analysis will be used to assess the prospective dynamics of the impact of investments in the regional infrastructure. The following indicators in the dynamics by years will be used as explanatory variables in the simulation: in particular, investment in agriculture, investment in mining industries, investment in healthcare, investment in education and the gross regional product. This will allow revealing the dynamics of change in the parameters of the gross regional product from the change of infrastructure parameters and can in turn be explained by the dynamics of investments in the infrastructure components of the region.

Let's consider the proposed methodology for assessing the nature of the impact of infrastructure shifts on the socioeconomic system of the region on materials of the Republic of Buryatia.

4. The context of the study: the Republic of Buryatia (description of the object of study)

Due to the fact that the investment can have a deferred and immediate nature, we took the period of 2003-2011 for our study. Analysis of the data monitored by state statistics and the assessment of the legal documentation regulating socioeconomic development of the Republic of Buryatia help reveal the main trends of change in infrastructure elements of the region.

An analysis of the dynamics of indicators of industrial infrastructure of the mining industry for a specified time period demonstrates a positive trend of growth by 10-20% annually. This is due to the fact that mining is one of the key points of economic growth of the Republic of Buryatia.

The agroindustrial complex of the republic has shown the growth of agricultural production at an average annual rate of 102.2% since 2004. About 5% of the territory of agricultural land is concentrated in the hands of individuals; the population owns the cattle stock – more than 80%, pigs – more than 55%, sheep and goats – more than 50%. However, the local farms provide more than 80% of total agricultural production. In 2010, the volume of agricultural production was 13.2 bln rub., which is 25.5% more than in 2007. At the same time, the food and processing industries produced twice more products than in 2007 (7.4 bln rub. and 3.7 bln rub., respectively). A key role is played by livestock with its supporting crop farming.

Building infrastructure is also of great importance for the economy of the republic. In the period 2003-2006, over 800,000 s.q.m. of residential floor space was commissioned, which was more than 9,500 flats. The extent of housing supply grew by 3.3% in 2009 compared to 2007. The average per capita living area thus amounted to 19 sq.m.

Transport infrastructure, especially road and rail transport, is major in the industrial infrastructure in view of the vast territory of the republic. The gradual reforming and development of this infrastructure element is a key

factor in the successful, sustained growth of the economy of the Republic of Buryatia, it is a condition for raising the living standards of people in the region. In 2005, the share of transport and communications in the production of gross value added was 31%. The transport infrastructure of the republic includes more than 6,900 km of public transport routes, 1,400 km of railways, 6,300 km of roads, 4 airports, 14,000 km of air communication lines, 57 km of tramways. The average daily ridership is 170,000 people, freight traffic – 23,000 tons. Private sector dominates (more than 90% of passenger traffic and 97% of freight traffic). In 2011, passenger traffic of railway transport amounted to 3.1 mln people, automobile – 59.01 mln people, making 69.1% and 107.0% in relation to 2008, respectively. Freight traffic of railway transport amounted to 7.4 mln tons, automobile transport – 0.9 mln tons, which was 82.9% and 100.2% in relation to 2008, respectively. The main problems of the transport sector in the Republic of Buryatia are a low level of technological development and a poor state of the transport infrastructure. For example, the depreciation of railroad fixed assets amounted to 82.0% in 2009, automobile assets – 80.5%.

Performance assessment of the social area was carried out in the context of healthcare and education systems.

Since 2003, the situation in the Republic of Buryatia with the number of doctors and nurses has improved, number of hospital beds rose to 106.1 per 10,000 population (across Russia – 111.3), capacity of medical and outpatient clinics – to 229.2 per 10,000 population (across Russia – 256.9). A positive perception and assessment of healthcare facilities increased from 33.5% in 2007 to 42.1% in 2011. Healthcare facilities are primarily shifted to single-channel financing through the CMI systems; the results-oriented sectoral wage system was introduced. Infant and maternal mortality and overall mortality rate declined to the level of the national average.

In education, there are more than 400 pre-school educational institutions, 494 secondary schools, 9 educational institutions of primary vocational education (when compared to 2009, reduction in the number of these institutions is 47%), 27 educational institutions of secondary vocational education and 5 institutions of higher education today. Coverage of youth with programs of primary, secondary, higher and postgraduate education is 24.3%. The implementation of measures for the restructuring and optimization of the network and number of employees of the education system started in 2009 (by 13.5% compared with 2008). At the same time, the proportion of teachers in the total number of employees increased by 3%.

Thus, the assessment of the impact of infrastructure shifts is carried out by the following components of infrastructure development: agroindustrial complex, mining and building industries for the production infrastructure, education and health – for social infrastructure.

5. Results and discussion

The following results were obtained in the course of the study.

Result 1

The objective necessity of the implementation of regional development measures aimed at improving its competitiveness and investment appeal requires an adequate mechanism for its strategic planning at the level of a particular region. The specifics of each region often require consistency of the principles of complexity and consistency for strategic planning of its development. For example, the strategic planning of socioeconomic development of the Republic of Buryatia should correspond to the main objectives of the strategic development of the Far East and Siberia, while the Republic of Buryatia has a number of territorial, economic and social characteristics that can distinguish it from other regions. Thus, the concept of the territorial marketing will allow aligning the interests of a particular region with the general policy of the country in the first place. Currently, the effective functioning of the socioeconomic system of the region is determined by the use of the concept of territorial marketing. For example, Volkov S.K. defines infrastructure support of the territories as the central problem of ensuring the competitiveness of regional development, where concept of territorial marketing is recognized as the leading technology of the modern concept of territorial development (Volkov 2014).

Territorial marketing covers a wide range of issues related to improving the quality of life and economic efficiency of the development of the particular territory. At the same time, the lack of development of infrastructure in many respects will be a deterrent to socioeconomic development of the region and, as a result, low investment attractiveness and competitiveness of the territory in the future development. This point of view is represented in the works of Kotler P., Asplund C., Rein I., Haider D. "Marketing Places: How to Attract Investments, Industries, Residents and Visitors to Cities, Communities, Regions and Nations in Europe" (Kotler *et al.* 2005).

It should be noted that the study of regional development from the perspective of territorial marketing will be interesting from the perspective of infrastructure marketing, since it was established that the higher the level of development of the relevant components of the regional infrastructure, the faster the region attracts investment and workforce and sees accelerating economic development and improving life and health. Conversely, the lower the level of development of the regional infrastructure, the more slowly or at greater cost the production develops, the lower the standard of living. (Malinovskaya 2011)

Thus, we have identified the main components of the infrastructure, which from the perspective of infrastructure marketing can be considered key indicators of regional development, namely production infrastructure, market infrastructure and social infrastructure. As an example, it may be noted that the production infrastructure includes the agricultural sector and the construction industry, market infrastructure – wholesale and retail trade, social infrastructure – healthcare and education.

Analysis of the state of development of infrastructure components in recent years shows a positive trend of growth of each of them. Currently, however, there is no necessary methodical approach to evaluation of the impact of infrastructure investment on the socioeconomic situation of the region, because it is known that the introduction of certain elements of infrastructure facilities of the territories into economic circulation has results of different quality, characterized by economic and social effects of the impact on the socioeconomic system of the region. For example, the construction of a production plant may require the availability of appropriate infrastructure, particularly the road to the plant. The construction of the road will require a large amount of investment. However, when the plant is commissioned, the developed transport infrastructure of the plant will reduce transport costs for delivery of finished products to consumers. Therefore, it is necessary not only to determine the development of each component of the infrastructure of the region, but also to investigate the contribution of this development to the development of the entire socioeconomic system of a particular region.

Result 2

Correlation and regression analysis was conducted to assess the impact of investment in infrastructure components of the region and the socioeconomic situation of the region as a whole.

Interpretation of the obtained results of the econometric modeling is as follows: for the majority of cases studied, there are no deferred effects on the value of the gross regional product by dedicated components of the infrastructure complex. The characteristic lagging of the GRP value behind the produced investment of the fixed capital of the agroindustrial complex is characterized by one-, two- and three-year lag at the correlation coefficient equal to 0.17; 0.55; 0.48 respectively. The increase in strength due to the increment of the time lag should be noted (Table 1).

Table 1 - Results of econometric modeling of GRP from the lag variable

Component of the infrastructure complex	Value of the time lag, years	Value of the correlation coefficient
Agroindustrial complex	1	0.17
	2	0.55
	3	0.48
Mining industry	1	0.93
	2	0.88
	3	0.66
Healthcare	1	0.65
	2	0.45
	3	0.30
Education	1	-0.63
	2	-0.26
	3	0.94
Wholesale, retail trade	1	0.32
	2	0.44
	3	0.27
Building industry	1	0.19
	2	0.20
	3	0.53

Evaluation of the results of the correlation analysis reveals a strong correlation between the size of the gross regional product and the lag variables, which is characteristic only for investment in education and mining industry. The weak impact of investment on the value of the gross regional product is due to the absence of large-scale investment projects implemented over the analyzed period. The investments were usually short-term and focused on retention of the achieved position. In addition, influence of education and the health system on the value of GRP remains significant. It should be noted that investments in education show a more lasting effect, in contrast to investments in healthcare.

The results of econometric modeling of the value of GRP depending on the volume of investment in the infrastructure complex are shown in Table 2. Regression models for building and trade sectors are characterized by low values of criteria of adequacy.

Table 2 - Econometric models with distributed lags*

No.	Econometric model	Investments in the corresponding element of infrastructure complex, mln rub.	Value of the coefficient of determination	F-criterion
1	$y_t = 74885.75 + 83.09 \cdot x_t$ (5.02) (2.61)	agroindustrial complex at time t	0.49	6.81
2	$y_t = 67232.84 + 16638.63 \cdot x_t$ (6.51) (4.68)	mining industry at time t	0.75	22.09
3	$y_t = 76712.16 + 16085.88 \cdot x_{t-1}$ (9.00) (4.84)	mining industry at time t-1	0.79	23.38
4	$y_t = 78305.35 + 24874.42 \cdot x_{t-2}$ (7.79) (4.29)	mining industry at time t-2	0.79	18.41
5	$y_t = 68299.00 + 52.09 \cdot x_t$ (4.25) (2.78)	healthcare at time t	0.53	7.77
6	$y_t = 44792.05 + 18.71 \cdot x_{t-3}$ (3.44) (6.12)	education at time t	0.90	37.49

Note: * y_t – GDP at time t, mln rub.

Application of correlation analysis allowed to obtain econometric models which helped carries out assessment of the sensitivity of the gross regional product to the value of absolute changes in investments in the various components of the complex infrastructure of the region (Table 3).

Table 3 - Elasticity coefficients for the components of the infrastructure complex

Component of the infrastructure complex	Time lag, years	Value of the elasticity coefficient, %
Agroindustrial complex	0	0.29
Mining industry	0	0.36
	1	0.29
	2	0.32
Healthcare	0	0.35
Education	3	0.58

According to Table 3, the indicator "investment in education" shows the highest value of the correlation coefficient. Increase in investment in education by 1% in the base year determines the increase in GRP value by 0.58% in three years. Investments in the agroindustrial sector and the healthcare system show an immediate effect without time lag. The mining industry is characterized by both delayed and immediate effect.

Conclusion

Finding ways to increase the competitiveness of the economy predetermines the objective necessity of taking into account territorial, economic and social characteristics of the regions. The concept of territorial marketing allows reveal the key indicators of regional development in the structure of the main components of infrastructure. The proposed method of evaluation of the effectiveness of investment was tested for the following elements of infrastructure development: agroindustrial complex, mining and building industries for the production infrastructure, education and health – for social infrastructure. The toolkit for econometric modeling revealed the instantaneous nature of the impact of infrastructure changes on the economic system of the region. Correlation analysis showed a strong correlation between the value of the gross regional product and the lag variables, which

is characteristic only for investment in education and mining industry. The weak impact of investment on the value of the gross regional product is due to the absence of large-scale investment projects implemented over the analyzed period. The investments were usually short-term and focused on retention of the achieved position. In addition, influence of education and healthcare system on the value of GRP remains significant. It should be noted that investments in education show a more lasting effect, in contrast to investments in healthcare.

References

[1] Bondarenko, V. (2007). Marketing of territories: aspects of the financial attractiveness of investing in territorial infrastructure. *Practical Marketing*, 3: 14.

[2] Dinis, A. (2003). Rural entrepreneurship: An Innovation and Marketing Perspective, Communication. Proceedings of the International Conference: Small Firms Strategy for Innovation and Regional Problems, Universida de Algarve.

[3] Funke, U. (1998). Methodological bases of urban development concepts. Eurograd, 10.

[4] Korotchenko, A.S. (2010). Correlation and regression analysis of the impact of investment activity on the growth of gross regional product of the Kaliningrad region. Herald of Baltic Federal University, 3/2010.

[5] Kotler, F., Jatusripitak S. and Maescincee, S. (1997). The marketing of nations: a strategic approach to building national wealth. New York: Free Press, pp: 451.

[6] Kotler, P., Asplund, C., Rein, I. and Haider, D. (2005). Marketing Places: How to Attract Investments, Industries, Residents and Visitors to Cities, Communities, Regions and Nations in Europe. St Petersburg: Stockholm School of Economics, pp: 376.

[7] Lavrov, A.M. and Surnin V.S. (1994). Reforming the Economy: Regional Aspects 4.2. Regional marketing and development trends. Kemerovo, Kuzbassvuzizdat.

[8] Lobanov, V. (1994). Marketing in public administration. *Problems of Management Theory and Practice*, 4.

[9] Malinovskaya, N.A. (2011). Methods of assessing the regional infrastructure complex. *Scientific and Technical Journal of SpbSTU*, 4: 5.

[10] Malinovskaya, N.A. (2011). Research of the regional infrastructure complex. Russian Entrepreneurship, 2(192), 9: 82-86. Date Views: 12.11.2015 http://www.creativeconomy.ru/articles/13777

[11] Meer, J. van der. (1992). The role of city marketing in urban management. Rotterdam: EURICUR. Erasmus University.

[12] Pankrukhin, A.P. (2002). Marketing of territories: Study guide. Moscow: Publ. RAGS, 42.

[13] Romanov, A.N. *et al.* (1995). Marketing: Textbook. Banks and Stock Exchanges. Moscow: UNITY, 479-485.

[14] Sharipova, E. (2013). Analytical materials. How to start a conveyer of long-term investment in infrastructure? Role of institutional investors. Date Views: 15.11.2015 http://www.pppinrussia.ru/userfiles/upload/files/FINAL%20 DOKLAD2-A4.pdf.

[15] Startsev, Yu.N. (2004). Territorial Marketing: study guide. Chelyabinsk: ChSU.

[16] Vanchikova, E.N. (2012). Evaluation of the implementation of socioeconomic development of the region. Bulletin of UMO. *Economics, Statistics and Informatics*, 4.

[17] Vanchikova, E.N. (2012). Evaluation of the implementation of socioeconomic development of the region. Bulletin of UMO. *Economics, Statistics and Informatics*, 4.

[18] Volkov, S.K. (2014). Marketing of infrastructure as a prerequisite for the effective development of the territories in modern Russia. *Modern Science-Intensive Technologies. Regional Supplement*, 3(39).

[19] Voronin, V.G. and Tselyh T.N. (2011). On the issue of the nature of territorial marketing. *Problems of Modern Economics: Problems of Marketing. Logistics*, 4(40).

[20] Wooley, H. (2000). Town centre management awareness: an aid to developing young people's citizenship. Cities, 17.