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# INSTITUTIONAL ANALYSIS OF THE CONTEMPORARY REGIONAL LABOUR MARKET IN THE CZECH REPUBLIC

*Václav Novák, Marek Vokoun, František Stellner, Marek Vochozka*

## Introduction

In this study we analyse labour economic policy instruments, which are present in current regional labour markets. The framework of our analysis is based on the perceptions of important institutional players who are in direct daily contact with both sides of the market. Both labour offices and private recruitment agencies are critical institutional players in the labour market. Their ability to assess economic policies and market outcomes (employment and unemployment) provides a unique basis for institutional analysis.

Our hypotheses deal with public institutions and their ability to provide good quality labour market economic policies. A questionnaire was used to collect data from selected institutions and then to test our hypotheses. The expectations are that there would be differences in the way public policy is perceived by the public and private sectors and in the perception of the labour market as an economic phenomenon in the selected regions.

This study starts by introducing the socio-economic differences between the regions followed by an examination of the economic policies that are dominant in the regional markets. The economic theories and current empirical results dealing with public policy effectiveness in the area of employment policy are then subjected to a critical review. The institutional analysis is predominantly focused on empirical evidence and the hope is that it is possible to also deliver a public policy recommendation, which will make the employment policies and their instruments more effective given the current institutional infrastructure.

Economists traditionally view institutions and scarce resources as a framework for economic activity (Aoki, 2001). Institutions are usually perceived to be players in a game i.e.

decision makers, entrepreneurs, and politicians who can substantively influence the whole economy. But in the game theoretic approach and in our analysis the institutions are the rules of the game which constrain and shape human interactions (North, 1991), not the players.

These formal and informal institutions in the labour market are the target of this research study. Formal institutions are for example the employment policies, the minimum wage, policies regarding secondary and tertiary education, EU labour market policies, etc. The informal institutions are usually not visible to an impartial spectator or an economic analyst. These informal institutions include social norms, traditions and customs, which can significantly change and influence labour market outcomes and the economic activity of labour market players (Ostrom, 1990). To shed some light on the efficiency of the formal and informal rules we carried out an analysis of the experience of major institutional players in the labour market.

## 1. Labour Market Players and Rules of the Game

The Czech labour market is influenced by many economic agents (players). There are private and public sector players, both on the demand and supply side. The main players are public administration officers (European, national, regional), employers, unions, educational institutions and non-governmental (not-for-profit) organisations. Those players shape the rules of the game; however it is the state economic policy, which defines the actual rules of the game in the labour market.

The individuals (supply side) are the targets of programmes and policies financed by public funds (national and European). These programmes are focused on preparation (education) and adaptability (requalification, mobility, and lifelong learning), and ensure

socially acceptable conditions (benefits) for unemployed citizens who are in danger of being permanently excluded from the labour market.

There is also public support aimed at the demand side (employers). There are public employment agencies, which provide information about vacant jobs and programmes for employers. There are employment programmes aimed at people with disabilities, employers in insolvency, and other incentive programmes for employers.

In other words, the public sector uses so-called “passive” employment policies that cover all the supply-side subsidies and benefits. There are also so-called “active” employment policies, which consist of all kinds of policy instruments. The main instruments are retraining and requalification programmes, community work, socially beneficial jobs, sheltered workshops, and consulting services at labour offices. There are also other instruments, which provide all kinds of incentives (to start a new company) and support (to increase mobility) to applicants.

The labour market outcomes are influenced by all kinds of interwoven rules of the game. This includes structural economic policy, higher education policy, anti-cyclical economic policy, labour tax policy, trade regulations, labour safety and other labour regulations. These economic policies interact and simultaneously influence the demand and supply sides and the behaviour of all the labour market players. Comprehensive overviews of institutions that influence the Czech labour market are summarised in Tvrdoň (2008).

According to the Czech Ministry of Labour and Social Affairs, youth unemployment and the overall situation in the labour market is better than in the rest of the EU (MPSV, 2015). In comparison to other so called transitional economies, the Czech Republic has achieved similar employment numbers with regards to the economically active population to the situation in Germany, which by EU standards is considered to have a well-performing labour market (Bah & Brada, 2014). These EU standards are the target of critique from leading EU political parties. The European and Czech labour markets are considered to lack flexibility and the current “active and passive” instruments of employment policies are viewed as being inefficient.

## 2. Employment and Labour Market in the Czech Republic

According to economic theory the ability to get a job heavily depends on the quality of the individual level of human capital investment and subjective job preferences. Traditionally the wage, which is an outcome of a particular labour market, is influenced by qualifications, age, experience, health status, family background and shared values (Mincer, 1958). These are individual traits that in the Czech environment are heavily influenced by the dominance of public education. However, no recent studies have explicitly dealt with this issue in the Czech context.

Dill and Soo (2005) suggest that the quality of education should be compared through a system of league tables and a university ranking system in order to stimulate improvements. Privatisation in education also contributes to diversification, new partnerships, and provides incentives based on competition, which is not present in most publicly financed environments (Ball, 2009). However, the debate about the public-private divide in education is rather complicated because it is in general considered to be a non-rivalry, non-excludable, public good. In higher education, the situation is not as clear and some economists question the public good of university education, which is full of rivalry, exclusive and broadly speaking a private to “mixed” good. However, the nature of education as a public good is not the central issue of this paper and requires additional research.

Economic analysts are interested in particular rules of the game – economic policies. High taxation, generous welfare state, and other labour market rigidities can reduce motivation. The consequence is that some people choose to live on benefits (Flek & Večerník, 2005). It can and does increase the role of informal institutions (grey economy) and leads to tax evasion (Slemrod, 2007). It is suggested that these effects are present regardless of the economic level of the country (Gërkhani & Schram, 2006). The mobility of labour is influenced by a rigid and regulated housing market, which was the case in the Czech Republic. The current deregulation process in the housing market has been partially successful in bringing about change but the unwillingness to move for work due to social and cultural factors prevails (Viček, 2010).

In general, policies aimed at labour market flexibility can significantly improve labour market outcomes and economic growth (Kahn, 2012).

A minimum wage is a traditional tool which according to liberal classic economic theory cannot work. This policy produces so-called “unwillingly” unemployed individuals, which are unable to find a job for a wage, which is lower than the minimum wage. These individuals are subsequently forced to live on benefits and are not motivated to search for a job, or alternatively they participate in the grey economy (Wawrosz, Heissler, & Mach, 2012). The actual impact of the minimum wage in the Czech Republic is inconclusive (Pavelka, Skála, & Čadil, 2014). Another analysis shows that there were years when it was better not to have a minimum wage job because living on benefits provided more money and free time (Pavelka, 2012).

In the 1990s, employment policy that included all kinds of unemployment and social benefits did not resolve the issue of unemployment in the Czech labour market (Sirovátka & Mareš, 2006). On the whole, an active employment policy is considered more efficient than a passive one (Gupta & du Toit, 2009; Rašovec, 2014). This literature review is mostly based on papers dealing with real economic data. Qualitative institutional research is missing. This study provides an

insight into the actual experience of the major players under current policies (rules) in the regional labour markets. An analysis follows of the regions and their differences.

### 3. Socio-Economic Differences in the Analysed Regions

The Ústecký Region (UR) is located in the north-west part of the Czech Republic (CR). It is the fifth largest region in terms of the number of inhabitants (more than 820,000). In size, it is a small region with an above average population density. The Jihočeský Region (JR) is located in the south part of the Czech Republic. It is the seventh largest region in terms of the number of inhabitants (more than 630,000). In terms of size, it is the second largest region with a below average population density. During the last 20 years, the numbers of inhabitants in both regions have been growing (see Tab. 1). The GDP per capita in both regions is below average for the Czech Republic. The age structure has shifted dramatically. On average the population is ageing. In 2013, in both regions, the population over 65 years of age was larger than the population of 1-15 years of age. The population growth rate and gross migration rate is positive in both regions, however, more people are moving out of the Ústecký Region in comparison to the Jihočeský Region.

**Tab. 1:**

**Regional socioeconomic indicators – the Jihočeský Region, the Ústecký Region and the Czech Republic (1994-2013)**

Indicator	1994-2003			2004-2013		
	JR	UR	CR	JR	UR	CR
Average population (10 <sup>3</sup> )	626.1	824.3	10,271.8	633.1	828.0	10,398.6
Population density (inhabitants / km <sup>2</sup> )	62.3	154.6	130.2	63.0	155.2	131.9
Age index (1994, 2013)	65.7	59.9	69.6	116.0	105.1	115.7
Crude birth rate (‰)	9.2	9.8	9.1	10.4	10.8	10.6
Crude mortality rate (‰)	10.5	11.0	10.9	10.1	10.8	10.3
Infant mortality (‰)	5.8	7.9	5.4	2.7	4.9	3.0
Net migration (‰)	1.2	1.5	0.9	1.4	1.3	3.0
Average GDP per capita (10 <sup>3</sup> CZK)*	211.3	192.5	226.2	311.1	289.4	362.3
Average unemployment rate (%)	4.5	11.4	6.4	4.8	11.2	6.8

Source: Czech Statistical Office: Demographic Yearbook of Regions 2004-2013, Czech labour market - Time Series 1993-2013, Public Database - The population in the selected area - time series 1991-2014; own calculations

\* Average GDP in the first period covers years 1996-2003, CZK – local currency

The industrial structure of both regions differs substantially. The Jihočeský Region has favourable natural conditions, which means more people in the region are employed in agriculture, fishing and forestry (7.6% in JR, 4.5% in CR, and 3.5% in UR). The natural conditions in the Ústecký Region dictate that more people are employed in mining (4.0% in UR, 1.4% in CR). The share of employees in the electricity, gas and heat manufacturing

and distribution sectors is above the national average because of the thermal power plants in UR and the nuclear power plant Temelín in JR. In UR, employment in services such as transportation and warehousing is above average. In JR, the situation in services is different. People are employed in tourism because the region has many cultural points of interest and UNESCO listed sites.

**Tab. 2: The educational structure (%) – the Jihočeský Region, the Ústecký Region and the Czech Republic (1991, 2001, 2011)**

Educational level	Jihočeský Region			Ústecký Region			Czech Republic		
	1991	2001	2011	1991	2001	2011	1991	2001	2011
Basic, pre-primary	34.3	23.8	18.8	38.9	27.9	23.2	33.5	23.3	18.5
Secondary education without GCE	35.6	39.2	36.2	36.0	40.1	37.2	35.7	38.5	34.9
Secondary education with GCE	23.4	28.8	32.9	20.3	25.7	30.3	23.2	28.7	32.9
Tertiary education	6.4	7.9	11.6	4.4	5.5	8.4	7.2	9.0	13.2
Without education	0.4	0.4	0.5	0.5	0.8	1.0	0.3	0.4	0.6

Source: Czech Statistical Office: Předběžné výsledky sčítání lidu, domů a bytů – Česká republika a kraje – 2011; own calculations

The educational structure fundamentally changed in both regions and throughout the Czech Republic after 1989 (Tab. 2). The share of tertiary educated and secondary educated with GCE increased. The proportion of people with basic education significantly reduced. The educational structure has similar values in the Jihočeský Region as throughout the state, although this region still has a lower percentage

of people with tertiary education. Educational structure of the population is long-term very unfavourable in the Ústi region. Compared with the national average, there is a higher proportion of people aged 15 or over with no education or only basic education and of tertiary educated and secondary educated with GCE.

Between 1993 and 2014 the overall level of employment declined in the Jihočeský Region

**Tab. 3: Employment structure (%) in industry sectors – the Jihočeský Region, the Ústecký Region and the Czech Republic (1993, 2014)**

Industry sector	Jihočeský Region		Ústecký Region		Czech Republic	
	1993	2014	1993	2014	1993	2014
Mining and quarrying	0.4	0.2	7.2	1.7	2.6	0.7
Manufacturing	25.5	27.6	26.5	25.5	28.8	26.7
Electricity, gas, steam and air condit. supply	1.9	2.0	2.9	1.8	1.6	1.1
Water supply, sew., waste man., and rem. act.	0.8	0.9	1.0	1.2	0.8	1.1
Industry total	28.6	30.7	37.5	30.2	33.8	29.7

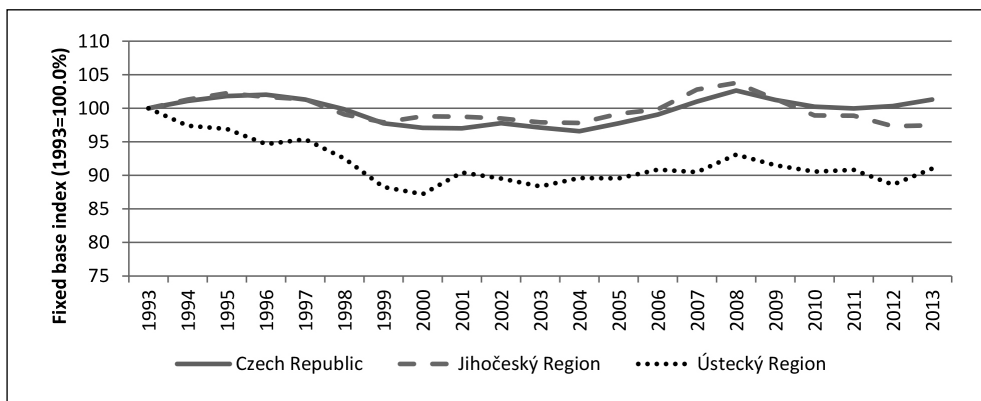
Source: Czech Statistical Office: Labour Market in the Czech Republic - Time Series – 1993-2014; own calculations

and the Ústecký Region, while in the whole country increased (Tab. 3). There was the drop of 2.5%, in the Jihočeský Region; the Ústecký Region recorded a significant decline - 8.3%. This stems from the structure of the industry, which was markedly different in both regions in the early 90s. In the Ústecký Region, mining and quarrying played an important role in the early 90s and. In 1993, it gave this sub-sector job for more than 7% of employed people there. In 2014, the share of this sector on employment was less than 2 percent in the Ústi region. In the reporting period, employment in the industry decreased by a significant 7.3 percentage points in the Ústecký Region. The Jihočeský Region showed an increase in industrial employment of 2.1 percentage points for the same period.

The reason was an increase in employment in manufacturing. It's almost unbelievable, but Jihočeský Region presented a higher share of employment in the industry sector than the Ústecký Region in 2014.

There are differences in the development of the employment rates in both regions (Fig. 1). In UR the employment rate fell to 87% (1993 = 100%) in 2000. In the years that followed it fluctuated around 90%. The developments in the Jihočeský Region were very similar to that of the national average. The economic crisis affected the Jihočeský Region more severely than the Ústecký Region. The decline in employment was lower, with even a slight increase in employment being observable in 2013.

**Fig. 1: Employment development in the Jihočeský Region and the Ústecký Region (1993-2013)**



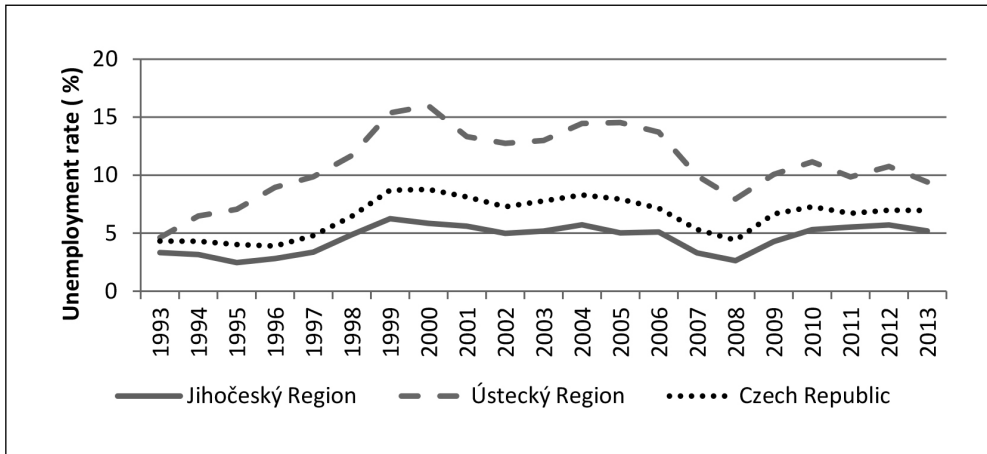
Source: Czech Statistical Office: Czech labour market - Time Series - 1993-2013

Substantive differences exist between the regions with regards to both the employment rate and unemployment rate (see Fig. 2). JR and almost all its districts belong to the group of regions with the lowest unemployment rates. In contrast, UR and its districts suffer from the highest unemployment rates and naturally is the target of national public support and EU development programmes. The unemployment rate in the CR and both regions was similar in 1993. The transformation process was based on structural changes to large industrial companies which as a consequence resulted in an increase in the rate of structural unemployment. The unemployment rate peaked in 2000 and the

difference in the rate between the two regions reached about 10% (Fig. 2).

The unemployment rate fluctuated between 2000 and 2004. Until the start of the economic crisis in 2008, the rate was decreasing and the differences between the two regions became smaller (about 5%) in comparison to the situation in 2000. This period after the so-called currency crisis which also hit the Czech economy was studied by Holátova and Řehoř (2006) and Toušek et al. (2005). They concluded that there were significant socio-economic differences between regions and that the key factors causing regional differences were the quality and activity of human capital.

**Fig. 2: Unemployment development in the Jihočeský Region and the Ústecký Region (1993-2013)**



Source: Czech Statistical Office: Czech labour market - Time Series - 1993-2013

After the beginning of the economic crisis, the unemployment rate started to rise in both regions. The developments between 2009 and 2014 suggest that the impact of the economic crisis was more severe in the JR. One of the explanations for this is that large scale public support and economic policies were targeted at UR which helped to significantly ease the negative effects of the economic crisis. The difference between the regions in terms of their unemployment rates was the lowest in 2013, but this does not compare well with the lowest difference in the rates which was achieved in 1993 (1.3%).

#### 4. Data and Methods

The institutional analysis was aimed at labour offices and their departments. The control group in our analysis was represented by a selection of private employment agencies and human resources (HR) departments of some of the largest employers in the region. We asked the respondents to fill in an electronic questionnaire (Appendix 1), which consisted of several employment policy questions. For the evaluation of a policy instrument, the Likert scale was used whereby 1 represented a highly beneficial instrument and 5 an inappropriate instrument.

The questionnaire was successfully sent to 290 officials in leading positions who

represent the institutional sphere of public employment policy in March 2015. The return rate was moderate (22%, 64 respondents). We believe that this was due to the fact that many employees were on leave and that some of the email addresses did not work. The control group consisted of 28 respondents (11.2% return rate, 250 private recruitment agencies or HR departments of large firms).

To test the hypotheses, we utilised parametric and non-parametric tests because the data was not always normally distributed. The standard unpaired t-test (Welch, 1947) would in "not normal" cases possibly provide biased results. The two-sample hypotheses were therefore tested using the Wilcoxon rank-sum test (Wilcoxon, 1945) which is an unmatched data equality test for two independent variables X1 (for example one regional group) and X2 (a selected public policy question number Q).

This rank-sum test is reflected in the Wilcoxon statistics of the single z-test, which tests the null hypothesis of equality on a sample of  $n$  observations. For this purpose, the probability of a Type I error was determined as  $\alpha = 5\%$  ( $p < 0.05$ ). The significant mean difference between the groups is used as a rough approximation of equality dissimilarities under the ceteris paribus condition with no allowance given for multiple variable interactions.

## 5. Hypotheses

This study is generally interested in the differences in evaluation of employment policies by the major players in the regional markets. The first hypothesis deals with significant differences in the perception of labour market policies (rules of the game) between the public and private sectors. The second hypothesis deals with regional differences in the perception of labour market policies between the Ústecký Region and the Jihočeský Region. The results will be compared in respect to the actual socio-economic differences.

The selection of the regions is predominately based on high regional differences in unemployment rates, GDP per capita and educational structure. In other words there is a higher share of low educated inhabitants, lower GDP per capita and higher unemployment in the Ústecký Region). Current regional analysis stresses the role of the socio-economic differences based on the "The North/South" divide, which is typical for countries like England, Italy and Spain (González, 2011). Although the situation is more complicated in the Czech Republic and more research is needed, but this paper also contributes to this debate. Southern regions (NUTS 2 regions Jihovýchod and Jihozápad) have in fact (CZSO 2015) on average higher GDP per capita than their counterpart northern regions (NUTS 2 regions Severovýchod and Severozápad).

Our hypotheses testing are heavily dependent on the context of the economic crisis of 2008. Average unemployed person's annual costs were 51,886 CZK between 2005 and 2014 (Appendix 2). The average costs (active, passive and other employment market policies expenditures per unemployed person) increased substantially in 2008 (68,229 CZK) and 2009 (65,684 CZK). Although the total average costs fluctuated around the average value between 2010 and 2013, the active employment market policy expenditures were lower than the average value (15,126 CZK) in 2009 and between 2011 and 2013 (see Appendix 2).

In the case of Ústecký and Jihočeský Regions, all kind of employment policies were introduced between 2005 and 2015. There are some differences (mobility programmes in Jihočeský Region) in their policy aims but the general focus is the same (long-term unemployment reduction, integration etc.) In

the questionnaire, the respondents were asked about rather traditional active employment market policies (AEMPs). There were, however, more programmes based on EU funds, which were introduced to complement and make AEMPs more effective between 2007 and 2013. The Human Resources and Employment Operational Programme was targeted at traditional AEMPs but also on individual multi-objective projects (for example sheltered housing with a subsequent business project). Those programmes are not considered directly in our questionnaire but were mentioned by our respondents as very innovative and possibly more long-term effective than traditional EMPs. The other programmes like support for absolvents and investment incentives were discontinued but they were also used by the regional labour offices.

## 6. Results

The statistics for employment policy (see Tab. 2) show only two normally distributed results in the public sphere. On average, passive policy is perceived to be the worst policy instrument by responsible head officers and employment policy workers. In contrast, the instrument oriented towards the employment of persons with disabilities scored very highly. The rest of the analysed instruments have skewed distributions and a high variability of responses. We must assume that there are therefore differences between the groups of respondents.

The statistics also show that there are no significant differences between the public officers in both regions. This result suggests that the perceptions of current active employment policy instruments are independent of regional employment and unemployment rates. The average effectiveness of active employment policy instruments is below the average for the Likert scale (2.5), which suggests a high level of scepticism towards the appropriateness and efficiency of the instruments. On average, the best, and not as badly perceived instrument, is the public support for socially useful jobs.

Retraining is perceived by our selected sample of private recruitment agencies and HR departments of large firms to be (by +0.83% points) a better instrument ( $z = 3.42$ ;  $n = 92$ ) than the officers' average (2.06%). The only conformity among the public and private sphere is in the area of passive employment policy. All the other instruments were perceived

by the private sector to be better (see Tab. 4). This suggests that the private sector perception is biased. They do not see all the unsuccessfully

retrained unemployed like their counterparts in labour offices do.

**Tab. 4: Employment policy evaluation – private sector differences**

Labour economic policy instrument	Std. deviation Normality (*) Mean (in %) (Officers = 64)		Score difference Private sector (in % points) (Agents = 28)	Statistics (N = 92)	
Retraining	0.794		2.06%	+0.83%	z = 3.42
Community work	1.035		1.77%	+1.02%	z = 4.08
Socially useful job	0.833		1.56%	+1.15%	z = 4.92
Counselling	0.873		2.00%	+1.25%	z = 4.76
Persons with disabilities	0.865	*	1.83%	+0.60%	z = 2.39
Passive policy	0.895	*	2.73%		

Source: own

**Tab. 5: Characteristics of an unemployed person – summary of statistics and statistical differences between public (officers) and private sector (HR departments and agencies)**

Characteristics of an unemployed person	Std. deviation Normality (*) Mean (in %) (Officers = 64)		Score difference Private sector (in % points) (Agents = 28)	Statistics (N = 92)	
Passive attitude	0.488	*	62.50%	-30.80%	z = -2.70
Only prim. education	0.495	*	59.38%		
No experience	0.479		34.38%		
Travel to work issues	0.473	*	32.81%		
Older person (55+)	0.453		28.13%		
Racial minority	0.380		17.19%	-17.19%	z = -2.33
Disabled person	0.350		14.06%		
Next education issues	0.333		12.50%		
No foreign languages	0.315		10.94%	+31.92%	z = 3.46
Psychological issues	0.244	*	6.25%		
Adolescents	0.244	*	6.25%		
Other issues	0.244	*	6.25%		
Physical issues	0.213		4.69%		
Woman	0.175		3.13%		
University graduate	0.125		1.56%	+12.72%	z = 2.46
Only sec. education	0.000		0.00%	+7.14%	z = 2.15

Source: Questionnaire Note: Binary (Yes/No) questions

Our next set of questions was aimed at the average characteristics of an unemployed person. There are significant differences between the regions in their perceptions of the public sector. In the Ústecký Region, the average unemployed are more likely (+0.48 p.p.) to have only primary education ( $z = 3.824$ ;  $n = 64$ ) and (+0.26 p.p.) no previous experience. On the other hand in Jihočeský Region the average unemployed person is more likely (+0.35 p.p.) to travel to work than in the Ústecký Region ( $z = -2.941$ ;  $n = 64$ ). No other differences between the regions were found. In other words, the rest of the perceptions are regionally independent and the characteristics are similar.

The comparison of the characteristics of an average unemployed person between the public and private sectors shows some substantial differences (see Tab. 5). As is shown, an appropriate education is a key distinction. The private sector is more concerned about the

quality of the secondary and tertiary education, and language skills than the passivity or race of the average unemployed person.

Once again the perception of the private sector may be biased. Labour office workers come into contact with the long-term unemployed and troubled individuals who are excluded and not motivated to actively solve their difficult social situation. Officers are therefore more likely to place greater emphasis on the passive attitude of an unemployed person.

Table 6 summarizes the average values for labour market issues of the public sector and the differences between them and recruitment agencies. The absence of job vacancies and high social benefits are accentuated by the officers in comparison with the private recruitment agencies. Here again, the labour office workers are in direct contact with the unemployed and see the combination of a passive attitude, primary education and no work experience (see Tab. 3). These factors in

**Tab. 6: Labour market issues – summary of statistics and statistical differences between public (officers) and private sector (HR departments and agencies)**

Labour market issues	Std. deviation		Score difference Private sector (in % points) (Agents = 28)	Statistics (N = 92)
	Normality (*)	Mean (in %) (Officers = 64)		
High social benefits	0.366	84.38%	-34.38%	$z = -3.44$
Secondary school graduates	0.492	*	39.06%	
No job vacancies	0.484	*	35.94%	$z = -2.09$
University graduates	0.393		18.75%	
Unemployed qualification	0.350		14.06%	$z = 3.64$
Labour taxation	0.315		10.94%	$z = 2.10$
Bad infrastructure	0.315		10.94%	
Other issues	0.294		9.38%	
Layoffs (Structural)	0.270		7.81%	
Layoffs (Economic cycle)	0.270		7.81%	
Racial discrimination	0.213		4.69%	
Labour regulation	0.175		3.13%	
Female discrimination	0.175		3.13%	
Start-up credit issues	0.125		1.56%	
High unemployment benefits	0.000		+21.43%	$z = 3.81$
High layoff costs	0.000		+7.14%	$z = 2.15$

Data: Questionnaire Note: Binary (Yes/No) questions

combination with high social benefits and no suitable job vacancies do little to motivate an unemployed person to find a job.

In contrast, the private sector places emphasis on the qualifications of the unemployed and their high unemployment benefits. The emphasis is also the costs associated with layoffs, and labour taxation. It is clear that these factors are all connected to the job applicants. The stress is on the level of education and experience, which is seen as a market problem (see Tab. 4) and the most problematic characteristic of an unemployed person (see Tab. 3).

There are some significant regional public sector differences with regard to the perception of the market situation. The results interestingly show that there are cause-like factors like the level of business taxation ( $z = -2.55$ ;  $n = 64$ ;  $+20.45$  p.p.), appropriateness of university education ( $z = -2.67$ ;  $n = 64$ ;  $+26.72$  p.p.), appropriateness of secondary education ( $z = -1.99$ ;  $n = 64$ ;  $+24.90$  p.p.) which are perceived to be of great importance in the Jihočeský Region (JR) labour market by public sector workers.

In contrast, the emphasis in the Ústecký Region is on the absence of job vacancies ( $z = 2.81$ ;  $n = 64$ ;  $+34.62$  p.p.), which is more a long term consequence-like factor of the regional labour market. In other words, the situation in the Ústecký Region is due to the lack of job vacancies for all the unemployed and unemployable. With regards to other factors like the level of infrastructure or discrimination there are no regional differences.

## Conclusion

Active employment policy instruments and passive policy instruments are not perceived by major institutional players as suitable nor very effective in the Czech regional labour markets. Labour office workers are even more sceptical than private recruitment agencies because of their first-hand experience with the passive attitude of unemployed people. Those people that are usually unemployed have no previous job experience, completed only primary education and are not willing to travel to work. The private recruitment agencies stress the need for better qualifications and skills. Because employment policy is not perceived as very efficient the causes need to be addressed. The pressing problem is the quality of education

and generous social benefits which makes employment policy inefficient for the least skilled unemployed.

Despite substantial socio-economic regional differences (education level, GDP per capita) in both analysed regions, the evaluation of all the traditional active employment policy instruments is poor with no significant differences between the regions. In the more problematic Ústecký Region the emphasis is on basic issues such as the lack of education and experience of the unemployed. The labour market issues here are the result of long-term consequence-like factors like the lack of job vacancies. The situation in the Jihočeský Region is better. The emphasis here is on mobility. The market issues here are more cause-like factors like the appropriateness of secondary and tertiary education and labour costs.

Our results are to some extent similar to those in previous research. An example of this is the combined issue of the lack of motivation and high social benefits. There are however some differences. On average, passive policy instruments are perceived to be more suitable and effective than the current array of active policy instruments. Deeper analysis shows that social benefits and unemployment benefits are still perceived (in particular by labour office workers) to be bad economic policy.

From our results it is clear that poor institutional infrastructure in secondary and tertiary education causes bad investment in human capital and subsequent disequilibrium in regional labour markets. All the institutional players stress the need for appropriate education, which is problematic. Radical changes were also introduced in education after the fall of the iron curtain in 1989. There was a need to increase the number of university graduates. This marked the start of the so-called "massification" of higher education in the Czech Republic. Studying at universities ceased to be the privilege of gifted students (Večerek et. al., 2010).

The Czech Higher Education Act regulates the framework in which universities operate. The ideal solution for further development was described in the International Competitiveness Strategy of the Czech Republic for the period 2012-2020 (Government of the Czech Republic, 2011). The Strategy highlights the importance of high quality teaching, the role of teachers, and put forward proposals for the better

organization and financing of the educational sector. Unfortunately, nothing has changed and the old “massification” process still leads to “quantity over quality” despite all the legislators’ wishes. A large proportion of education funding is allocated based on the number of students that attend an educational establishment and the quality indicators of universities do not reflect the actual quality.

Respondents from the public sector were given the opportunity in their responses to introduce an employment policy instrument, which they believed would be more suitable than the current active policy instruments. Many respondents even from private sector stated that regional programmes aimed at young people who want to gain some work experience were beneficial. Also regional specific qualification/education programmes were considered to be beneficial. The EURES programmes and The Human Resources and Employment Operational Programmes were also highlighted. These programmes aim to be individual, long-term oriented, multi-objective and find unemployed people jobs abroad and/or in cross-border regions. On the whole, private sector respondents believe that educational reform is necessary and that social benefits should not be so generous or that community work should be required in return.

This paper also contributed to the issue of “The North/South” divide. The perceptions of effectiveness of standard employment policy tools are the same in both regions. It is possible that the past political decisions and inefficient social and economic policy in Ústecký Region led to a slower development; however, more research is needed in this area.

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**1. Please choose three of the most urgent problems in the labour market in the Ústecký Region / Jihočeský Region at the present time.**

We are interested in factors affecting the creation of new jobs and the demand for them. We are interested in your experience and points of view. If the most acute problems are not identified in this form, please use the field "other" to make them known.

- Unemployed lack sufficient qualifications
- Dismissal due to a drop in demand (no new contract)
- The structure of the subjects taught at secondary school does not meet the needs of the labour market
- The high cost of dismissing employees
- Poor infrastructure in the region
- The structure of the subjects taught at university does not meet the needs of the labour market
- Racial discrimination in the labour market
- Layoffs due to changes in the structure of the sector (industries are technologically obsolete)
- High unemployment benefits
- High taxes and premiums for social and health insurance
- Difficult to obtain a loan to start-up or develop a business
- Strong regulation of labour law relations
- Excessive influence of trade unions
- Lack of jobs
- Social benefits not conducive to a return to work
- Discrimination against women in the labour market
- Minimum wage is too high
- Other: &

**2. Please select the three items that best characterize the typical job seeker in the Ústecký Region / Jihočeský Region. \***

We are interested in your experience and points of view. If you feel that an important characteristic is missing from the list, please use the field "other" to make it known.

- Unwillingness to follow further education
- Racial minority
- Passive approach (to search for employment, employment programmes)
- The individual only completed elementary school
- Impaired physical health (e.g. lifestyle diseases)
- Female
- Unwillingness to retrain
- Person with disability
- Does not speak a/any foreign language(s)
- Impaired psychological health condition (e.g. stress, anxiety, difficulty in communicating, etc.)
- Cultural minority
- Religious minority
- College graduate
- Over 55 years of age
- Not willing to travel for work
- Minors (under 18 years)
- High school graduate
- Lack of experience (or no previous job)
- Sexual minority
- Other: &

**3. Please indicate the three positions that lack the most candidates/qualifications which candidates lack in your region at present.**

1. position/qualifications lacking candidates:.....
2. position/qualifications lacking candidates:.....
3. position/qualifications lacking candidates:.....

**4. State employment policy – ratings**

On a scale of 1 to 5 rate the current employment policy instruments in the Ústecký Region and their impact on employment levels.

1 - very helpful, 2 - beneficial, 3 - neutral, 4 - rather inconvenient, 5 - inappropriate

**4.1 Job retraining (through Labour Office)\***

	1	2	3	4	5	
Very helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inappropriate

**4.2 Public works (PW)\***

	1	2	3	4	5	
Very helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inappropriate

**4.3 Socially beneficial jobs (SBJ)\***

	1	2	3	4	5	
Very helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inappropriate

**4.4 Consultancy (at Labour Offices)\***

	1	2	3	4	5	
Very helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inappropriate

**4.5 Support for the employment of persons with disabilities\***

	1	2	3	4	5	
Very helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inappropriate

**4.6 Unemployment benefits (cash assistance, passive employment policy)\***

	1	2	3	4	5	
Very helpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inappropriate

**4.7 If you wish to evaluate another instrument (e.g. European programme, a form of support not listed above, etc.) please use the following field (optional).**

[text-area]

5. Please indicate any instrument of employment policy you would suggest should be introduced (or extended, modified, upgraded) in your region or in the Czech Republic (optional).

[text-area]

For any additional information on this issue which you wish to share please use the following field (optional).

[text-area]

If you wish to receive the results of this study electronically, please enter your e-mail address in the following field (optional).

[text-area]

To be listed in the introduction of this study as our collaborator, please provide your name, title(s) and the institution which you represent in the following field (optional).

Name, surname, title, institution (e.g. Jana, Nebeská, Ing., Ph.D., City of Ústí nad Labem)

[text-area]

**Appendix 2:**

**Employment market policies measures. Summary of passive (PEMP) and active (AEMP) employment market policies expenditures per one unemployed person in the Czech Republic between 2005 and 2014**

Year	Unemployed (thousands)	PEMP	AEMP	EMP
2005	410.2	17,181 CZK	10,172 CZK	29,510 CZK
2006	371.3	19,681 CZK	14,279 CZK	38,254 CZK
2007	276.3	25,389 CZK	20,534 CZK	54,548 CZK
2008	229.8	30,957 CZK	26,682 CZK	68,229 CZK
2009	352.2	42,811 CZK	14,067 CZK	65,684 CZK
2010	383.7	34,810 CZK	16,088 CZK	59,265 CZK
2011	350.6	29,521 CZK	10,887 CZK	50,881 CZK
2012	366.9	23,875 CZK	7,075 CZK	41,634 CZK
2013	368.9	26,223 CZK	11,616 CZK	48,691 CZK
2014	323.6	28,677 CZK	19,861 CZK	62,169 CZK
<b>Mean</b>	<b>343.3</b>	<b>27,913 CZK</b>	<b>15,126 CZK</b>	<b>51,886 CZK</b>

Source: Ministry of Labour and Social Affairs, Čerpání finančních prostředků na státní politiku zaměstnanosti v období 2003-2014. Note: EMP aggregate consists of PEMP, AEMP and other EMP tools expenditures.

## Abstract

**INSTITUTIONAL ANALYSIS OF THE CONTEMPORARY REGIONAL LABOUR MARKET IN THE CZECH REPUBLIC****Václav Novák, Marek Vokoun, František Stellner, Marek Vochozka**

*Public institutions are key players in the regional labour markets in the Czech Republic. Their activities are constrained by economic policies, which are aimed at increasing employment and the efficiency of the labour markets. Our analysis uses a questionnaire to collect data from the institutions and evaluate their perception of the regional labour market. The results suggest that active employment policy instruments and passive policy instruments are perceived as inefficient and inappropriate. The unemployed usually have no previous job experience, completed only primary education and are not willing to travel to work. The pressing problem is the quality of education and the generous social benefits that makes employment policy inefficient for the least skilled unemployed. Despite substantial regional socio-economic differences in both analysed regions (the Ústecký Region and the Jihočeský Region), there are no significant differences in the poor evaluation of all the traditional active employment policy instruments. In the more problematic Ústecký Region the emphasis is put on basic issues such as the lack of education and experience of the unemployed. The local labour market issues are dictated by long-term factors such as the lack of job vacancies. In the Jihočeský Region the situation is better. The issue is more one of mobility. The market issues here are more related to the appropriateness of secondary and tertiary education and labour costs. To increase the efficiency of employment policies we recommend improvements to the institutional infrastructure in higher education, which should be oriented towards investment in the quality of human capital.*

**Key Words:** Institutions, labour market, economic policy, education.

**JEL Classification:** E2, J4, J6.

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# ON THE GRAVITY EQUATION OF TRADE: A CASE OF GERMANY

*Jiří Mazurek*

## Introduction

The gravity model (or equation) of international trade is an economic analogy to Newton's Law of gravity. The economic version of this law assumes that international bilateral trade is directly proportional to 'sizes' of trading economies, and indirectly proportional to their distance. Gravity was introduced into economic theory by Tinbergen (1962), and later this pioneer work was followed by many other studies, see e.g. Anderson (1979; 2010), Bergstrand (1985), Deardoff (1998), Anderson and van Wincoop (2003), Helpman et al. (2008), or Bergstrand and Egger (2011). A concise review of gravity approach can be found e.g. in Anderson (2010) or Salvatici (2014).

Theoretical explanation of the gravity equation for aggregated or disaggregated trade can be found e.g. in Anderson (1979) or Chaney (2011). Trade in a real world is influenced not only by economic size and distance, but also by trade 'frictions' (trade costs or trade barriers) such as borders among countries, a different language and currency, colonial ties, free trade agreements, etc., these additional factors were incorporated into gravity models as well, see e.g. Deardoff (1998), Baier and Bergstrand (2009), Anderson (2010), Bergstrand and Egger (2011) or Salvatici (2014).

Gravity models theoretically explain the role of an economic size in bilateral trade flows at any scale (countries, regions, etc.); though the role of a distance is not well understood yet, see Disdier and Head (2008). Moreover, gravity applies to other socio-economic phenomena such as migration or direct foreign investments. Generally, according to Anderson (1979) or Chaney (2011), gravity models of trade can be considered the most successful empirical tools in economics.

The empirical evidence for gravity models is rather strong, as various studies report the coefficient of determination between 0.6 and

0.8. A meta-analysis of 1,467 estimates in 103 papers provided by Disdier and Head (2008) found  $\alpha \approx \beta \approx \gamma \approx 1$  in relation (1) (see below). Remarkably, the coefficient  $\gamma$  has been stable (and close to one) for more than one century. A theoretical explanation of this result can be found e.g. in Chaney (2011).

Gravity model estimations are usually carried out for cross-sectional or panel data. However, countries all over the world form a very heterogeneous sample. There are countries with centuries of industrial tradition and export (the USA, the UK, Germany, etc.), countries that export aggressively in the last decades (Japan, Korea, China, etc.), and also a large number of developing countries whose exports are limited to articles such as bananas or cocoa beans. Moreover, a trade is a product of particular human action, and people living under different conditions and regimes simply cannot act in a similar way. Therefore, one should not expect international trade to be universally described or explained by one equation, model or a formula. To mix such different trade partners while looking for a general pattern (as in physics) makes little sense in economics. Hence, a more sensible approach might be the use of more homogenous sets of countries, such as developed (OECD) countries, Latin-American countries, etc.

This aforementioned approach is followed in this paper, where the gravity equation is used to model aggregate export's shares of one country (Germany) to its trading partners (importing countries).

As the gravity model is usually formulated in a multiplicative form, it is log-transformed into a linear equation and coefficients of a model are estimated by an appropriate regression method. A problem of a correct estimation of a gravity model is a broadly discussed issue, see e.g. Heckman (1979), Silva and Tenreyro (2006),

Martínez-Zarzoso et al. (2007), Helpman et al. (2008), Baier and Bergstrand (2009), Egger (2010), Herrera and Baleix (2010) or Herrera (2013). However, there is not a consensus on what the most appropriate regression estimation is in the case when assumptions of Ordinary Least Squares (OLS) method are violated, in particular, when a significant heteroscedasticity is present. Under such circumstances the Pseudo Poisson Maximum Likelihood (PPML) method, the Nonlinear Least Squares (NLS) method or the Feasible Generalized Least Squares (FGLS) methods were proposed by Silva and Tenreiro (2006) or Martínez-Zarzoso et al. (2007). Nevertheless, if assumptions of OLS are satisfied, it is the BLUE (Best Linear Unbiased Estimator) method.

The aim of the article is to examine how the aggregated gravity models fit the latest export data for Germany both without and with trade frictions. Germany was selected for this study because it is the 3<sup>rd</sup> largest world exporter (behind the USA and China), and it ranks among the most developed countries of the world. It is suitably located in the middle of the continent surrounded by many trading partners in different distances; and last, but not least, the data for Germany can be considered accurate and reliable.

The paper is organized as follows: in section 1 Germany's export is briefly discussed, in section 2 the data is described, in sections 3 and 4 aggregate gravity models without and with frictions are presented along with their results. Conclusions follow at the end of the article.

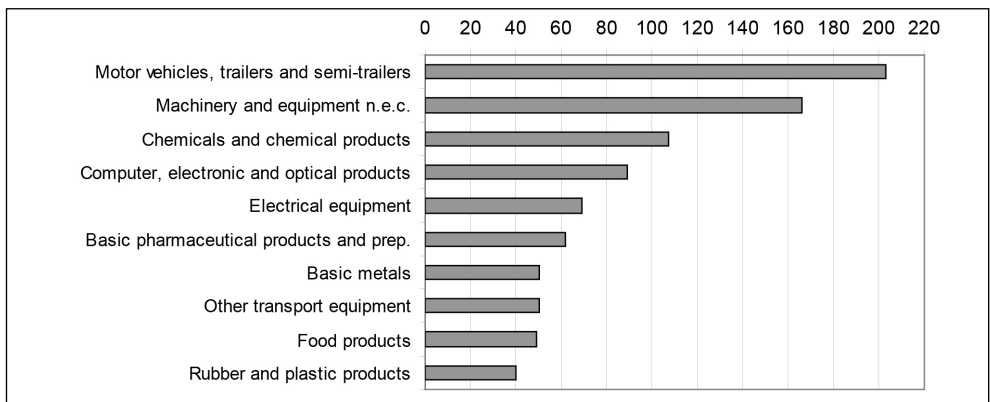
## 1. Germany's Export

Germany belongs among countries with a positive balance of international trade in the long term. In 2014, the balance (export minus import) reached 217 billion Euros according to Statistisches Bundesamt (2015b). Commodity structure of export is rather stable in the last decade. The most important export items are transportation (cars, car parts, engines and aerial technology), instruments of electrical engineering, telecommunications technology, office technology and machinery; see Statistisches Bundesamt (2015a). Figure 1 provides more detailed commodity structure of export in 2014.

The most important trade partners of Germany are France, USA, UK, Netherlands and China (see also Appendix A). In 2014, 58% of Germany's export went to EU, 17% to Asia, 12% to Americas, 10% to non-EU European countries, 2% to Africa and the rest (0.3%) to Australia and Oceania according to Statistisches Bundesamt (2015b).

Germany is a federal parliamentary republic consisting of 16 constituent states. In 2014, the strongest exporting states were Baden-Württemberg (16% of total Germany's export), North Rhine-Westphalia (15.9%), Bavaria (14.9%) and Lower Saxony (6.9%). Around 85% of export was a completed production, 5% semi-finished production, and around 1% accounted for raw material. More detailed data including a structure of export by individual states can be found in Statistisches Bundesamt (2015b).

**Fig. 1: The commodity structure of Germany export in 2014 (in billion Euros)**



Source: Statistisches Bundesamt (2015a)

## 2. Method and Data

Germany's export is examined via aggregate gravity equations with and without frictions. These equations (models) are introduced and described in detail in the following two sections. As gravity equations have a multiplicative form, they were linearized by the logarithmic transformation. Then, linear regression was performed by the most suitable estimation method.

For the empirical investigation the following data was used:

- Importing partners' shares (in %) of Germany's export for the year 2013 were obtained from Statistisches Bundesamt (2014). The data is provided in the form of a ranking of trading partners in the descending order. For this study the list of all countries was truncated and includes 66 main partners (from France to Qatar) with an individual share of import from Germany at least equal to 0.10%, as the relative error of values lower than 0.10% would be inappropriately high (see a discussion at the end of section 4). These 66 countries comprise 97.6% of Germany's export.
- Distances between Germany and importing countries (in kilometers) were obtained from a distance calculator at Timeanddate (2013). The distance between two countries was defined as an air distance between their capital cities.
- GDP (PPP) in billions USD of importing countries were retrieved from the International Monetary Fund (2013).
- Other countries' data include their currency, a membership to Schengen area and an existence of joint borders with Germany.

The dependent variable in the models was importing partners' shares (in %), other variables were considered independent. All data is provided in Appendix A. It should be noted that export shares and GDP (PPP in billion dollars) could be a subject of later revisions.

## 3. Frictionless Gravity Model, Results and Discussion

The standard gravity model (equation) of aggregate international trade usually takes the following form (Chaney, 2011):

$$T_{ij} = k \frac{GDP_i^\alpha GDP_j^\beta}{d_{ij}^\gamma}, \quad (1)$$

where  $T_{ij}$  is a trade from a country  $i$  to a country  $j$ ,  $GDP_i$  denotes gross domestic product,  $k$  is a positive coefficient, and  $d_{ij}$  is a geographic distance of both countries.

Anderson (2010) assumes that supply  $Y_i$  of a country  $i$  is attracted by a demand  $E_j$  of a country  $j$ , where  $d_{ij}$  denotes a distance of both countries, and proposes the following frictionless and aggregate gravity model of trade:

$$T_{ij} = \frac{Y_i E_j}{d_{ij}^2} \quad (2)$$

Also, in some alternative gravity models an income per capita (along with a population) of countries is used instead of supply and demand, and an error term is added on the right hand side of equations; see Anderson (1979):

$$M_{ij} = \alpha Y_i^\beta Y_j^\gamma N_i^\xi N_j^\epsilon d_{ij}^\mu U_{ij} \quad (3)$$

In (3)  $M_{ij}$  is the dollar flow of a given good from a country  $i$  to a country  $j$ ,  $Y_i$  and  $Y_j$  are incomes in both countries,  $N_i$  and  $N_j$  are their populations, and  $U_{ij}$  is a log-normally distributed error term with  $E(\ln U_{ij}) = 0$ .

In the last decades, more sophisticated models for disaggregated goods and with trade frictions were developed, see e.g. Anderson (2010) or Salvatici (2014).

In this paper the following aggregate frictionless gravity model for Germany's export shares is considered:

$$E_i = k \frac{GDP_i^\alpha}{DIST_i^\beta} \quad (4)$$

In (4)  $E_i$  denotes a share of Germany's export (in %) to a country  $i$ ,  $GDP_i$  is a gross domestic product of an importing country  $i$ ,  $DIST_i$  is a distance between country  $i$  and Germany, and  $\alpha$ ,  $\beta$ , and  $k$  are coefficients.

Relation (4) simply states that an export rises when an importing country is closer and/or richer. It should be noted that if absolute values of exports (e.g. in billions of USD) were considered in (4) instead of relative exports, then only the coefficient  $k$  would change.

For the regression analysis the relation (4) is reformulated in the following way:

$$E_j = k \cdot GDP_j^\alpha \cdot DIST_j^\beta \quad (5)$$

Gravity equation is transformed logarithmically (all variables are positive) which yields:

$$\ln E_j = \ln k + \alpha \cdot \ln GDP_j + \beta \ln DIST_j \quad (6)$$

The correlation matrix of variables in the model (6) is shown in Table 1. As it can be seen, correlation coefficients were not particularly high. Multicollinearity in the model (6) was examined via the Variance Inflation Factor (*VIF*),  $VIF_i = 1 / (1 - R_i^2)$ , where  $R_i^2$  is the proportion of variance in the *i*-th independent variable associated with other independent variables in a model, see O'Brian (2007). A rule of thumb states that for values of *VIF* larger than 10 multicollinearity of a model can be considered a serious problem. In the model (6) *VIF* of both explanatory variables was only around 1.3.

For the regression model (6) the data from Appendix A was used. The regression was performed via statistical software Gretl. Residuals were examined for exogeneity, normality and heteroscedasticity. All assumptions of OLS were satisfied with an exception of heteroscedasticity associated with the logarithm of GDP, where the null hypothesis (homoscedasticity) could be rejected by White's test at  $p = 0.04$  level. Therefore, Gretl's built-in OLS with the corrected heteroscedasticity method (which incorporates weighted least squares method) was used for the estimation. Results are reported in Table 2.

As it can be seen from Table 2, both regressors (logs of GDP and distance) were found significant at 0.01 level. As expected, regression coefficient for logarithm of distance is negative, and the coefficient for logarithm of GDP is positive, both coefficients are close to 1, which is in accord with other studies' findings. The adjusted coefficient of determination  $R^2 = 0.742$ , which is within a range of 0.6-0.8 was found in other similar studies as well.

**Tab. 1: The correlation matrix of variables from the model (6)**

	Ln(export)	Ln(Dist)	Ln(GDP)
Ln(export)	1	-0.291	0.525
Ln(Dist)		1	0.506
Ln(GDP)			1

Source: own

**Tab. 2: The frictionless gravity model – estimation results**

Regressor/method	OLS with c. h.
Const.	1.030 (0.554)*
Ln(Dist)	-0.903 (0.081)***
Ln(GDP)	0.896 (0.071)***
No. of observ.	66

Source: own

Notes: Standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**4. Gravity Model with Frictions, Results and Discussion**

Frictions of any kind (borders, a different language or currency, colonial ties, legislative, culture, religion, etc.), which influence real trade, can be incorporated into the gravity models as well. In this paper the following trade frictions as explanatory variables were examined:

- *Adjacency (A)*: the existence of national borders is considered one of the most important frictions in international trade. According to Anderson (2010), cross-border trade is typically reduced by a factor of 1/20 to 1/3 to its potential value. However, when a trade is carried out between countries without common border, it is reduced even more significantly.
- *Currency (C)*: different currency might diminish trade volumes due to exchange rates uncertainty; it may require additional transaction costs as well.
- *Location in the Schengen area (LISA)*: the Schengen area, established in 1995, abolished internal border controls and allowed free transfer of people within the area. This could affect trade volumes within the Schengen favorably.

All these trade friction variables are dummy (binary) variables with values 0 or 1, see Table 3. Also several other trade frictions were considered at the beginning of the study, such as democracy index of importing countries, length of common borders with Germany, geographic location of importing countries (not just their distance), or the fact whether transportation of goods is managed on a land or a sea, but preliminary results showed these variables were not statistically significant in the examined models, or were highly correlated with other independent variables, so they were eliminated from the model. Nevertheless, though only three variables associated with trade frictions were left in the model, its explanatory power was very high (see results at the end of this section).

The friction gravity model has the following form:

$$E_i(\%) = k \cdot GDP_i^\alpha \cdot DIST_i^\beta \cdot EXP(C_i^\gamma \cdot A_i^\delta \cdot LISA_i^\eta) \tag{7}$$

Log-transform of (7) yields:

$$\ln(E_i) = \ln k + \alpha \ln GDP_i + \beta \ln DIST_i + \gamma C_i + \delta A_i + \eta LISA_i \tag{8}$$

**Tab. 3: Selected trade frictions**

Trade friction	Acronym	Values
The same currency	C	yes: 0, no: 1
Shared borders with Germany	A	yes: 0, no: 1
Location in the Schengen area	LISA	yes: 0, no: 1

Source: own

The correlation matrix of all regressors in (8) is provided in Table 4. Variance Inflation Factor (*VIF*) for all explanatory variables was found lower than 4, with a maximum value of 3.24 for LISA. Therefore, multicollinearity of the model (8) did not constitute a problem.

Again, assumptions regarding the use of OLS were examined, with the result OLS is an appropriate estimation method with an exception of heteroscedasticity of  $\ln(\text{GDP})$ , so OLS with corrected heteroscedasticity in Gretl was performed again. Estimation results are shown in Table 5.

All variables associated with trade frictions were found statistically significant, though only adjacency was found statistically significant at 0.01 level. Moreover, regression coefficients of all friction variables were found negative as expected. According to coefficients' values, the most important trade friction is adjacency – countries not bordering with Germany import significantly less (by a factor of 1.6) than Germany's neighbors. Adjusted coefficient of determination for the model is very high,  $R^2 = 0.92$ , which indicates the model is appropriate and possess high explanation power.

**Tab. 4: Correlation of explanatory variables in the model (8)**

	Ln(DIST)	Ln(GDP)	A	C	LISA
Ln(DIST)	1	0.506	0.545	0.493	0.726
Ln(GDP)		1	0.077	0.239	0.364
A			1	0.334	0.562
C				1	0.655
LISA					1

Source: own

**Tab. 5: Estimation results of the model (8)**

Regressors	OLS with c. h.
const.	0.416 (0.494)
Ln(Dist)	-0.695 (0.088)***
Ln(GDP)	0.877 (0.040)***
A	-0.495 (0.135)***
C	-0.351 (0.135)**
LISA	-0.328 (0.171)*
No. of observ.	66

Source: own

Notes: Standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Arguably, the most important determinants of export volumes (or shares) are distance between trading countries and a value of GDP of importing countries (countries' wealth). However, when export is low, influence of other factors may be not negligible. For example, one large government or private contract (such as opening of Bosch's subsidiary in Kenya during 2014), may change the export data substantially. This can be easily illustrated by the Statistische Bundesamt (2013; 2014) data on Germany's exports from 2012 and 2013. The change in export volumes between years 2012 and 2013 for the top ten importers from Germany (from France to Belgium) was about 2% on average, but for countries ranked from the 101<sup>th</sup> to the 110<sup>th</sup> place (from El Salvador to Zambia) this year-to-year change amounted to 46% on average. A question arises, whether such data can be considered more than just a noise.

In this study only the data for top 66 countries with at least 0.10% share of Germany's export was examined, but its total share of export is

97.6%. Remaining 173 countries sum up to only 2.4% of Germany's export, but, if used, they would form a majority of the dataset. That is the main reason why they were left out of this study. However, if averaged data over some longer period (five or ten years) demonstrate more stability, then it might be possible to include these countries as well.

## Conclusions

In this study Germany's latest aggregate export shares with the use of a gravity equation without and with trade frictions were examined. This is a slightly different approach from a standard methodology where trade volumes are studied with the use of cross-sectional or panel data. Also, only data for countries with import shares from Germany exceeding 0.10% were employed, as countries with lower trade volumes are susceptible to large year-to-year fluctuations, which affect the estimation by gravity equation negatively. The use of averaged data over longer periods might be more appropriate as elimination or smoothing

of data fluctuations may result in much better statistical performance of gravity models in general.

One of main findings of this study is that the frictionless gravity model is very successful in fitting the data with adjusted coefficient of determination  $R^2$  equal to 0.74. As expected, export shares were found (roughly) directly proportional to a GDP of an importer and negatively proportional to importers' distance.

More interesting findings concern the gravity model with frictions, namely adjacency, currency and location in the Schengen area. This model fitted the data even better than frictionless model, with the adjusted coefficient of determination  $R^2$  as high as 0.92. All frictions were found statistically significant at 0.10 level, and their regression coefficients were found negative, which means they were factors contributing to the trade decrease indeed, with (not)adjacency as the most important trade barrier itself.

The border effect, which diminishes trade substantially even in cases where no borders are physically present (as in the EU), is still considered puzzling, see Anderson (2010). One possible explanation, somewhat overlooked in the literature, might rest in information deficiency. To trade, information about demand and supply for particular goods must be available to both potential trade partners. But subjects of trade (Germany's exporters, for example) are better informed about situation at their home market in Germany than about the situation at neighboring markets (for example in Belgium), because they primarily acquire information through home German media (TV, newspapers, Internet, etc., and also through personal contact). However, near borders with Belgium German exporters can acquire information from Belgian sources, and thus could be, at least partially, informed about its market. This information acquisition is even more reduced when there is no border between both countries (no adjacency), as information can be shared only indirectly (by Internet, satellite TV) or by (not so often) personal contact. That is why trade with a foreign subject is less likely.

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**Appendix A: The data for the gravity model with frictions – Part 1**

Country	Export share (%)	Dist. (km)	GDP PPP (bil. USD)	C	LISA	A
001 France	9.146	879	2,534.5	0	0	0
002 United States	8.174	6,727	16,768.1	1	1	1
003 United Kingdom	6.906	932	2,320.4	1	1	1
004 Netherlands	6.492	577	780.3	0	0	0
005 China	6.121	7,377	16,149.1	1	1	1
006 Austria	5.148	523	376.7	0	0	0
007 Italy	4.871	1,183	2,035.4	0	0	1
008 Switzerland	4.293	752	432.0	1	0	0
009 Poland	3.885	520	896.8	1	0	0
010 Belgium	3.882	651	455.0	0	0	0
011 Russian Federation	3.275	1,616	3,491.6	1	1	1
012 Spain	2.868	1,870	1,488.8	0	0	1
013 Czech Republic	2.843	280	287.6	1	0	0
014 Turkey	1.955	2,042	1,443.5	1	1	1
015 Sweden	1.894	813	418.2	1	0	1
016 Hungary	1.601	691	229.6	1	0	1
017 Japan	1.562	8,940	4,667.6	1	1	1
018 Denmark	1.449	356	240.9	1	0	0
019 Korea Rep.	1.322	8,150	1,697.0	1	1	1
020 Brazil	1.033	9,573	3,012.8	1	1	1
021 Slovakia	0.973	554	144.0	0	0	1
022 United Arab Emirates	0.906	4,641	570.6	1	1	1
023 Romania	0.882	1,297	371.2	1	1	1
024 Saudi Arabia	0.844	4,175	1,553.1	1	1	1
025 India	0.837	5,793	6,776.0	1	1	1
026 Mexico	0.818	9,741	2,058.9	1	1	1
027 Canada	0.807	6,146	1,518.4	1	1	1
028 Australia	0.785	16,062	1,052.6	1	1	1
029 South Africa	0.780	8,789	662.6	1	1	1
030 Norway	0.750	840	328.0	1	0	1
031 Finland	0.747	1,109	218.3	0	0	1
032 Portugal	0.582	2,315	268.8	0	0	1
033 Singapore	0.577	9,928	425.3	1	1	1
034 Taiwan	0.538	8,971	970.9	1	1	1
035 Hong Kong	0.514	8,767	382.5	1	1	1
036 Luxembourg	0.507	601	48.5	0	0	0
037 Ireland	0.500	1,320	213.3	0	1	1
038 Ukraine	0.492	1,210	392.5	1	1	1

## Appendix A: The data for the gravity model with frictions – Part 2

Country	Export share (%)	Dist. (km)	GDP PPP (bil. USD)	C	LISA	A
039 Malaysia	0.439	9,620	693.6	1	1	1
040 Greece	0.433	1,804	278.0	0	0	1
041 Slovenia	0.375	724	58.7	0	0	1
042 Thailand	0.359	8,615	964.5	1	1	1
043 Israel	0.329	2,851	257.5	1	1	1
044 Indonesia	0.286	10,779	2,389.0	1	1	1
045 Argentina	0.258	11,886	927.9	1	1	1
046 Chile	0.255	12,504	395.6	1	1	1
047 Bulgaria	0.242	1,320	119.6	1	1	1
048 Lithuania	0.226	823	75.4	1	0	1
049 Egypt	0.218	2,892	909.8	1	1	1
050 Belarus	0.209	958	166.8	1	1	1
051 Kazakhstan	0.197	4,701	395.5	1	1	1
052 Algeria	0.189	1,928	522.6	1	1	1
053 Croatia	0.187	769	86.6	1	1	1
054 Vietnam	0.169	8,342	475.0	1	1	1
055 Iran	0.168	3,514	1,244.3	1	1	1
056 Philippines	0.158	9,880	643.1	1	1	1
057 Estonia	0.154	1,045	34.4	0	0	1
058 Morocco	0.146	2,610	241.7	1	1	1
059 Serbia	0.144	1,002	89.7	1	1	1
060 Colombia	0.133	9,430	602.0	1	1	1
061 Latvia	0.130	848	46.5	1	0	1
062 Iraq	0.127	3,269	499.6	1	1	1
063 Nigeria	0.122	4,848	972.6	1	1	1
064 Kuwait	0.121	3,826	275.4	1	1	1
065 Tunisia	0.121	1,766	119.7	1	1	1
066 Qatar	0.115	4,395	298.4	1	1	1

Source: own

**ON THE GRAVITY EQUATION OF TRADE: A CASE OF GERMANY****Jiří Mazurek**

*Gravity models (equations) of trade belong among the most successful empirical tools in the modern economics since their first economic applications in the yearly 1960s. They assume that bilateral trade is directly proportional to “economic sizes” (usually described in terms of GDP or income) of both trading partners and inversely proportional to their distance. The aim of this study was to examine Germany’s latest (2012) yearly aggregate exports to its major international partners by a gravity equation without and with selected trade frictions including a geographical adjacency (the so called border effect), an influence of the same or different currency (Euro), and a location in the Schengen Area, the zone of a free movement of persons. Gravity models both without and with selected trade frictions fitted the data well, while the model with frictions performed significantly better. The adjacency was found the most important single trade friction, the location in the Schengen Area appeared to be the least important friction (but it was still statistically significant). Other feasible trade frictions, such as border length, a location in Europe or democracy index were examined too, but their effect on the trade was rather negligible. A possible explanation of the border effect, based on information deficiency, is included in the study as well. Furthermore, it was observed that yearly Germany’s exports data are susceptible to large year-to-year fluctuations especially for countries with low imports. Therefore, using averaged data over five or ten years long periods might be more appropriate.*

**Key Words:** Export, Germany, gravity equation, international trade, trade frictions.

**JEL Classification:** C51, F14, F17.

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# TREATMENT COSTS OF PARKINSON'S DISEASE IN CENTRAL EUROPE

*Petra Marešová, Blanka Klímová, Martin Vališ, Kamil Kuča, Hana Mohelská*

## Introduction

Parkinson's disease (PD) is a serious disease and economic and social problems of present times. It is caused by the loss of dopamine-producing neurons and by the accumulation of a protein into Lewy bodies in neurons in the area of midbrain, in the so-called pars compacta substantia nigra. In fact, before this disease breaks out, there is a loss of 60-80% of dopaminergic neurons (Farlow et al., 2013). There is thus a relatively long period of time preceding the actual manifestation of motor symptoms at which point a substantial proportion of dopaminergic cells has been already lost with no movement-related issues being evident. Therefore, a detailed neurological and laboratory examination of patients suffering from impaired olfaction and sleep disturbances would bring a significant benefit to PD diagnosis in its early stage. The first symptoms of this disease comprise overall tremor, particularly in hands, slowness of movement, rigidity of limbs, and balance difficulties (Ransmayr, 2015).

Sometimes these symptoms are described by acronyms TRAP (Tremor, Rigidity, Aknesis and Posture instability) (Yorkston, Beukelman, Strand, & Bell, 1999). These key motor symptoms are also called Parkinsonism or a parkinsonian syndrome. In addition, besides the motor symptoms, in the course of the development of PD patients might acquire other disorders known as non-motor symptom complex which includes cognitive difficulties and dementia; neuropsychiatric symptoms such as depression, anxiety, hallucinations or apathy; autonomic symptoms such as low blood pressure, constipation, difficulties in swallowing, increased sweating or sexual dysfunction; sleep disorders; or loss of smell.

This disease mostly affects older people (60+). According to the study of 2012, about 4.1-4.6 million people suffered from PD

worldwide (Dorsey et al., 2007). Currently, almost 6.3 million of people are affected by this disease (European Parkinson's Disease Association, 2015). More than one million of the Europeans has it and there are forecasts that by 2030 a number of patients will double. Despite the fact that the impact of Parkinson's disease on present society is enormous, many people are not well informed about this disease.

Experts warn against the increasing frequency of Parkinson's disease with the person's growing age. This increase is quite obvious until person is 75 years old. After that, the increase is not that much striking (European Parkinson's Disease Association, 2015). An average age of the onset of the disease is around 57 years. That is why Parkinson's disease is considered to be an aging disease (Drummond & O'Brien, 1997). Out of the whole population older than 60 years, 1% of people suffer from this disease ("Všeobecná Zdravotní Pojišťovna [General Health Insurance Company]," 2015). As many as 10% of patients fall ill before they are 40. This is an early onset of the disease (young onset type). In this case, the calendar age is not important, but it is the biological age of an individual, which is influenced by his genetics. Another 10% fall ill after they are 75, which is a late onset of the disease (late onset type) (Růžička, Roth, & Kaňovský, 2000).

From the point of view of public systems of many countries in Europe, it can be said that care about people with dementia is done in mutually separated sectors. A part of this care is provided by healthcare system, as in the case of other mental health diseases the majority of the cost of disease are not born in the healthcare system (Dlouhý, & Barták, 2013) and part by social services. A specific interface of these systems in form of long-term social health care has not been established yet despite many attempts (Barták & Gavurová, 2014; Gavurová

& Vagašová, 2016). A substantial portion of services is still provided informally by family members and other caregivers in households. This area has not been much researched yet (Šoltés & Gavurová, 2014). A smaller part is then a subject of commercial interest within the so-called grey economy.

There are only few specific data on the issue of dementia and associated costs which are publically available. Therefore, it is very difficult to draw a specific picture of financial burden on the systems in European countries. The purpose of this article is thus to provide more detailed information about the current value of the direct costs of the treatment and care about patients with PD. They are calculated not only on the basis of aggregated data from the publically available sources, but also on the basis on authors' own survey.

## 1. Methodology

In this study Drummond's methodology (Drummond & O'Brien, 1997) is used for the specification of costs. In this methodology the costs are divided into two categories – direct and indirect costs. This study is focused on the direct costs, especially costs of outpatient and inpatient care, costs of drugs. The data were collected on the basis of guided interviews run by head of the Department of Neurology. Partial data on outpatient and inpatient care are specified. The data for the costs of drugs are based on (Winter et al., 2010) and they are included in the final amount in conclusion so that there could be an opportunity to compare the direct costs with other EU countries.

510 with patients participated in this study in the period of 2011-to the third quarter of 2015. The data were collected at the University Hospital in Hradec Kralove in the Czech Republic as one of the countries of Central Europe. The study focuses on the following parameters: length of hospitalization, price of hospitalization, number and types of outpatient examinations. The data are sorted and values of descriptive statistics are specified such as average, maximum minimum, mean, deviation.

The results refer to the diagnoses according to the International Statistical Classification of Diseases and Related Health Problems. The attention is focused on Parkinson's disease dementia (G20+). 510 in the category G20 are included. Secondary Parkinsonism (G21) and Parkinsonism in diseases filed elsewhere (G22)

are not analysed. For category G21 only the numbers of patients are described, for category G22 no patients are in University of Hospital in analysed period.

## 2. Treatment Costs of Parkinson's Disease in Central Europe – a Czech Cohort Study

In the Czech Republic the total number of patients with PD is estimated at 16,000 people. The incidence, however, gradually increases with age and in the age categories at 65 years it affects 1-2% of population. The General Health Insurance Company (GHIC), which covers costs of most patients in the Czech Republic, reported in 2014 almost 16,000 patients with PD. Their treatment reached nearly 14,782,966 EUR (CZK/EURO – exchange rate is based on data from the European Central Bank accessed 14th March, 2016).

The biggest financial share is formed by the costs of commonly used prescribed drugs within the outpatient care (more than 52%). Almost 10% is then created by the costs of Duodopa ("Všeobecná Zdravotní Pojišťovna [General Health Insurance Company]," 2015). The costs of drugs per patient for the Czech Republic were specified in (Winter et al., 2010) and it is 1,220 EUR, which is also considered in this study and included in the total amount of direct costs.

### 2.1 Characteristics of Patients

Table 1 presents numbers of patients, who were registered at the University Hospital of Hradec Kralove in the monitored period with individual diagnosis and numbers of outpatient examinations. Attention is only paid to the patients in category G20, whose number is 510.

### 2.2 Costs of Outpatient Care

One of the items of the direct costs are the costs of outpatient care. This study involves the costs of individual visits such as a visit at the neurologist, blood collection, CT head or body native and contrastive screening as it is presented in Table 2.

The visits at the neurologist can be twice a year, but according to the patient's state also three-four times a year. The calculation of the costs is based on a model example of two special examinations by a neurologist per year, one complex examination by a neurologist, one

**Tab. 1: Total number of examinations and patients with dg. G20, G21 (outpatient department)**

Outpatient care	Diagnosis					
	G20			G21		
Year	Number of patients	Number of outpatient examinations	Average examination per patient	Number of patients	Number of outpatient examinations	Average examination per patient
2011	136	371	2.73	3	4	1.33
2012	99	301	3.04	4	7	1.75
2013	99	258	2.61	5	7	1.40
2014	89	202	2.27	7	11	1.57
1.-9./2015	87	191	2.20	4	9	2.25
<b>Total</b>	<b>510</b>	<b>1,323</b>	<b>2.59</b>	<b>23</b>	<b>38</b>	<b>1.65</b>

Sources: University Hospital of Hradec Kralove (2015) and authors' own calculations

**Tab. 2: Costs of outpatient care**

Examination	Type	EUR
1st visit at the neurologist	Complex	24.91 €
	Special	5.34 €
2nd and every other visit at the neurologist	Targeted	12.63 €
	Special	5.34 €
	Followed person	0.38 €
Blood collection, twice a year	Only if indicated by a doctor	1.37 €
CT head or body native and contrastive screening	Only if indicated by a doctor	94.37 €
<b>Total</b>		<b>144.34 €</b>

Sources: University Hospital of Hradec Kralove (2015) and authors' own calculations

targeted examination by a neurologist, blood collections twice a year, CT head screening once a year. The total final amount is 144 EUR. Additional costs include the costs of drugs (modified according to (Winter et al., 2010) at average amount of 1,220 EUR per year. The total annual costs of outpatient treatment are 1,364 EUR.

### 2.3 Costs of Inpatient Care

The number of patients in relation to the length of hospitalisation and costs are described in Table 3.

The costs and the length of hospitalization are significantly influenced by the fact whether the patient spent some time at the Intensive Care Unit (ICU) or not. The costs without the stay at ICU and with the stay at ICU are presented in Table 4.

The days of hospitalization and the costs of hospitalization for individual years and all the patients with standard deviation are described in Table 5.

The costs of inpatient care range in the individual years between 407 and 1,239 EUR on average per patient. Then, the **total direct**

**Tab. 3: Days and costs of hospitalization**

Days of hospitalization	Number of patients	Costs of hospitalization (EUR)	Number of patients
less than 1 week	39	less than 400	38
to 2 weeks	56	to 700	64
to 3 weeks	13	to 1,700	8
more than 4 weeks	6	more than 1,700	4

Sources: University Hospital of Hradec Kralove (2015) and authors' own calculations

**Tab. 4: Costs with respect to the stay at ICU**

Year	Number of days	Total cost (EUR)	Average costs per day (EUR)
2011	146	7,018.9	48.1
2012*	122	5,784.6	47.4
2013*	260	12,115.1	46.6
2014*	354	15,923.4	45.0
1.-9./2015	199	9,200.4	46.2
<b>Total*</b>	1,081	50,042.5	46.3

\*These data do not include the patients who had to be hospitalized at ICU.

Patients hospitalized at ICU			
Year	Number of days (ICU)	Total cost (ICU) (EUR)	Average cost per day (ICU) (EUR)
2012	33	12,812.2	371.0
2013	14	4,770.6	294.2
2014	15	3,967.6	219.5
<b>Total</b>	62	21,550.4	317.0

Sources: University Hospital of Hradec Kralove (2015) and authors' own calculations

**costs of patient** per year may be modelled on the basis of the following relationship:

- Average outpatient care per patient + Drugs + Average inpatient care per patient,
- Thus = 144 + 1,220 + 686 = 2,032 €.

Not every patient has to be hospitalized during the year, but the hospitalization at ICU significantly influences the costs and it does not have to be directly connected with Alzheimer's

disease. In that case the costs could be lowered by 686 EUR (CZK/EUR – exchange rate is based on data from the European Central Bank accessed 14th March, 2016).

### 3. Discussion

Within this study the outpatient and inpatient costs of PD in Central European country – Czech Republic were monitored. The authors

**Tab. 5: Overview of the costs of inpatient establishments in the period of 2011-2015, diagnosis G20**

Hospitalization		The days of hospitalization			Costs of hospitalization (EUR)		
Year		M	±	SD	M	±	SD
2011	(n = 15)	8.47	±	3.62	406.6	±	161.3
	Range	1 day	—	14 days	59.7	—	657.0
2012	(n = 15)	11.1	±	5.76	1,239.8	±	2,321.3
	Range	3 days	—	28 days	177.1	—	9,021.7
2013	(n = 26)	11.07	±	6.19	649.5	±	865.6
	Range	1 day	—	28 days	60.1	—	4,770.6
2014	(n = 34)	11.29	±	7	585.0	±	521.0
	Range	3 days	—	40 days	156.4	—	311.6
1.-9./2015	(n = 20)	9.95	±	5.717	460.0	±	234.1
	Range	3 days	—	24 days	145.4	—	1,024.6
Total	(n = 110)	10.59	±	6.02	642.5	±	1,011.4
	Range	1 day	—	40 days	59.7	—	9,021.7

Sources: University Hospital of Hradec Kralove (2015) and authors' own calculations

**Tab. 6: Comparison of the selected direct costs**

Costs of PD in Czech Republic in 2008, source: (von Campenhausen et al., 2011), in EUR		Own study – costs of PD in the Czech republic in 2011-2015, in EUR	
Hospitalization per one patient/per day	70	Hospitalization	51.8
GP (2x) and Neurologist (2x)	14 + 24 = 38	Neurologist four times a year	49
<b>Total</b>	<b>108</b>		<b>100.7</b>

Source: authors

researched the direct costs among 510 patients at the University Hospital of Hradec Kralove were explored in the period of 2011- to the first quarter of 2015. They included neurological examination, CT screening, blood collection, hospitalization, and drugs. The total costs reached a value of 2,032 EUR.

According to (von Campenhausen et al., 2011), the total costs per patient in the Czech Republic were monitored. If only the amounts comparable with this survey are selected, it is possible to observe almost the identical costs of prices of examination and hospitalization per patient (Tab. 6).

Furthermore, within a comparison with other foreign studies (Andlin-Sobocki, Jönsson, Wittchen, & Olesen, 2005), (Spotkke et al., 2005), (Hagell, Nordling, Reimer, Grabowski, & Persson, 2002), (Findley et al., 2003) the length of hospitalization can be discussed. For example, an average length of the stay of the hospitalized patients ranged between eight days in Austria to 19 days in Germany during the six-month observation (von Campenhausen et al., 2011). In the Czech Republic it is about 10 days. The costs connected with the hospitalized patients (including the hospitalization and rehabilitation) differed in the selected

**Tab. 7: Total treatment costs in the selected European countries**

Country	Direct costs per one year per one patient	Direct costs (Inpatient care, Outpatient care and drugs) (19% of direct costs)
Total costs	EUR	EUR
Czech Republic	6,700 (Winter et al., 2010)	1,273
Italy	5,004 (von Campenhausen et al., 2011)	950
Germany	8,160 (Spottke et al., 2005)	1,635
Austria	5,892 (von Campenhausen et al., 2011)	1,119
Sweden	7,920 (Hagell et al., 2002)	1,504
United Kingdom	9,500 (Findley et al., 2003)	1,805
Czech Republic (this survey)	x	2,032

Source: authors

countries from 100 EUR to 1,600 EUR. In the Czech Republic the costs connected with hospitalization are about 700 EUR. Thus, one can see that the costs of hospitalization as well as its length in the Czech Republic are average.

Table 7 compares the costs of the selected direct costs in the selected European countries: Inpatient care +Outpatient care + drugs. The amounts of the direct costs from other studies are calculated on the basis of (Andlin-Sobocki et al., 2005), where direct costs -the individual items are as follows: 41% home care, 11% drugs, 3% hospitalized care, other direct costs 5%. Thus, this study considers 19% of the total costs (without home care).

These costs from all studies are converted into the period of 12 months with respect to the possibility of their comparison with other studies.

As Table 7 above shows, the highest direct costs per patient per year are definitely in the United Kingdom, followed by Germany and Sweden. On the contrary, the lowest direct costs per patient are in Italy and Austria. The Czech Republic again stands somewhere in the middle. As far as the selected direct costs (inpatient care, outpatient care and drugs) are concerned, the Czech Republic on the basis of this study comes first, followed by the United Kingdom and Germany. Italy again comes last. The results of this study is particularly influenced by the costs on inpatient care, including the stays at ICU, which significantly affect the

prices. In other studies this specific information on the types of hospitalization is not included. In case of lowering the data by hospitalization variable, the costs in the Czech Republic would reach 1,364 EUR, which would rank the Czech Republic after Germany (Tab. 7).

The survey showed that the underpinning of patients with PD was beneficial from the costs point of view because the costs on the outpatient care were much lower in comparison with the inpatient care. In addition, patients released from the hospital are usually transferred to the establishments with subsequent care, for example into hospices, because family care due to its complexity is impossible. In the individual regions of the Czech Republic there are substantial differences which would deserve detail research. Most of the patients has been recorded in Prague, south Moravia and central Bohemia. There are twofold or even threefold differences in the provided health services among the individual regions (“Všeobecná Zdravotní Pojišťovna [General Health Insurance Company],” 2015). In the regions it is not possible to trace more significant connections and ties among the frequencies of individual types of services. Thus, one cannot argue that one form of service was compensated by another.

### Conclusions

The information stated above shows that the issue of the treatment costs of PD is not systematically solved, except perhaps an

individual treatment, but not within the framework of individual countries so that the data could be compared. In spite of the distortion of the data, it can be claimed that the treatment costs are rising. With respect to the aging population in Europe, these items will increasingly represent a bigger burden of health systems. Therefore, emphasis should be put on the unified strategy for their payment in individual countries. In addition, the authors of this study suggest that amount of healthcare services in all the country's regions (Maresova, Klimova, & Kuca, 2014). In addition, with respect to the rising treatment costs, more attention should be also paid to the alternative non-pharmacological therapies (Klimova & Kuca, 2015). Furthermore, international comparisons on the volume of provided care must be considered very carefully. These comparisons are usually based on expert estimation and they are not supported by reliable data (Maresova, Mohelska, Dolejs, & Kuca, 2015). Even a more complicated comparison among the other EU countries is in the area of social care (Klimova, Maresova, Valis, Hort, & Kuca, 2015) because in social services in comparison with healthcare, there is no regular disclosure of information, which would deal with the issue of dementia.

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## Abstract

**TREATMENT COSTS OF PARKINSON'S DISEASE IN CENTRAL EUROPE****Petra Marešová, Blanka Klímová, Martin Vališ, Kamil Kuča, Hana Mohelská**

*The aim of the study is to describe current values of direct costs of Parkinson's disease in western and central Europe in comparison with other available data in order to illustrate the development of the treatment costs of Parkinson's disease (PD) on the public sector.*

*In this research study Drummond's methodology is used for the specification of costs. The costs are divided into two categories. The first category consists of the costs of creation and running of health care program and these costs are perceived as the used sources. The costs are calculated on the basis of the reviews of the studies from the European countries, but also on the basis of authors' own survey in the University Hospital of Hradec Kralove conducted among 510 patients in the period of 2011-to the third quarter of 2015.*

*Within this study the direct costs among 510 patients at the University Hospital of Hradec Kralove were explored in the period of 2011- to the third quarter of 2015. These costs included neurological examination, CT screening, blood collection, hospitalization, and drugs. The total direct costs of patient per year reached 2,032 EUR.*

*The survey showed that the underpinning of patients with PD was beneficial from the costs point of view because the costs on the outpatient care were much lower in comparison with the inpatient care. In addition, patients released from the hospital are usually transferred to the establishments with subsequent care, for example into hospices, because family care due to its complexity is impossible.*

**Key Words:** *Parkinson's disease, direct costs, treatment, Europe.*

**JEL Classification:** *I12.*

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# LONG-TERM INFRASTRUCTURE INVESTMENT: A NEW APPROACH TO THE ECONOMICS OF LOCATION

*Petr Dlask, Václav Beran*

## Introduction

In both classical economics (Adam Smith, David Ricardo) and neoclassical economics (e.g. John Hicks, Léon Walras, William Stanley Jevons, George Stigler, Carl Menger, John Bates Clark), there are three primary factors of production: *land, labor, capital*. Land means a resource creating an additional utility and is not only a natural resource to be found above or below the soil. There cannot be a disregard for the decision making process concerning location and investment. The problem is manifest not only in the individual *solo* investment but also in the *portfolio* dispersion of investment in an entire region.

The article focuses on the arguments supporting the thesis (implication): the *decision rule* creates the *decision space* and this *space* (meant as an occasion for manoeuvre) if *evaluated*, provides *the utility*. Discrepancies in the assessment of development opportunities in a regional or urban area are well-known matters of discussion and have serious long term economic consequences. Let us consider the above statement as a goal-setting endeavour. The statement formulates the *specific* and *measurable* intentions, and the intent of the authors is to query whether goals are attainable, realistic and time-bound. More generally it describe a situation carrying the implication

$$\begin{aligned} \text{Economic decision Rule} &\Rightarrow^{\text{create}} \text{Economic} \\ \text{decision Space} &\Rightarrow^{\text{evaluate}} \text{Economic decision} \\ \text{Utility} & \end{aligned} \quad (1)$$

or adjusted to eliminate the redundant words

$$\text{Rule} \Rightarrow^{\text{create}} \text{Space} \Rightarrow^{\text{evaluate}} \text{Utility} \quad (1a)$$

It will not be amiss to look briefly for the causes of gaps in theory and/or in any

application to actual practice. The factual gaps may be perceived in: a) a good evaluation of solo investment and b) the unsatisfactorily calculated impact of investment in an area (region). The evaluation methodology suffers from a) the absence of probabilistic causality, b) weak respect for the dynamics in time, c) disregard of the influence of decision-making rules, and d) marginalization of the effect of externalities (the dynamic of chain effects in the area, and the economic impact of location addressed in sub-section 2.2).

*Motivation:* The main reason for writing this article was the findings visualized in Fig. 1. The differentiated development is presented for Central and Eastern Europe. The findings and data illustrate an existing situation elaborated by the World Bank. The article searches for reserves in locating investments and any potential to increase productivity for the region (Artis, Curran, & Sensier, 2010).

*Implementation:* The development of cities can be efficient, but it happens not always by design. Fixation on the distant target or vision has mostly a higher priority than dynamics and orientation in the process for achieving long-term goals. The inspirations behind, or rather some indicators of, the general problem is addressed by (Mandelbrot, 1991) and other authors and an extensive overview is presented by (Wolfram, 2002).

*Application:* An economic development including development of settlements, industries, regions, etc. depends on the presence of the necessary infrastructure as a condition for investment; but it is not a sufficient condition. According to radical changes sought in the EU (European Commission, 2013), the following must happen: *greater accessibility and readiness for integration of data from the three principal sources (public, private and societal) taking matters beyond the Directive 2013/37/EU.*

## 1. Literature – Synopsis and Comments

Some authors sum up the problem mentioned in (European Commission, 2013) from different angles, and talk about the issue in terms of dynamics, risks, uncertainties, dimensions (1D, 2D, ..., etc.). The question of dynamics in the economy was made evident already in (Forrester, Industrial Dynamics, 1961) and also later (1969) in *Urban Dynamics* (Forrester, 1969). Comparison and evaluation of consequences in time is the main source of the discrepancy in any given situation. The theory of economics and management (E&M) currently addresses the desire for further development in various ways. We have to mention at least *Econophysics*, and the related concerns addressed by (Gallegati, Keen, Lux, & Ormerod, 2006) or sustainable development in (Stern, 2006). The main problems or difficulties are found in the following: dynamics of time, area structure, causal interaction of the action, action risk, uncertainty, prudence, ethical standards, etc. Investments and the active process of investing are widely recognized as a tool for economic development (Artis, Curran, & Sensier, 2010), (Beran & Dlask, 2005; 2011). The question poses enquiry around the respective conditions of *necessity* and *sufficiency* for any economic development. The article experiments with the hypothesis that instead of demanding generic models, the *decision-making rules* should create the backbone structure of most economic and managerial problems, see for example (Mitsova, Shuster, & Wang, 2011), (Parker, 2007), (Prunetti, Muzy, & Innocenti, 2014) and (Stanilov & Batty, 2011). It is necessary to point out the limitations of any new solutions.

*Limit 1:* A lot of different types of knowledge and information may overshadow a hopeful endeavor, for example in (Malecki, 2012), regarding activities about an urban retrofitting in (Dixon, Eames, Hunt, & Lannon, 2014). Mitroff & Silvers describe this potential of overshadowing as *Probabilistic causality* in (Mitroff & Silvers, 2013). The idea of the „multi-fiber“ probabilistic causality is inspiring. The probabilistic conception of causality is an important and interesting problem. It is noteworthy that in most of the generic models the users generally deal only with a segment of the influencing parameters. Such an approach does not respect the parameter volatility for decision making (DM). Let us give a brief example in explanation.

For investment aims in (Stimson, Stough, & Brian, 2006) states it is possible to construct a causality matrix (Mitroff & Silvers, 2013), and the activities *Infrastructure* and *Not-Infrastructure* play the role of the initiating condition while *Investment* and *Not-Investment* play the role of a responding activity. The matrix is presented in Tab. 1.

The causal interactions  $a_{ij}$  in the matrix in Tab. 1 shows possible outcomes of the implication *Infrastructure*  $\Rightarrow$  *Investment*. Another approach presents process/product and qualitative/quantitative aspects as presented in (Lennert & Robert, 2010). It is undeniable that the infrastructure plays the role of a necessary condition and the investment the condition of sufficiency. The outcome  $a_{11}$  in Tab. 1 is commonly considered as appropriate for action permission. However the decision maker deserves more sensitive and specific information about topic “climate”: as  $a_{12}$ ,  $a_{21}$ ,  $a_{22}$ . Most decision-making methods (Net present

**Tab. 1: Regional development and investment as a causal interaction (in an area  $\omega$ )**

		Investment Conditions (efficiency)	
		Investment efficient	Investment inefficient
Exploring for Development Preconditions	Infrastructure exists (+)	$a_{11}$ : Efficient outcome exists +	$a_{12}$ : Negative outcome -
	Infrastructure does not exist (-)	$a_{21}$ : Negative outcome -	$a_{22}$ : Positive outcome +

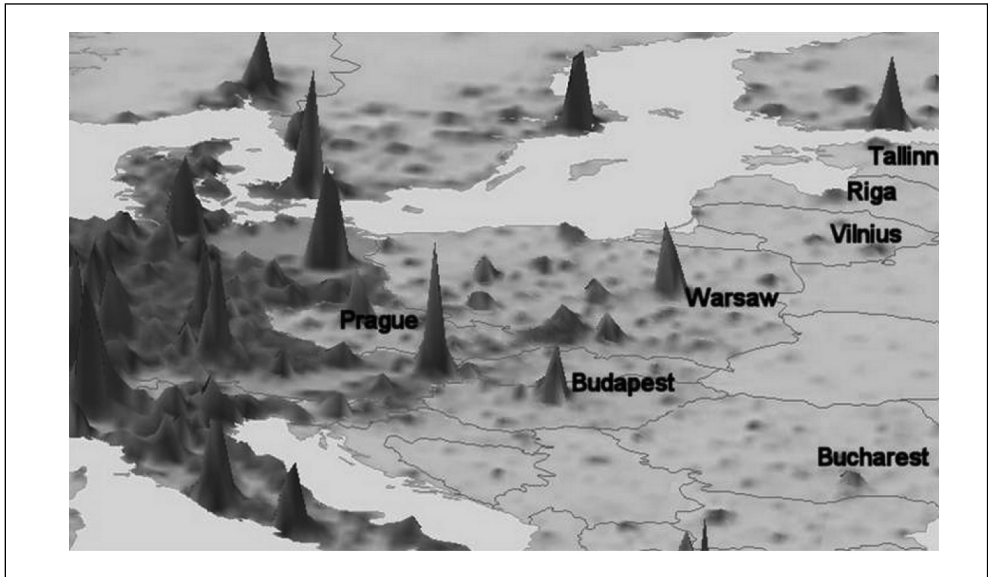
Source: own based on (Mitroff & Silvers, 2013)

value NPV, Internal rate of return IRR, Pay-back period and others) are based on a deterministic causal nexus, which has only a limited validity in the real world.

*Limit 2:* The tendency to tackle only one single situation  $a_{11}$  has in many situations a limited validity as well. The regional development (RD,

settlements, cities, regions) is subject to some kind of causalities in 3D space with the segmented areas X, Y, Z and their *benefits* or efficiency and utility as their fourth axis. The wording of the dimension is taken from ISO 16739:2013 where there is presented an extension to 4D-image (time) and 5D-image (costs).

**Fig. 1: Economic activity (GDP/km<sup>2</sup>) in Central Europe – an uneven topography**



Source: World Bank GIS Laboratory

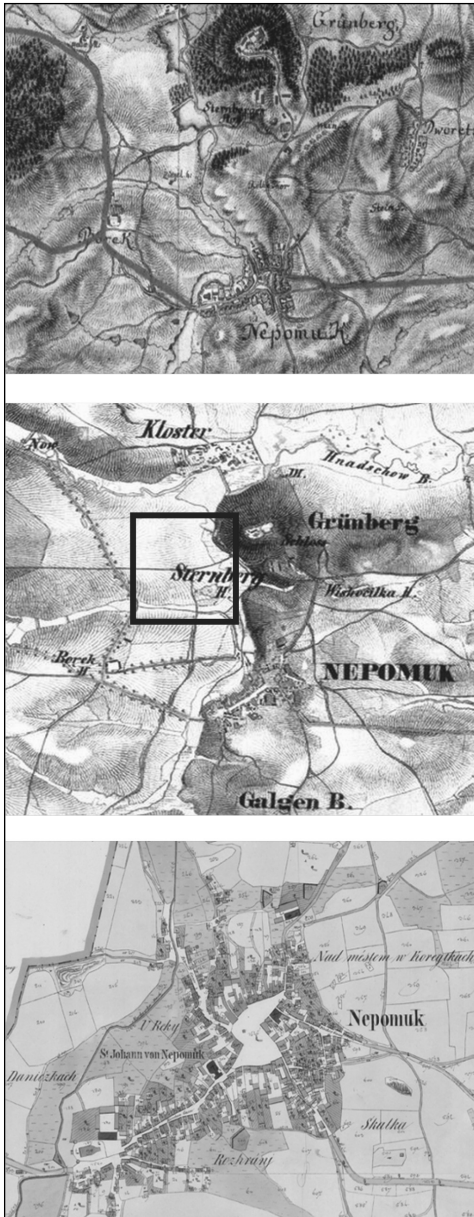
The analysis of a landscape and its texture, along with spatial analyses are the disciplines that open more insights into the behavior of regions (Tao, Tang, & Strobl, 2012). Many authors are looking for an answer in simulation and in a spatial structures model as supporting tasks.

*Limit 3:* Development is a dynamic process in *time* (Artis, Curran, & Sensier, 2010), (Beran & Dlask, 2005; 2007; 2011), and in actuality an urban or investment arrangement takes place in *space*. The relevance of the topic *urban development and cellular methodology* and its rapid emergence in the last 15 years is evident from the data shown in database ISI. The published items about “urban development and cellular methodology” (per year) increases from nearly zero before year 2000 to more than 700 in 2013/2014.

Society and indeed almost every individual or citizen requires that the urban arrangement, the regional infrastructure and its economy can provide high benefits in time and space.

*Limit 4:* Dysfunctional practice is rooted in defective theory. Decision rules are underestimated in management practice. A rule shows the way – direction – for the construction of roads, railways, waterways, public buildings, residential buildings, and their architectural arrangement; rules express the use of a public or private space – and this has been so for centuries. They were developed by means of a consensus in the rules of DM for the creation of the arrangement of a whole space development, as well as the economic and cultural background to it (the technical-economic memory of the given space). A formalization of DM *rules* decreases apprehension regarding

**Fig. 2:** The LLC growth of settlement in the last centuries; (1764-68), (1836-1852), (1837)



Source: Archives of Town Nepomuk

conflicts between players and in 3D is expressed in the *time*, *space* and *economy* of the decision proposals. The presence of players in the right time at the right place is desirable. Proper functioning is to be ensured, for those who believe in the authorship of an invisible hand (Smith, 2013), through the implementation of self-regulation. On the other hand, there exists a culture of decision rules and their reflection on the planning: -territorial, -spatial and other dimensions (Sykora, Balchin, & Bull, 1999). The simulation of a long-term development has a predominantly sophisticated support in professional simulation products. *Metronamica* is one of them, which has built-in allocation algorithms, that calculate the transition of cells (from one land use to another) on the basis of sophisticated rules (accessibility, zoning,...) (Stanilov & Batty, 2011) or (Weber, 1929).

The purpose oriented software is in the main sophisticated and based on complicated generic formulas. This paper tries to pave the way to a rule oriented approach, based on the generally available software or applications directly created by the user.

#### **Rationale/approach to problem study: investment location**

The DM rules form the economic barriers and frames, as well as the character of the regional and urban or technical decisions space (Beran & Dlask, 2005), (Batty, 2005), and (Weber, 1929). The decision *rules* create as well as establish probably one of the largest long-term regulations in a society taken as a whole. We understand the last sentence as a statement that creates benefits for a long-term conception. Payment for the economic deficiencies which result from the long-term fundamentals, acts for the whole lifetime period of construction works; for example, a tracing of roads, streets, railways, channels, housing structures etc. The given concepts, facts and their limits are mostly visible through centuries; see Fig. 2. The main subject of interest of this paper is a DM mechanism and its impact on the regional economy. The problem is solved from another perspective – optimization in general, see in (Fotr, Plevný, Švecová, & Vacík, 2013).

A development is limited not only by the life cycle (LC) of construction substances, but also by a long life cycle (LLC) of layouts, infrastructure etc. Among LLC construction objects are the transport infrastructure,

engineering infrastructure, water distribution system and the usage of adjoining functional areas. This article aims to determine the potential benefits – thus the utility – of the use of the territory (area)  $\omega$ .

## 2. Methodology: Simulation Model and Virtual Complexity

The criterion for an economic development has to involve measuring the achieved *utility* in terms of relation (1) and is described in detail in chapter 2. *Decision rules*. The evaluation needs an aggregate prospect (prognosis) of the utility based on past investments in terms of sufficiency. The success of investment sets out a demarcation line of knowledge, infrastructure, industrial production, final consumption and housing, a broader view being given by (Damborský, Wokoun, & Krejčová, 2013).

On the one side, interference in the general cycle

$$\begin{aligned} \text{Consume} &\Rightarrow \text{Investment} \Rightarrow \\ &\Rightarrow \text{Development} \Rightarrow \text{Consume} \end{aligned} \quad (2)$$

as a basic dependence is expressed in various forms in classical macroeconomics; it binds the investment  $I$  with the *change* in production output  $Y$  in time, written as

$$I = v \, dY/dt \quad (2a)$$

where  $0 \leq v \leq 1$ , and shows the effectiveness of the proposed investment,  $dY/dt$  is change of production output for time unit  $t$ .

On the other side, (2) or (2a) doesn't solve the problem of the *territorial* distribution and the impact of *decision-making* rules. The choice and the suitability of the investment location is brought into play predominantly only through *feasibility studies*. Here we speak about the partial  $I_{\text{solo}}$  investment and isolated micro-decisions. The further described simulation explains the potential benefits for the complexes: regions, areas. The study tries to explain, the extent to which (as % of utility) the final effect might improve the efficiency of investment.

The authors of the paper argue that the DM rules implemented *form* the pattern of the *future development*. ADM rule directs the development of infrastructure, buildings and their potential economic destinations. The agricultural pattern of the area in Fig. 3 is changed to a more

economically intensive exploitation. Decision rules orchestrate the evaluation. More about decision rules is presented in subsection of chapter 2.2 and in formulas (10), (11).

### 2.1 Evaluation of Economic Potential – the Investment Tools and Indicators

The regional development is recognized in the starting position  $t$  mostly as an agricultural land *without initial investment*. Such an example presents a utility, prearranged in Fig. 2 and in segments  $\omega_j$  (see Fig. 3) weighted only with the weather volatility and the harvest incomes. We assume the location as a potential town expansion area, framed in Fig. 2. The proceeds or utilities  $u_j$  in the partial agricultural segments vary between 1 and 5% of yields per year.

Later, the *initial investment* (at time  $t = 1$ ) in the central located segment is written as  $I_{t=1}(10,10) = 1$  and will act as an initial spreading element for the development. The investment in a region (area) is fixed in *time* and *localization*,  $I_t(i,j)$ . The cumulated yields (utility) for a period  $\langle t_{\text{start}}, \dots, t_{\text{actual}}, \dots, t_{\text{horizon}} \rangle$  is given as an aggregation (sum) of matrices  $\mathbf{U}_t(\omega) = \sum_{t_{\text{start}}}^{t_{\text{actual}}} \mathbf{u}_t(\omega)$ , where  $\omega$  is the range of area (let us say for example, the territorial functions, the administrative definition etc.), and  $t$  is an actual observer's time position. The single element  $\omega_j$  contains the value of simulated utility  $u_j$  of one period. The segment locations are specified with  $i = 1, 2, \dots, m$  and  $j = 1, 2, \dots, n$ . To compare the different time stages, a number of indicators are available (e.g. difference, distance, divergence, etc.).

The *difference* of the stages  $t$  and  $t-1$  is given in general as a matrix of *utility differences*; indicated changes for  $\Delta t$ , given as a disparity matrix of the actual and past state

$$\Delta \mathbf{u}_t(\omega) = \mathbf{u}_t(\omega) - \mathbf{u}_{t-1}(\omega) \quad (3)$$

where data for matrices  $\mathbf{u}_t(\omega)$ ,  $t = 1, 2, \dots, t_{\text{actual}}$  is the confirmed reality or  $t = t_{\text{start}}, \dots, t_{\text{actual}}$  is an accepted simulation on the basis of relations (10) and (11), visualized in Fig. 3, Fig. A1 or Fig. 7. An example of  $\Delta \mathbf{u}_t(\omega)$ ,  $t = 1, 2, \dots$  is given in Fig. 8. The matrices  $\Delta \mathbf{u}_t(\omega)$  obtained in (3) are significant as an indication of the attractiveness of the potential ( $t+1$ ) investment.

The prediction of utility changes  $\Delta \mathbf{u}_{t+1}(\omega)$ ,  $\Delta \mathbf{u}_{t+2}(\omega), \dots$  (where  $t$  is interpreted as  $t_{\text{actual}}$ ) can be derived by simulations, expert judgments,

statistical analysis. The matrices  $\Delta \mathbf{u}_{(t+1)}(\omega)$  allow calculation of further development states as

$$\mathbf{U}_{t+1}(\omega) = \mathbf{u}_t(\omega) + \Delta \mathbf{u}_{t+1}(\omega), \quad (4)$$

$$\mathbf{U}_{t+2}(\omega) = \mathbf{U}_{t+1}(\omega) + \Delta \mathbf{u}_{t+2}(\omega), \text{ etc.} \quad (5)$$

where the matrix  $\mathbf{U}_t(\omega)$  is the sum of utilities for period  $(t_{\text{start}}, t+1)$ , or even let us say a prognosis outlook from a last observer state  $t_{\text{actual}}$  as a starting point for the prognosis. The matrix  $\mathbf{u}_t(\omega)$  illustrates as  $t_{\text{actual}}$  the “north-west” corner of Fig. 7 and matrix  $\Delta \mathbf{u}_{t+1}(\omega)$  illustrates the “north-west” corner of Fig. 8.

The matrix  $\mathbf{U}_t(\omega)$  multiplied by a vector of row relevancies (for example in terms of the urban, economic, social investment and development)  $\mathbf{w}^- = [w_1^-, w_2^-, \dots, w_k^-, \dots, w_n^-]$  where  $0 \leq w_k^- \leq 1$  and  $\sum_{k=1}^n w_k^- = 1$  and by a vector of column relevancies  $\mathbf{w}^l = [w_1^l, w_2^l, \dots, w_p^l, \dots, w_n^l]^T$ , where  $0 \leq w_l^l \leq 1$  and  $\sum_{l=1}^m w_l^l = 1$  identifies the main development trends. The matrices in (6) and (7) serve as *development* (change) *indicators* for the states  $t$ , written as row  $(1 \times n)$  matrices  $\mathbf{u}_t(\omega)$  for columns (read for example as a cumulated profile of west-east development)

$$\mathbf{u}_t^-(\omega) = \mathbf{w}^- \mathbf{U}_t(\omega) \quad (6)$$

and as columns matrix  $(n \times 1)$  for rows (read for example as a profile of north-south development)

$$\mathbf{u}_t^l(\omega) = \mathbf{U}_t(\omega) \mathbf{w}^l \quad (7)$$

where  $\mathbf{w}^-$  is the row matrix of utility relevancies for columns of matrix  $\mathbf{U}_t(\omega)$ ,

$\mathbf{u}_t^-(\omega)$  is the utility row matrix of sums for time phases  $t = 1, 2, \dots, t_{\text{actual}}$ ; let us say the west-east utility profiles of area  $\omega$  up to the actual time horizon, example given in Fig. 4b,

$\mathbf{w}^l$  is column matrix of utility relevancies for rows  $j = 1, \dots, m$  of matrix  $\mathbf{U}_t(\omega)$ ,

$\mathbf{u}_t^l(\omega)$  is the utility column matrix of weighted sums; in our example the north-south utility profile of area  $\omega$  up to  $t_{\text{actual}}$ , example Fig. 4a.

The indicator of total yield of the investigated area  $\omega$  can be given e.g. as matrix

$$\mathbf{u}_t^o(\omega) = \mathbf{w}^- \mathbf{U}_t(\omega) \mathbf{w}^l \quad (8)$$

More examples used later in this article are presented in Tab. 2.

The long-term economic profile is given by the simulation series  $\mathbf{U}_t(\omega)$  and investment  $I$

placement for all  $t$  where  $t_{\text{end}}$  is the used economic horizon  $h$ . The utility of investment (Beran & Dlask, 2007) is not only a question of the effectiveness of sales, demand or offers, but also a question of the simulation inputs as

- a) location,
- b) the range of investment,
- c) economic life cycle of investment,
- d) reliability (risk) of economic activities in location,
- e) potential growth factor in location, etc.

The above mentioned points should be interpreted with respect to the *probabilistic causality* in (Mitroff & Silvers, 2013), mentioned in the Tab. 1 of our chapter *Introduction*. The utilities of an area  $\omega$  is not only a sequence of cumulated utility matrices  $\mathbf{u}_1(\omega), \mathbf{u}_2(\omega), \dots$  but also the sophisticated calculation process of the partial combinatory parameters a) to e), implemented in a time sequence of simulations (to be read as delays or future expectations)

$$\mathbf{U}(I, \omega) = \text{Sim} [\mathbf{u}_1(I, \omega), \mathbf{u}_2(I, \omega), \dots, \dots, \mathbf{u}_h(I, \omega)] \quad \text{for } t = 1, \dots, h \quad (9)$$

where  $\mathbf{U}(I, \omega)$  is a time sequence of matrices of utilities for the area  $\omega$ , specified by investment conditions  $I$  in uniform periods  $t = 1, \dots, h$ ,

$I$  is the investment conditioned by a), ... , e), etc.,

$\mathbf{u}_t(I, \omega)$  is the utility simulation for the time period  $t$ .


The economic potential establishes the base for the comparison of variants and preferences of different investment strategies. The long term effect is a significant DM indicator.

The comparison of variants may have a varied construction of indicators. The most affordable are indicators presented in relationship (3), (6) and (7).

## 2.2 Decision Making Rules

The DM criteria are mostly the rules of growth, providing a utility that oscillates with respect to the limiting local conditions, such as:

- a) revenues, which are partially unstable and conforming to the external conditions (supply, demand, influence of externalities outside the territory of interest, energy prices, ecological regulation, tax regulations, charges etc.),
- b) effect of investment time delay, if say the investment revenues are delayed for a few years,

- c) effect of revenue expands from an area element  $\omega_{ij}$  to Moor neighborhood elements (*eight*), surrounding the calculated cell: pictogram as , labeled later as  $\omega^M$ ,
- d) total effect over longer time is dependent on both initial *investment*, and the level of *randomness* of the effects,
- e) all effects (utility) are cumulated,
- f) the decision making rule, applied to the time period  $t$ , influences area  $\omega$  in time period  $t+1$ .

The authors of the paper argue that the DM rules implemented, form the pattern of the future development. A DM-rule directs the development of infrastructure and their potential economics. The agricultural pattern of the area in Fig. 3 is changed to a more economically intensive exploitation. Decision rules orchestrate the evaluation.

The evaluations enable a management decision about possible: a) state, b) changes, c) acceleration, d) volatility, etc. The example in Fig. 3 and in subsection chapter 2.3 presents the evaluation of a localization of the structural investments. The forthcoming periods (years) are evaluated (read that table processor elements  $\omega_x$  are evaluated) by a decision rule given for instance as

**IF** (segment  $\omega_x$  shows in previous time period growth, that it is higher than the given limit)

**then yes**  $\Rightarrow$  increase in the actual time period by  $\alpha$  %;

**no**  $\Rightarrow$  **IF**(the surrounding of segment  $\omega^M$  was growing in the previous period) (10)

**then yes**  $\Rightarrow$  random increase by a high (optimistic) assessment;

**no**  $\Rightarrow$  low random increase assessment)).

The relation (10) can be written in the form close to the table processor entry as

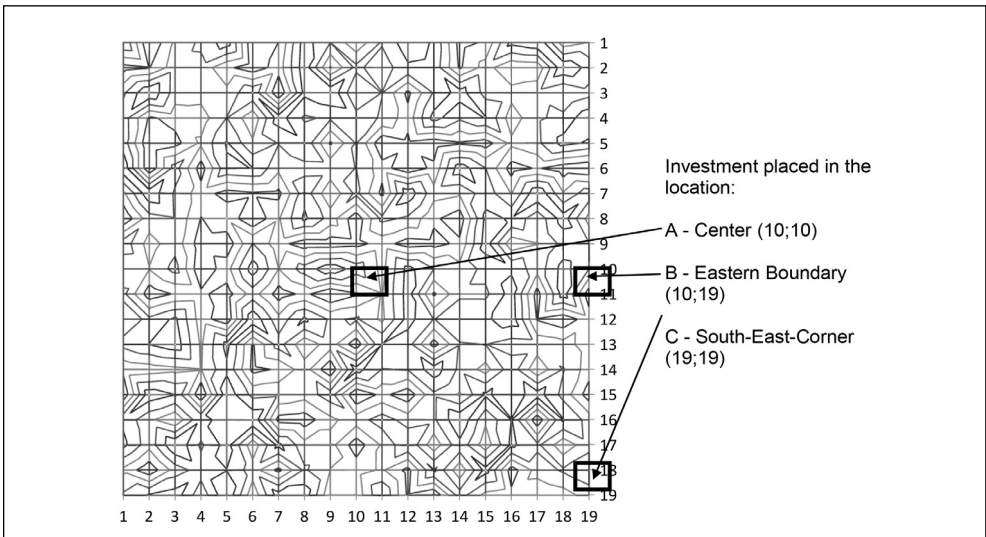
$$\begin{aligned}
 &\text{IF } (u_{t-1}(\omega_x) \geq I \cdot \text{index of required growth} \\
 &\text{then } u_t(\omega_x) = u_{t-1}(\omega_x) \cdot \text{index of required growth} \cdot R_1 \\
 &\text{or else IF } (\text{surrounding } u_{t-1}(\omega_x^M) \geq I) \\
 &\text{then } u_{t-1}(\omega_x^M) \cdot R_2; \\
 &\text{or else } u_{t-1}(\omega_x^M) \cdot R_3)
 \end{aligned}
 \tag{11}$$

where R is the random-number generator with required probability density distributions  $R_1, R_2, R_3$ ,

I is initial investment implemented into area,  $\omega_x$  is particular element x of area  $\omega$ ,

**Fig. 3:**

**Agricultural area, random conditioned utility simulations: resulting utility range is min 79.8 to max 82.7 units**



Source: own

$\omega_x^M$  is Moore neighborhood of the element  $x$ ; surrounded by 8 elements,  
*index of growth* is calculated as  $e^{\alpha t}$  where  $\alpha$  is an expected growth factor.

To simplify interpretation, we assume that the infrastructure is starting on agricultural land (without revitalization, land reclamation, environmental restoration, etc.). Any investment creates the effects in  $t$ , according to the rules, mentioned before in a) to e); the effects are dispersed and calculated according to (10) and (11).

### 2.3 Meta-Analysis

The described approach can be interpreted and generalized to a large range of development situations, and the precision and accuracy of the calculation can be improved if a denser grid is used. More realistic information may increase the detected interpretation effects. For the protection of property rights in the most practical examples, we use further for our illustration a metadata simulation, based on the historical locality specified in Fig. 2.

### 2.4 Location of Investment – Comparison

The location of investment  $I$  in area  $\omega$  is an important economic step that creates a utility  $U_t(\omega_{ij})$  for the particular investment in period  $t$ . A feasibility study of an individual *solo* investment, without respect to the spread (read as impact) on the  $\omega$ , does not enable description of the long term utility effects. More about the evaluation and localization of an area is written in (Zang, 2012; Žižka, 2010). The category includes the location indicators, quotients, shift-share analysis, the Gini coefficient of localization, the Ellison, Glaeser agglomeration index etc. The economic impact of the location will be visible if we change the investment location; the initial investment locations are in center “A” and then in the site boundary “B”, and in the south-east corner of the area described as “C”, see Fig. 3. Experimental results as the sum of utilities is written as  $U_t(\omega)$ , and are presented in Tab. 2.

The simulated sum of utilities  $U_t(\omega)$  for location of  $I$  in  $\omega$ -areas A, B, C for the intended investment in Fig. 2, illustrate the expected benefits. The ranges of *min* and *max* differs.

Tab. 2:

**Simulation results: Investment  $I = 1$  located in A, or B, and C; expected effectiveness  $\alpha = 1.05$  provides  $U_t(\omega) \geq I$  with volatility 10%; for  $U_t(\omega) \leq I$  is volatility 5%**

Location $I = 1$ for areas A, B, C		<i>min</i> Sum $U_{t=10}(\omega)$	<i>max</i> Sum $U_{t=10}(\omega)$	Expected $U_{t=10}(\omega)$	Dispersion $\sigma$
Center (10, 10)	A	178.38	420.19	322.70	48.96
Eastern boundary (10, 19)	B	207.08	426.85	306.47	44.38
South East corner (19, 19)	C	185.10	375.12	298.03	40.90
Area utility for agriculture	D	112.61	354.98	253.18	47.89

Source: own

Note: 1. Dispersion is given as standard deviation  $\sigma = \sqrt{E[(X - \mu)^2]}$ ,  $E[X] = \mu$   
 2. See relations to (Tab. 2). in (Fig. 3).

The differences between the *max* and the *min* utility  $U_{t=10}(\omega)$  are high. In practical applications the technical conditions are sophisticated, and the situation speaks even more strongly for the use of the advanced quantification methods. These offer the application of the optimization techniques in (Fotr, Plevný, Švecová, & Vacík, 2013) which “...aims to specify the problem of optimization of development of a project portfolio under risk (optimal allocation of scarce resources)”. In Appendix there is a visualized situation with some limits of growth. The

restrictions create investment limits (river, transit-road, eco-corridor, parks, and forest) and change the potential spread of development, see Appendix Fig. A1. For simplicity, the optimization was not applied. However, the simulations of the utility parameters are the necessary basis for formulation of the objectives and optimization function.

Actually:

1. the territory development is caused by random variations of market conditions in a determined region,

2. from the middle term view, development in a territory is influenced by all the urbanization phases from the past,
3. the highest development in a territory (Fig. A1) doesn't have to appear only in the initial segment, chosen for the investment (see dispersion effect in Fig. 4a, b),
4. shift in the segments with the highest custom (utility) effect in the area change the proportion according to the time of influence.

The results and properties of a real urban simulation can be described in the form of analysis and particular simulations for  $t = 1, t = 2, \dots$ , and can provide answers to the questions:

- a) to what extent is it rational to assume that the territorial development is unique?
- b) to what extent is the final initiating effect of the starting investment unique?
- c) what are the criteria expedient for investment in the urbanized district?

Each territory is a singular entity. Questions in this category can be answered only by a simulation. Appendix interprets in Fig. A1 the simulated benefits in the area with restrictions (limits), and the infrastructure investments are placed and start from the South-East corner. The simulated area includes limits, such as a small water flow or a road. Both limits represent obstacles to additional investment requirements, bridges, and auxiliary communications. The development profiles are visible in Fig. 4a, and 4b as cumulative values in  $U_{t=1, \dots, 10}^-(\omega)$  and  $U_{t=1, \dots, 10}^+(\omega)$ . The approach allows an economic comparison of changes, encouraging the creation of new designated components and their limits.

### 2.5 Evaluation of Investment Location – Dispersion Model

The development area has its cumulative utility  $U_t(\omega)$  profile. The simulation opens out to better insight into potentials for future development.

The economic criterion of Payback Period is a short term indicator (to reach a recoup of the capital expended in an investment, or to reach the break-event point). In the simulation example as presented in Fig. 4a, b the time unit is 5 or 10 years and the dimension of the time horizon is about 50 or 100 years. The evaluation is based on expression (6) and (7). We assume that the calculation has to be realized for every single territory segment  $\omega_{ij}$ .

A commercially focused management aims for the short-term effects and paybacks. In most cases the use of such strategies is practiced due to the lack of information about the dynamics in time and the risk of investment. A more sophisticated economic understanding (DM) has to respect the reality of a long-term economy and the risk involved in the long life cycle of a substantive investment. The transfer from the extensively used areas, for example agriculture seen in Fig. 3, and a revitalization towards the intensively used ones (services, industry, housing, seen Fig. A1 constitute the potential for regional management. Commercial investors tend to respect in their development projects a relatively short time horizon (early repayment of credit). A public administration should look for *effectiveness* in the full life-cycle as  $max U_{LC}(\omega)$ . The calculation tool is appropriate for such problems in simulation.

Fig. 4a, b shows the benefits of each particular investment location and the impact on the surrounding area. Volatility in the growth of individual area segments is caused by natural relief conditions (river, road, bridges, forest, existing residential development, etc.), see Appendix Fig. A1.

The schematic aggregated development, respecting restriction on the development is given in Tab. 3. In Fig. 5 there is presented a simulation of investment located in the center of  $\omega$ . The differences in data are illustrated in Fig. 4a and Fig. 4b, and are very cautionary. The transaction costs for an ad-hoc investment location are over the life-cycle very high and indicate the price for missed economic opportunities. Fig. 6 implements Tab. 3 data into a graphic sequence. The profound consequences of a wrong localization of an initial investment are visible at the end of the *life cycle*. They extend in our simulation to many times the value of the initial investment.

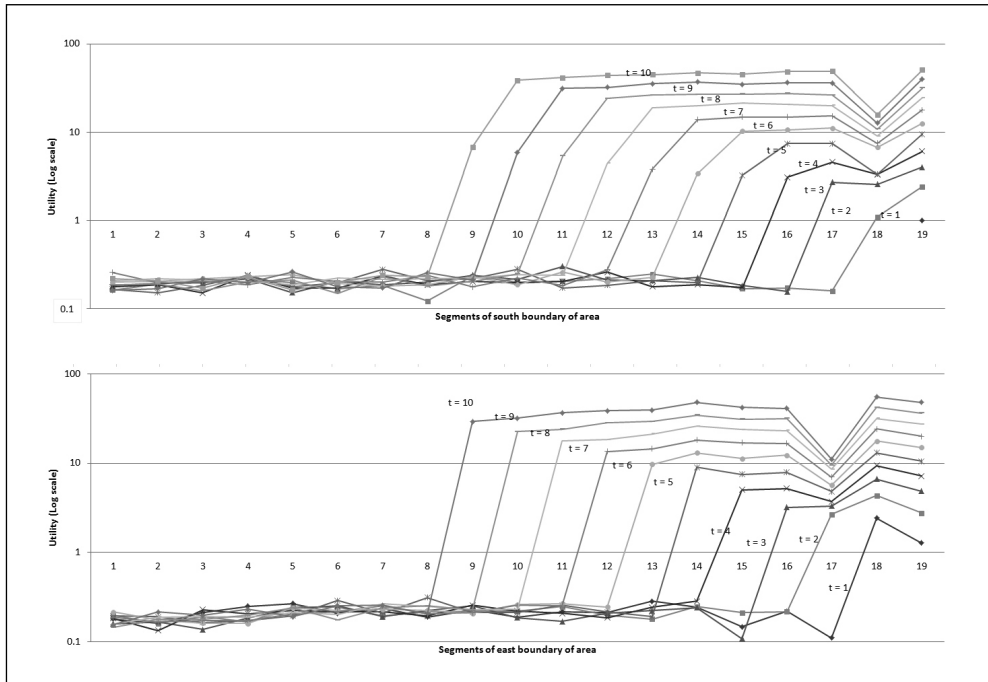
### 3. Research Results

The simulation of an RD area involves a number of situations along with a more individual view connected with the particular project, as is mentioned above. An interesting global view exists. The total and partial development revenues of disposable territory segments  $\omega_{ij}$  were mentioned in subchapter 2.1 with the expressions given in (3), (4), and (5).

The indication of main streams of utility is indicated by  $u_t^-(\omega)$  and  $u_t^+(\omega)$  in expressions

Fig. 4a, b:

Utilities  $U_t^-(\omega)$  and  $U_t^+(\omega)$  spread profiles for  $t_1, \dots, t_{10}$  as initial investment is in position C – South-East area corner ( $I_{19,19}$ ) before and after crossing river and road  
 a) matrices  $U_{t=1, \dots, 10}^+(\omega)$  presents simulation of North-South cumulative values,  
 b) matrices  $U_{t=1, \dots, 10}^-(\omega)$  presents West-East cumulative values



Source: own

(6) and (7). The practical situation illustrates Fig. 4a, b and Fig. 5; we may speak about the states in  $t = 1, \dots, h$ . Interesting for the direction of a new investment are also  $\Delta U_t^-(\omega)$  and  $\Delta u_t^+(\omega)$ . They indicate the direction of changes for  $t = 1, \dots, h$ .

We are looking for the answer to the posed question, in what direction (time, space, economics) the territory development has to be managed.

Development of a land-use plan is a factual instruction as to the direction in which future development has to go, and what constituent parts of the territory have to be used. Instruments for the complicated decision-making entailed are very few and they are mostly based solely on the long-term experience of development in the given territory.

Urbanization, as it is known today in contemporary regions and cities, is a result

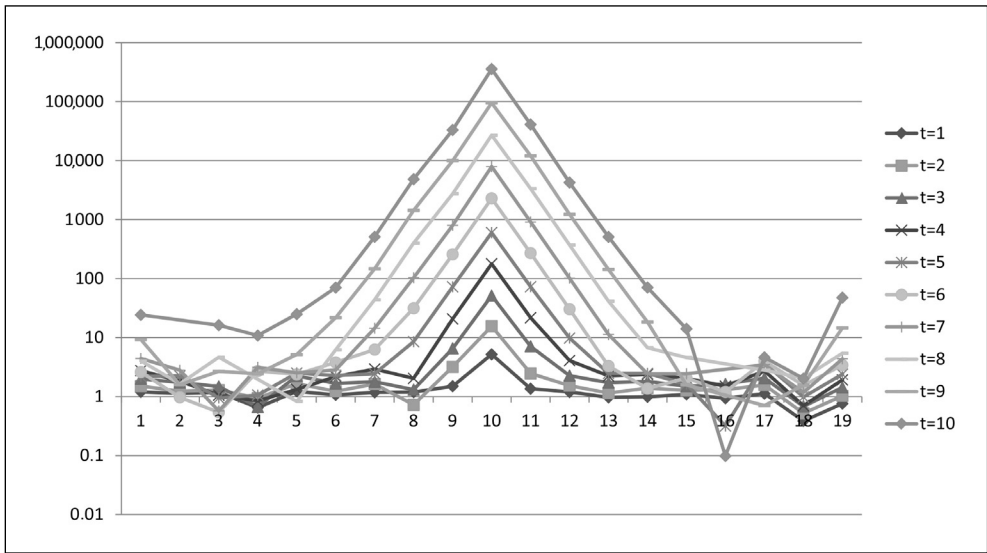
of development over several centuries, see changes from agriculture in Fig. 2 or development sequences  $t = 1, \dots, 8$  in Fig. 7.

The past development was several times slower than development at the present time. It is no exaggeration to say (at least in industrially exposed regions) that the rates of the growth of a territory burden from the viewpoint of population level, the growth of industrial production (for example GDP per territorial unit [km<sup>2</sup>], see Fig. 1), are beyond any historical comparison.

A comparison which shows that the present generation consumes the same quantity of resources and industrial assets as all previous generations is both limiting and alarming. Important details are concentrated in the so-named *Stern Report* (Stern, 2006).

Professor Stern lists the basic economic and ecological arguments that can actuate and

**Fig. 5:** Vectors  $U_t(\omega_{ij})$  for  $t_1, \dots, t_{10}$ ; the initial investment in  $\omega$  location: A – Center



Source: own

**Tab. 3:** Time sequence of simulations of  $l = 1$  localized in A, or B, and C; growth effectiveness 1.03; restriction on development are shown in Appendix Fig. A1

Utility \ t	1	2	3	4	5	6	7	8	9	10
A – Center (10,10)	19	19	23	32	51	97	174	587	2,693	16,742
B – Eastern boundary (10,19)	19	19	23	28	38	53	80	136	363	1,489
C – South East corner (19,19)	20	20	25	35	48	77	155	310	1,325	6,748
Agriculture	17	18	22	27	36	47	65	95	171	495

Source: own

also factually prove the mentioned statements. The concept, which was observable, represents a further attempt to explain the long-term behavior of territorial units in a situation when a rapid development of industrial consumption and services requires fast and competent *decision-making*. The creation of an instrument for *investment localization* is a necessity. For this complicated task there are limited SW and calculation methods available.

The proposed approach is an instrument, and an opportunity to apply simulation to the explanation of territorial and regional behavior within time and space. The paper concerns a quantification of differences between the separate functional segments of the territory.

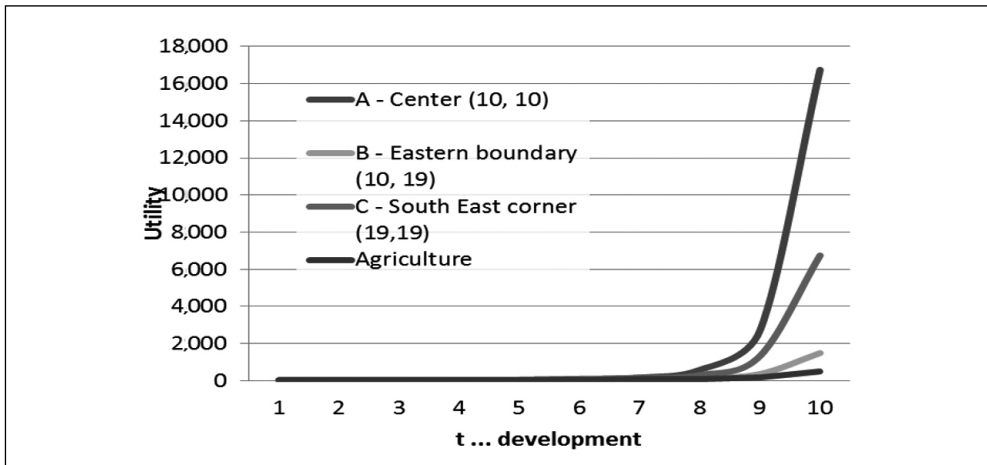
Every single territorial segment, read as  $\omega_{ij}$ , is evaluated and serves towards an intermediate decision in the moment of time  $t$ . Moreover, it has its own autonomous component of a strategy of growth within time. In the relations (10) and (11), the notion of  $\omega_x^M$  surrounding is used for the choice of expansion direction. The simulation algorithm assumes that the matter concerns the development only when the two territorial components  $\omega_{ij}$  have a common border.

### Conclusion

Ahistorical perspective (expressed as time series statistics) in present day modern economics does not have a decisive influence. A prognostic

Fig. 6:

Effects of limits (given as river, road, bridges, woods) for initial locations A, B, C in time



Source: own

calculation in the form of a continuation of time series should not and mostly does not have any causal dependence for new (efficient) decisions. New ideas and new approaches are desired, as seen in Appendix Fig. A2. In classical economics there are discussed only three basic factors of production: *land, labor, capital*. Contemporary economists consider entrepreneurship (meaning management) as a factor of production. The article points to the contribution of public capital in development and its lack of appreciation in microeconomics. In macroeconomics there is work in progress and extensive discussion (in EU, US, and elsewhere) based on arguments summarized (2014) in the book *Capital in the Twenty-First Century* by Prof. Thomas Piketty (Piketty, 2014). Macroeconomics deal mainly with fiscal instruments. Microeconomics focuses on price and benefit. The path between the simplification referred to in (2a) and a revision of public investment in the area is a challenging task. As is taxing very high incomes at 60 or 80% at macroeconomic level.

Returning to the current simulation example and to relevant results we see:

1. the *simulation rules* in terms of (11) form the long term growth of local utilities in time; see Fig. 7.
2. In terms of volatility of  $R_1$ ,  $R_2$  and  $R_3$  there are presented the benefit strengths. The

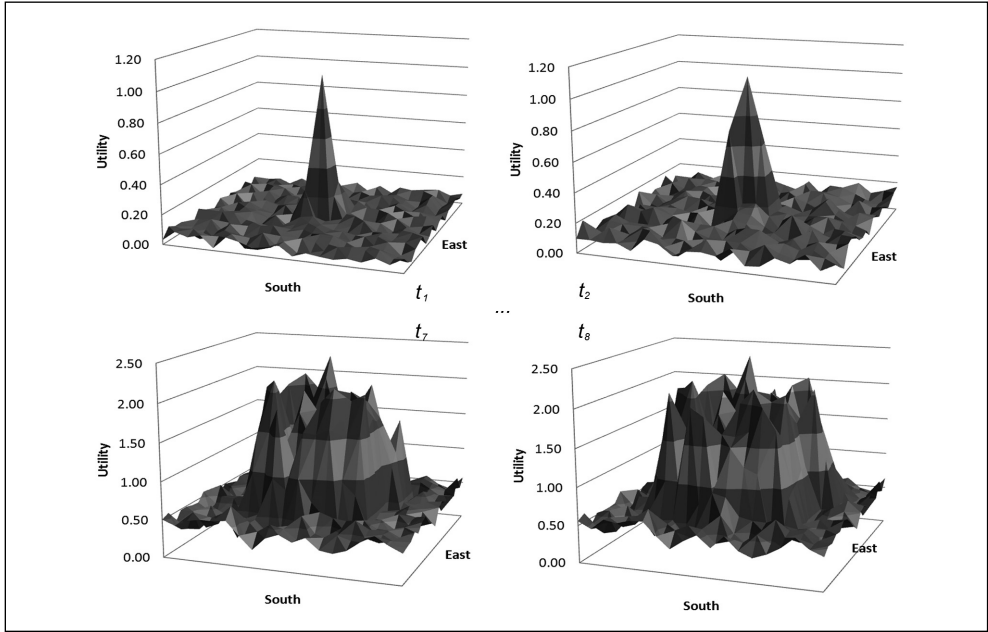
overall growth pattern (dispersion from  $\omega_{10,10}$ , A-Center) is unaffected; the overall effect shows a continuous growth, see Fig. 7 and Tab. 3.

3. The growth rate (intensity, differences) is changing over time, see Fig. 8. Moreover, the growth rate is
  - a) moving in time,
  - b) the effect (power) of the initiating investment over time loses intensity,
  - c) the initiating investment brings profit adjacent to the neighborhood; the advantage of initial investment is time-limited, (in Fig. 8 till  $t_4$  or  $t_5$ ),
  - d) predominant effects are seen growing outside the primarily initiating  $\omega_{10,10}$  investment area.

The relation of the simulation and territorial development can offer new broader views; complementary to investment efficiency and rate of return, indicated in the context of (1). The new approach may confirm or disprove the investment decisions. The long-term effects are mostly beyond the economic horizon of current practice. Particularly the GIS data enable a more sophisticated simulation of fitting together the effect within the bounds of land-use planning and investment decisions, on which there is more in (Henderson, 1986).

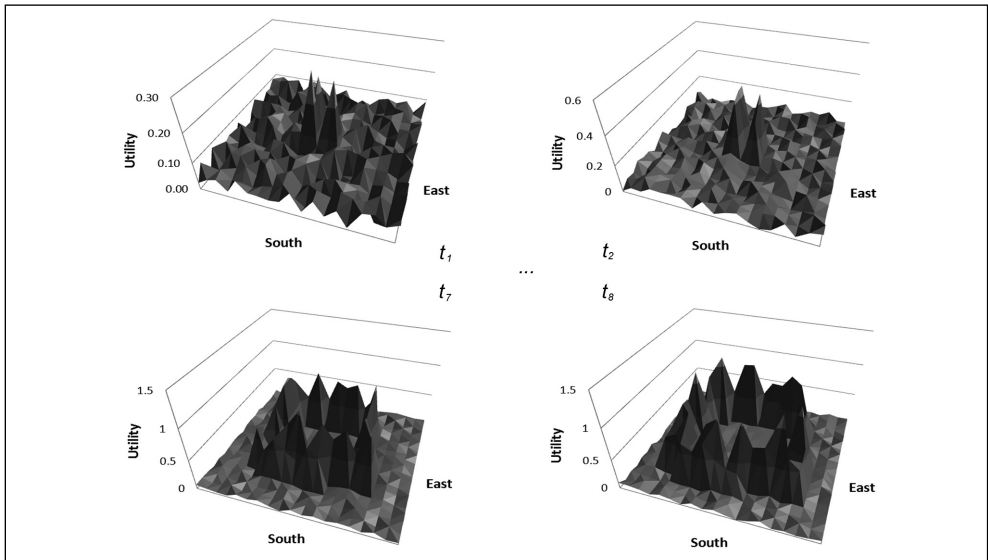
A response to efficiency in the form of calculations of investment intensity is certainly

**Fig. 7:** Simulations  $U_t(\omega)$  of utility from territorial development in time sequence after initial investment in  $\omega_{10,10}$ ; utility accumulation in time (from left to right top-down  $t_1, t_2, \dots, t_7, t_8$ )



Source: own

**Fig. 8:** Differences  $\Delta u_t(\omega) = u_t(\omega) - u_{t-1}(\omega)$  according to (3) in territory growth for investment in  $\omega_{10,10}$  in time, time development (from left to right top-down  $t_1, t_2, \dots, t_7, t_8$ )



Source: own

a good financial economic tool. In any case, it builds up to a new view on the issue of investment and the use of limited resources. On the other hand, the approach does concentrate on the interest of a decision maker in the long-term life-cycle of the territory.

By means of the simulation of development trends, intermediate segments in a territory (that is area, region, and district) can be found that demonstrate the highest added value. In many cases, unfortunately, there is a danger that any situation will be dealt with or solved before full recognition or understanding.

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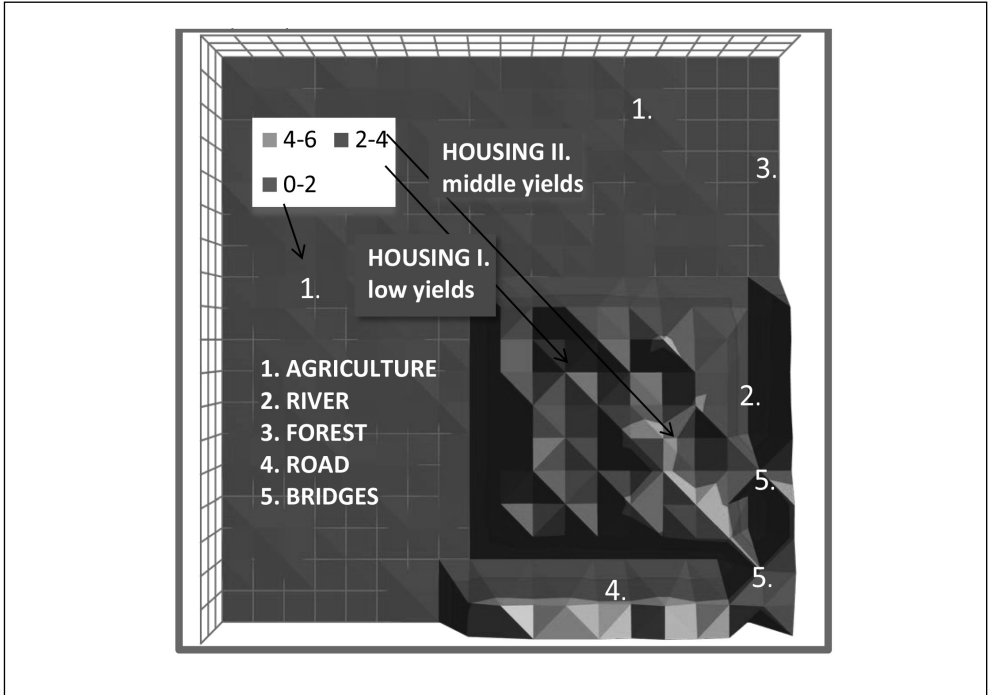
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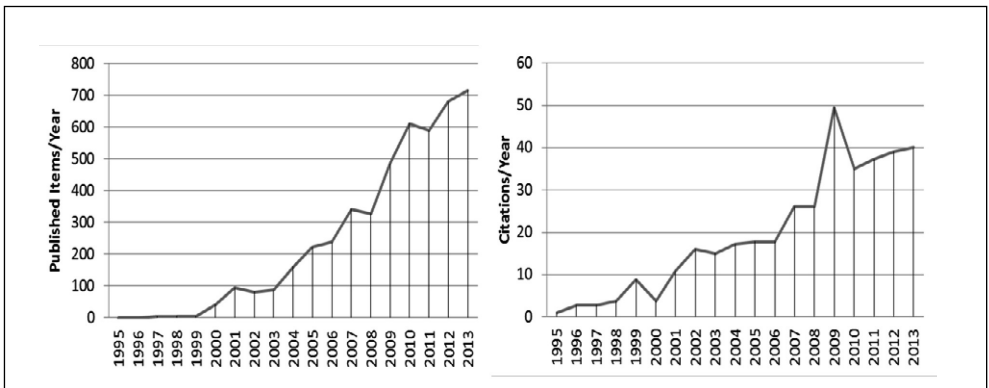
Appendix: Figures A1 and A2

Fig. A1: Simulation  $U_{t=10}(\omega)$  for framed area in Fig. 2, Initial Investment starts from south east corner (19,19). Restrictions: east vertical is river, south horizontal is road.



Source: own

Fig. A2: Published items and citations (from 1995 to January 2014) for topic chain: urban development and cellular methodology



Source: own based on Database ISI

## LONG-TERM INFRASTRUCTURE INVESTMENT: A NEW APPROACH TO THE ECONOMICS OF LOCATION

Petr Dlask, Václav Beran

*Contemporary modern development of a region (RD) is associated with some conception of economic volatility and technological knowledge. The RD is triggered by the existence of an infrastructure as a threshold. Only then can we expect the long-term economic and regional effects. From the long-term view, the development of most regions is also associated with a surprising diversity. The reasons for growth or stagnation are very often indistinct, and in some cases they are even unidentifiable.*

*Existing development is a materialized foot print of earlier economic activities and there is more about that, for example, in *Quality of life in cities*, (European Commission, 2013). We should understand the economics of RD as an account; an account of either poor or successful regional management. In other words, regional economics and management (E&M) is at its causal roots a proof of the right or wrong decision rules and their implementation. This article argues that the state of municipalities and of regions is only partly a hostage of the regional investment economy and that a non-negligible way to success is paved by decision making processes especially through the use of certain decision criteria.*

*The paper aims to demonstrate that:*

- a) an elementary decision rule determines the decision space determining both time and conceivable actions, (timing of innovations, use and functions of areas, implementation of particular investments, localization of research directions, market expansion, etc.);*
- b) dispersion effects are around and outside the primary investment that generates the growth;*
- c) the burnout effect of the initial investment exists and begins to act after a certain time period;*
- d) fixing the time of the initial investment burnout is identifiable and can be calculated.*

*Point c) and d) represent triggers for any need of new investments, usually called innovation, modernization, reconstruction etc.*

**Key Words:** *Development, utility, simulation, infrastructure, evaluation, metamodel.*

**JEL Classification:** *C63, C81, O18, R58.*

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# REGIONAL ECONOMIC EFFECTS OF THE EUROPEAN CAPITAL OF CULTURE PROJECT: THE USE OF INPUT-OUTPUT ANALYSIS

*Marta Nosková*

## Introduction

Topics such as economy of culture, the impact of culture on the economic development of regions, or multiplier effects of culture have begun to be quite popular in recent years not only in foreign literature, but also in the Czech Republic, where the evaluation research is rather rare (Slach & Ježek, 2015). Good examples might be the works of Raabová (2010), who studied the cultural sectors in the Czech Republic and their effects on the economy, Llop & Arauzo-Carod (2011), who studied economic impact of a new museum, Herrero et al. (2006), who analysed the effects of the European Capital of Culture 2002 Salamanca, or Dunlop et al. (2004), who dealt with the economic effects of cultural industries in Scotland.

Culture can be defined according to Oxford Advanced Learner's Dictionary of Current English (2002) as a general term for art, music and literature. The first efforts to determine its value occurred in the 1990s in England when this subject was actively treated by local government. Arts and culture was until then seen only as a marginal part of the economy and mostly dependent on public subsidy. "Advocates of the creative industries idea believed that this was too narrow a view" (British Council, 2011, p. 15) and wanted culture to be understood for its true contribution. Under the new term cultural and creative industries they did not recognize "just the traditional art forms such as theatre, music and film, but service businesses such as advertising (which sell their creative skills mostly to other businesses), manufacturing processes that feed into cultural production, and the retail of creative goods" (British Council, 2011, p. 15). Thus from this broad classification, it is clear that the impact of

cultural and creative sector is very significant. Also the European Commission acknowledges that it employs more than eight million people and produces about 4.5% of European GDP (European Commission, 2013). It is also clear that the economic impact of culture (respectively cultural and creative industries) generally is too broad topic, within which it is possible to deal with cultural impacts (theatre, movie, arts etc.) as well as the impacts of film industry, architecture, book industry and others. Thus it is advisable to narrow the topic.

In this paper, the attention will be paid to the European Capital of Culture (hereinafter referred to as "ECoC"), which is a title awarded annually to two cities in Europe, where varied cultural programme is then implemented during the year and often also some investment in the local cultural and recreational infrastructure is made. ECoC aims "to safeguard, develop and promote European cultural and linguistic diversity, to promote Europe's cultural heritage and to strengthen the competitiveness of the European cultural and creative sectors, in particular that of the audio-visual sector, with a view to supporting smart, sustainable and inclusive growth" (Decision No 445/2014/EU, p. 2). In terms of ECoC, culture is seen as goods and services "consumed" on the spot (e.g. a concert) as well as production of cultural products aimed at mass reproduction (e. g. a book) and activities such as design or architecture (European Commission, 2006). This approach will be used in this paper.

ECoCs are very often analysed for its economic impacts on country, region or city. The most famous evaluation report is Palmer report (2004) that assesses the overall impacts of ECoCs 1995-2004, where a part is dedicated

to economic impacts. Other very sophisticated reports were made for ECoC 2008 Liverpool including some that analysed economic impacts (Impacts 08, 2010). Also already mentioned Herrero et al. (2006) dealt with impacts of ECoC as well as Hudec and Džupka (2014), who studied culture-led regeneration of the city on the example of Košice (ECoC, 2013). In addition, there are regularly published several reports summarizing the impacts of the particular ECoC.

In 2015 the Pilsen Region in the Czech Republic became the centre of various cultural activities as a result of the “ECoC 2015” title obtained by the City of Pilsen. Recently, the title has been awarded to medium sized cities (e.g. Pécs, Maribor, Kosice and Pilsen) in comparison to the cultural centres that obtained the title earlier such as Athens, Paris or Florence. The title can help build the image of a cultural metropolis and also contribute to the development of chosen cities, not only thanks to the aforementioned investments, but also thanks to attracting tourists from all corners of the world (assuming that everything is supported by high-quality city marketing – see Ježek (2010)). Attracting visitors and the resultant economic benefits are often one of the main interests of particular ECoC (Liu, 2014) and are also the main consequences, because according to Šebová et al. (2014, p. 655) there may be “link between the European Capital of Culture (ECoC) designation and the development of cultural tourism in Europe”. Thus the ECoC title can serve as a great example to show that culture does not have to be only a non-profit activity, but it can also bring considerable funds to the region, especially in case of major cultural events, such as the ECoC.

Recently, economic effects of culture are often calculated using multipliers derived from input-output tables (e.g. Herrero et al., 2006, Llop & Arauzo-Carod, 2011, or Impacts 08, 2010). This paper aims to indicate the possible impacts of Pilsen ECoC 2015 project using the input-output modelling as well. The input-output analysis is usually made for the whole countries, because it is derived from the national symmetric input-output tables published by local statistical office. However, ECoC projects have mostly regional or even only municipal economic effects, because culture is mainly concentrated in large cities

(Slach et al., 2013). In the case of Pilsen ECoC 2015 project the mostly affected would be naturally the City of Pilsen. However, some events of Pilsen ECoC 2015 project took place outside the City of Pilsen and thus some funds were spent elsewhere in the region. Moreover it is not possible to derive symmetric input-output tables for the City of Pilsen (because of lack of municipal data).

Thus in order to calculate economic impact of Pilsen ECoC 2015 the regional input-output tables for the Pilsen Region were compiled and then were derived appropriate multipliers for industries that are related to culture (culture in this case is understood as a collective term of art, music and literature) or may be affected by a larger increase of tourists due to the interesting cultural programme (accommodation, meals, transportation, etc.) This paper aims only to indicate the effect of ECoC on the region as well as to show the economic importance of culture generally. It is not yet possible to assess the exact economic impact of Pilsen ECoC 2015 project because the resulting multipliers needs to be multiplied by data that are not yet processed and the calculation of this impact is a subject of the future research.

The first part of this paper deals with a selected method of calculating the multipliers, i.e. input-output analysis. First, it is introduced and then the procedure of multiplier derivation from the symmetric input-output tables published by the Czech Statistical Office is briefly explained. However, the crucial part of the paper is the computation of the regional input-output tables for the Pilsen Region. Compiling these tables for smaller territorial units (compared to countries) is not common and even the Czech Statistical Office does not compile them. Nevertheless, there are several methods to estimate them, even though it is not a commonly treated subject. In the Czech Republic, for example, Bednaříková (2012) estimated input-output tables for the Vysočina Region. In the last part of the paper, the multipliers are calculated and the results are presented.

## **1. Input-Output Analysis**

In the thirties Wassily Leontief published his essay “Quantitative Input-Output relations in the economic system of the United States” (1936). The main idea of his work was that “economic activity of the whole country is

visualized as if it were covered by one huge accounting system" (Leontief, 1936, p. 106). Each business enterprise from all branches of industry, agriculture, transportation as well as private persons and their budgets are treated as a separate accounting unit. The table includes all purchases and sales within a period of time (usually a year) in the country and it is balanced. It is in fact the table of inputs and outputs of the whole economy.

Although he was rightly first in input-output modelling, he was not the only one who addressed himself to these ideas. Quesnay Francoise, who compiled the so-called "Tableau Economique" in 1758, is often considered to be his predecessor. It describes economic production using a tabular array. This issue was also greatly contributed to by Leon Walras with his analysis of the overall balance from 1954. According to Bednařiková (2012), the input-output analysis is actually an effective application of the Walrasian general equilibrium analysis, namely due to the fact that it is composed of "a system of simultaneous equations describing the demand for the supply of sectorial outputs" (Bednařiková, 2012, p. 267).

The fifties of the 20th century were the period of the greatest expansion of the input-output modelling in the USA. Scientists in the USA developed this model not only for economies of entire countries, but also for regions or industries, and found that it can be utilized for the development policy and planning (Impacts 08, 2008). For instance, Isard (1953) dealt with regional and inter-regional commodity flows in order to build a regional input-output model and also Leontief elaborated this issue in his book entitled "Input-Output Economics" from 1951 (1986).

## 2. Multipliers in General

The input-output analysis is nowadays bound up with the terms of multiplier effects and multipliers. However, it is necessary to note that the original Leontief's concept does not operate with multipliers at all and their connection to input-output analysis occurred later. The idea of the multiplier effect and multipliers was first introduced by Kahn (1931) in his paper called "The Relation of Home Investment to Unemployment", but it was more fundamentally developed by Keynes in his famous work entitled "General Theory of Employment, Interest and Money" (1936).

The mostly used multipliers nowadays are multipliers type 1: (direct + indirect effects) / direct effects where the result of 2 means doubling the direct effects and the type 2: (direct + indirect + induced effects) / direct effects, which includes the increased economic activity caused by household expenditures occurred as a result of their increased income due to the higher economic activity of companies. (Bednařiková, 2008; The Scottish Government, 2011). Type 1 multiplier is used more frequently and can be derived from unmodified published symmetric input-output tables. The calculation of type 2 multipliers requires only simple modifications of published tables.

## 3. Symmetric Input-Output Tables in the Czech Republic

Symmetric input-output tables (hereinafter referred to as "SIOT") constitute the basis of Input-Output (hereinafter referred to as "I-O") analysis. They show flows between all sectors of the economy, i.e. inputs and outputs of each sector of the economy (in the Czech SIOT there are 82 sectors according to the CZ-CPA classification). Each sector is showed both in one row and one column, i.e. SIOT show both the demand side (columns) and the supply side (rows). For a better explanation see Tab. 1, which shows a simplified SIOT with three fundamental sectors.

To calculate output multipliers, the following tables are needed: a transactions table (SIOT), a table of technical coefficients, a table of comprehensive consumption coefficients.

The supply side (rows) shows that the overall resources are either consumed in the production process (intermediate consumption,  $z_{ij}$ ) or they are used finally ( $y_j$ ). As for the demand side (columns), it is evident that the resources are produced by inputs of intermediate consumption ( $z_{ij}$ ) and added value ( $v_j$ ). The equality of total resources is expressed by two equations, which "create a balanced model from which all other relations within the structural analysis are derived" (Rojčček, 2007, p. 135).

Another table, which must be compiled, is a table of the input coefficients (also sometimes referred to as direct coefficients, direct consumption coefficients or direct requirement coefficients). The input coefficients matrix is calculated by normalizing data in SIOT according to the line of total resources, i.e.,

**Tab. 1: Transactions table**

Inputs\Outputs	Intermediate consumption			Final use in total	Used resources in total
	Primary sector	Secondary sector	Tertiary sector		
Primary sector	$z_{11}$	$z_{12}$	$z_{13}$	$y_1$	$x_1$
Secondary sector	$z_{21}$	$z_{22}$	$z_{23}$	$y_2$	$x_2$
Tertiary sector	$z_{31}$	$z_{32}$	$z_{33}$	$y_3$	$x_3$
Value added	$v_1$	$v_2$	$v_3$		
Resources in total	$x_1$	$x_2$	$x_3$		

Source: Own table according to CSO (2014) and Rojíček (2007)

**Tab. 2: Input coefficients matrix**

Inputs/Outputs	Intermediate consumption		
	Primary sector	Secondary sector	Tertiary sector
Primary sector	$a_{11} = z_{11}/x_1$	$a_{12} = z_{12}/x_2$	$a_{13} = z_{13}/x_3$
Secondary sector	$a_{21} = z_{21}/x_1$	$a_{22} = z_{22}/x_2$	$a_{23} = z_{23}/x_3$
Tertiary sector	$a_{31} = z_{31}/x_1$	$a_{32} = z_{32}/x_2$	$a_{33} = z_{33}/x_3$

Source: Own table based on Impacts 08 (2008)

$A_{ij} = z_{ij} / x_j$  (see Tab. 2). The input coefficients matrix expresses the view of a customer (demand-oriented I-O model). These input coefficients, or direct consumption coefficients, indicate how individual intermediate products contribute to the production of one product of a particular sector and show the so-called “backward linkages” (Rojíček, 2007; Impacts08, 2008).

Table 2 shows normalization of transactions table. Here  $a_{ij}$  indicates how much of one product of industry  $j$  is created by the input from the  $i$  industry. After obtaining the input coefficients matrix that actually shows direct consumption, it is necessary to include indirect consumption as well. The procedure is as follows: the matrix of direct consumption coefficients is subtracted from the unit matrix and the inversion matrix is created from the resulting matrix. Such a compiled matrix is called a matrix of comprehensive consumption coefficients and the coefficients themselves are called output multipliers. If the values in individual columns of the matrix are added together, the output multipliers for the entire industry are obtained.

These are multipliers of type 1. To calculate the multipliers of type 2, it is necessary to

include households into the matrix of direct consumption coefficients, and thus another row (“wages and salaries”) and another column (“final consumption expenditure of households”) are added. The specific steps for calculating these multipliers are stated, for example, in the methodology of The Scottish Government (2011) or the Australian Bureau of Statistics (1995). In this article, however, multipliers of type 2 will not be used at all, because there are not enough data for calculating them for the regional tables. Multipliers (either type 1 or 2) calculated by the method described above are called output multipliers and indicate by how much the production of the entire economy (or more precisely the region) will increase if there is an increase in demand for the production of industry  $i$  by one unit. However, according to Raabová (2010), these multipliers can often be considerably distorted (all intermediate consumption is included, and thus if a product is only traded in it will incorrectly be included in the calculation of the multiplier several times). Other types of multipliers help to solve this issue: the gross value added multiplier, the income multiplier and the employment multiplier.

Therefore, the value added multiplier (gross) does not include intermediate consumption. It indicates by how much the gross value added increases in the economy if the demand for the output of the selected sector increases by one unit. To calculate the value added multipliers, it is necessary to know the value of the coefficient vector  $g$ , which indicates how the gross value added participates in the production of one output unit of a particular sector (it is the row vector of added value from the normalized SIOT). This vector is then multiplied by the Leontief inverse matrix in order to include other rounds of consumption and the vector of value added multipliers for individual sectors is obtained (Economic Impacts, 2011).

Income multiplier can be calculated similar way. It shows by how much the income from wages, salaries and social transfers, i.e. "compensation of employees" (the sum of "wages and salaries" and "employers' social contributions" from the published SIOT), will increase in the whole economy if the demand for the production of selected industry increases by one unit. To calculate it, the vector of coefficients  $i$ , specifying how the compensation for employees participates in the production of one output unit in a particular sector (corresponding vector from the normalized SIOT), is needed. This vector is multiplied by the Leontief inverse matrix again, and the income multipliers for individual sectors are obtained (Australian Bureau of Statistics, 1995).

It is also possible to calculate the same way employment multipliers using the vector  $e$ . However, this one cannot be obtained from the standardized SIOT, but from other sources, as it is calculated as a quotient of the number of persons employed in the sector to the production generated by the respective sector (Australian Bureau of Statistics, 1995). These multipliers indicate how many new jobs will be created throughout the economy if the demand for the output of selected industries increases by one unit.

#### 4. Regional Multipliers

According to Fjedlsted (1990), multipliers calculated for a large area cannot be applied to a small area. It is due to the logical assumption that regional multipliers are lower than the national ones because regional economies, unlike national economies, tend to be more open (there are higher leakages),

as, for example, there are fewer suppliers and employees in the smaller area and very often external resources must be used (Macháček et al., 2013). Therefore, if the tables calculated for the whole country were used for the calculation of multipliers of lower regional levels, the resulting data would be greatly overestimated. Thus, if the I-O analysis has to be made for a smaller area than the entire country, i.e. for the national level (for which the SIOT are regularly published), it is necessary to use a suitable method to compile the appropriate tables.

Since the development of I-O models, many researchers have begun to deal with the regional I-O models. One of the first ones was already mentioned Isard (1953), but as Hewings and Jensen (1986, p. 302) mentioned, his model "has rarely been implemented empirically". This issue was also dealt with by Morisson and Smith (1974), who identified two basic approaches to creating regional I-O tables. They state that analysts can either "collect all or some of the data through empirical survey, or can attempt to produce an I-O table from the available published statistics" (Morisson & Smith, 1974, p. 2). They also specify that the first option will be the most expensive and the second the least accurate.

Hewings and Jensen (1986) have given a more detailed overview of different methods for compiling regional tables, which they have divided into four basic approaches: commodity-based methods, survey-based methods, non-survey methods and hybrid approaches. The first approach can be applied in very rare cases where there are detailed data on inputs and outputs at the regional level for every sector available. In this case, one can construct regional I-O tables using the same methods as for the national ones. The second is the survey-based method, which, in order to construct I-O tables, uses primary data obtained through questionnaires completed in businesses, organizations and from other sources, and from them buying and selling behaviour formulae are derived. These data are then processed and the respective I-O tables are derived from them. The method is very demanding in terms of resources and time. The third are the so-called "non-survey methods", and they are based on deriving regional tables from the national ones. Hewings and Jensen (1986) define three basic approaches to their deriving: using commodity balance tables, the quotient

approach and the iterative approach. The fourth and most recent approach to compiling the regional tables is a hybrid approach. It uses the attributes of both non-survey and survey-based methods. Using these methods, the preliminary table is first constructed, into which the survey results, i.e. primary or preferred data, are subsequently included. There are several methods of the hybrid approach and their characteristics are presented by Hewings and Jensen (1986). One of them is the GRID method (Generation of Regional Input-Output Table), which was successfully used in the Czech conditions (Bednařiková, 2012). The method was introduced by Jensen et al. (1979) and consists of several steps. At first, it is necessary to calculate the national technical coefficients from the national table and then to recalculate the national coefficients into the regional ones using location quotients. Subsequently, more specific data are entered (e.g. from questionnaires) and very often the aggregation of data for sectors occurs.

Having considered all possible alternatives for calculating the regional I-O tables, the most appropriate way to calculate the regional table for the Pilsen region has been the one using some of the recommendations for the GRID method, but also taking into account the fact that the conversion should primarily be based on the use of location quotients, namely the latest quotient FLQ.

The specific calculation procedure will be described according to contemporary authors, such as Flegg and Webber (1997), Golemanova and Kuhar (2007), Kowalewski (2012), Bendařiková (2012) and Flegg and Tohmo (2013), as well as according to authors who introduced these methods to the world or who have actively dealt with them after their development, e.g. Morrison and Smith (1974) or Round (1978). The calculation of regional SIOT consists of several basic steps (they will be described according to Golemanova and Kuhar (2007)). The first step is the adjustment of the national I-O table, the next one is the computation of the regional direct requirement matrix, aggregation of regional sectors and the computation of the complete regional I-O tables.

According to Golemanova and Kuhar (2007), the adjustment of the national I-O table means deleting the intra-sectoral flows in the main diagonal of the national SIOT, because the transactions that appear to be intra-sectoral

at the national level will become imports at the regional level in most cases and their entering in the table could cause an overestimation of the regional intermediate consumption. This premise has already been mentioned by Morrison and Smith (1974), who, however, have clarified that it may not always be applicable, especially for larger regions, where transactions within sectors may be expected. In smaller regions, these authors recommend to enter zeros into the principal diagonal of the direct requirements matrix, but only for some sectors (e.g. for the manufacturing and construction industries, but not for the services sector).

The next step in the calculation is computation of the regional direct requirement matrix. Here, location quotients, which convert the national coefficients into the regional ones, are used. Calculations of these quotients can be based on various indicators of economic activity (output, employment, sales, etc.), but it is difficult to find a scientific work that would use another criterion than employment (other data are not usually available). There are several types of quotients (see Morrison & Smith, 1974), but the most commonly used ones are SLQ (Simple Location Quotient), CILQ (Cross-Industry Location Quotient) and FLQ (Flegg-Weber Location Quotient). The first two were commonly used in works from the seventies and the FLQ was introduced in the nineties. Thanks to these quotients it is possible to estimate regional trading coefficients that state "the proportion of regional requirements met by firms located within the region" (Flegg & Webber, 1997, p. 796).

The methods using location quotients are based on assumptions that technologies do not differ at the national and regional levels (i.e. companies at national and regional levels use the same ratios of different inputs to produce individual outputs), but the technical coefficients do differ, namely to the extent to which goods and services are imported from other regions (proved by Flegg and Tohmo (2013)). Therefore, one can write that  $a_{ij} = r_{ij} + m_{ij}$ , where  $a_{ij}$  is a national direct consumption coefficient,  $r_{ij}$  is a regional direct consumption coefficient (input coefficient) and  $m_{ij}$  is a regional import coefficient (Morrison & Smith, 1974). Coefficient  $r_{ij}$  can be defined as the amount of regional input  $i$  consumed to produce one unit of regional gross output  $j$  (Flegg & Webber, 1997). Imports

from other regions and from abroad are then expressed as coefficient  $m_{ij}$ .

This approach suggests that regional direct consumption coefficient must always be lower than or the same as the national direct consumption coefficient, i.e.  $r_{ij} \leq a_{ij}$ . Regional direct consumption coefficients are thus estimated as follows:  $r_{ij} = a_{ij} * q_{ij}$  where  $q_{ij}$  represents the modification of the national coefficient (Kowalewski, 2012). This  $q_{ij}$  can be made identical with the above mentioned trading coefficient (marked  $t_{ij}$ ), which expresses how much of the required inputs in the region can be provided by local businesses. This coefficient can range from  $0 \leq t_{ij} \leq 1$  (Round, 1978) and the method of its calculation depends on the type of location quotient (general  $q_{ij}$ , or  $t_{ij}$  is thus replaced by the selected quotient). The most commonly used and simplest one is SLQ, which is for the sector  $i$  defined as follows:

$$SLQ_i = \frac{E_i^R/E^R}{E_i^N/E^N} \quad (1)$$

where  $E_i^R$  is a regional employment in the sector  $i$ ,  $E^R$  is the total employment in the region,  $E_i^N$  is the national employment in sector  $i$  and  $E^N$  is the total national employment. Thus, the indicator measures the concentration of the selected sector in the region in comparison with the level of a higher territorial unit (the country). Intuitively, it can be deduced that if  $SLQ_i > 1$ , the sector is more concentrated in the analysed region than in the entire country and if  $SLQ_i < 1$  than it is less concentrated. These features may be used in the conversion of national input coefficients to the regional ones. If  $SLQ_i > 1$ , it can be assumed that the sector in the region is able to meet the requirements of demand for its goods and services within the region and the regional direct consumption coefficient is thus equal to the national one ( $r_{ij} = a_{ij}$ ). The same applies if  $SLQ_i = 1$ . However, if  $SLQ_i < 1$ , then it can be assumed that the industry in the analysed region needs to import from other regions to be able to meet the requirements of demand for its products and services, and thus  $r_{ij} = a_{ij} * SLQ_i$ .

One of the first improvements of this quotient was CILQ, which reflects the supply-demand relations between sectors. The quotient compares the proportion of regional employment of the selling sector  $i$  to the national one with the proportion of the regional

employment of the buying sector  $j$  to the national one. The formula takes the following form:

$$CILQ_{ij} = \frac{E_i^R/E^R}{E_j^R/E_j^N} \quad (2)$$

where  $E_i^R$  is the regional employment in sector  $i$ ,  $E^R$  is the national employment in sector  $i$ ,  $E_j^R$  is the regional employment in sector  $j$ ,  $E_j^N$  is the national employment in sector  $j$ . It is also possible to write:

$$CILQ_{ij} = \frac{SLQ_i}{SLQ_j} \quad (3)$$

If  $CILQ > 1$ , it indicates that the regional selling sector  $i$  is able to satisfy all the requirements of the regional buying sector  $j$ . In that case no modifications of national direct consumption coefficients are required and  $r_{ij} = a_{ij}$ . The same applies if  $CILQ = 1$  (if it is not in the diagonal – see below). If  $CILQ < 1$ , then the regional selling sector  $i$  is unable to meet all the requirements of the regional buying sector  $j$  and imports are necessary. In this case, the national direct requirements coefficient must be modified as follows:  $r_{ij} = a_{ij} * CILQ_{ij}$ .

Using CILQ has its pitfalls, as stated by Morrison and Smith (1974). The first drawback is that this indicator does not reflect the relative size of the region in relation to the higher territorial unit. Another problem arises due to the construction of CILQ which equals one for all intra-sectoral transactions, so it is recommended to use the SLQ for calculations in the main diagonal of the matrix.

The last frequently used quotient is FLQ, which was introduced by Flegg and Weber in 1995 and modified in 1997 (Flegg & Weber, 1997). The quotient is based on CILQ and takes the following form:

$$\begin{aligned} FLQ_{ij} &= CILQ_{ij} * \lambda^* & \text{for } i \neq j \\ FLQ_{ij} &= SLQ_{ij} * \lambda^* & \text{for } i = j \end{aligned} \quad (4)$$

where  $\lambda^* = [\log_2(1 + E^R/E^N)]^0$ .

The indicator thus includes not only the values of CILQ indicator, which reflects the inter-sectoral connections, but also takes into account the relative size of the region using  $\lambda^*$ , and avoids the disadvantages of CILQ. Thus it takes into account the relative size of both

the supplying and the buying sectors (Flegg & Weber, 1997).

Values of the parameter  $\lambda^*$  can range from 0 to 1 and the parameter is dependent on both  $E^R / E^N$  and the parameter  $\delta$ . The value of  $\lambda^*$  increases with the size of the region  $E^R / E^N$ , and decreases with the growth of the parameter  $\delta$ . The parameter  $\lambda^*$  expresses the need for imports (the higher the  $\lambda^*$  is, the lower is the need for imports). The greatest need for imports logically arises in small regions. The exponent  $\delta$  ranges from 0 to 1 and it is an element of flexibility. The value of  $\delta$  also increases with the size of the region, but it also has an opposing effect on the value of  $\lambda^*$ . A higher value of  $\delta$  reduces the value of  $\lambda^*$  and there is a greater need for imports. In the rare case when  $\delta = 0$  and therefore  $\lambda^* = 1$ , then  $FLQ = CILQ$ . It is also true that when  $\lambda^* \rightarrow 1$ , also the  $E^R \rightarrow E^N$  (Flegg & Tohmo, 2013).

The choice of the parameter  $\delta$  size is rather an empirical issue. Flegg and Tohmo (2013) in their work dealt with the evaluation of FLQ and then with the determination of optimal values of  $\delta$ . Their work was based on comparing the results of already compiled regional tables by the survey-based method and tables compiled by them using FLQ. The authors have observed that the value of  $\delta$  grows with the size of the region (the region's size is measured by its share in the national output) and  $\delta = 0.25$  appeared to be the best value. The authors have also developed a regression equation (Flegg & Tohmo, 2013, p. 713), which is used to calculate the value of  $\delta$ :

$$\ln \delta = -1.8379 + 0.33195 \ln R + \\ +1.5834 \ln P - 2.8812 \ln I + e \quad (5)$$

where  $R$  is the size of the region, measured as a share of output or employment of the region and of the whole country (in percentage),  $P$  is an estimate of the regional propensity to import (based on the survey) divided by the average propensity to import of all other regions,  $I$  is an estimate of the average regional intermediate consumption, including region imports (based on the survey) divided by the corresponding national value and  $e$  is a residue. However, the authors themselves realize that to obtain  $I$  and  $P$  is quite complicated, and therefore they propose analysts to proceed with the assumption that  $I = P = 1$ , which will lead to:

$$\ln \delta = -1.8379 + 0.33195 \ln R \quad (6)$$

This approach brings better results as opposed to just picking the "best" value of  $\delta = 0.25$ .

The same conditions for recalculating the national input coefficients into the regional ones apply for this indicator. If  $FLQ > 1$ , then the regional sectorial supply (sector  $i$ ) is sufficient to meet the demand requirements of the buyer sector  $j$  and the national input coefficient is equal to the regional one. The same applies, even if  $FLQ = 1$ . In the case that  $FLQ < 1$ , the supply of the seller sector  $i$  is insufficient to meet demand requirements of the buyer sector  $j$  and therefore some products must be imported. Then it is necessary to reduce the corresponding national technical coefficients as follows:  $r_{ij} = a_{ij} * FLQ_{ij}$ .

Many works have dealt with the choice of the appropriate quotient. As already suggested by Round (1978), the trading coefficient should be a function of three variables: the relative size of the selling sector  $i$ , the relative size of the buying sector  $j$  and the relative size of the region. The first variable is represented by the relation  $E_i^R / E_i^N$ , the second one by  $E_j^R / E_j^N$  and the third one by  $E^R / E^N$ . It is obvious that SLQ takes into account the first and third ones and vice versa CILQ considers the first and second ones, but FLQ takes into account all three of them. FLQ as the most accurate method is endorsed by a number of works (Tohmo, 2004; Bonfiglio & Chelli, 2008; Kowalewski, 2012). Moreover, Flegg and Tohmo (2013) believe that it is a quotient suitable for use in a hybrid model of non-survey methods. Therefore, FLQ is also used in this paper.

Once the quotients are calculated and the national direct consumption matrix is converted to the regional one, also sectors with zero employment must be excluded. According to Golemanova and Kruhar (2007), the third step is an aggregation of regional sectors. It is appropriate to combine some small and unimportant sectors (with little economic activity, i.e. employment) with others that have similar technology. The final step (Golemanova & Kruhar, 2007) is the calculation of the complete regional I-O tables, i.e. the conversion of the regional input coefficients table into the product-by-product table, expressed in prices. For this purpose, it is necessary to convert the obtained direct consumption coefficients matrix into monetary flows.

To calculate the monetary flows, it is necessary to obtain a vector of total regional

resources that can be estimated using the employment proportion and SLQ (if its calculation is based on employment) from the national data table. If for any sector  $SLQ > 1$  applies, it can be concluded that the sector is appropriately represented in the region and employment proportions (in this case, the proportions of the number of people employed in individual sectors of the region to the number of people employed in individual sectors of the entire country) are suitable to estimate the regional output (by multiplying the national outputs of individual sectors by the respective employment proportions). If, however,  $SLQ < 1$  and the sector is not represented in the region to large extent, the sector outputs must be adapted (by multiplying the aforementioned value by the respective SLQ).

In order to calculate the total I-O tables, it is also necessary to deduce several more items both on the input and output sides (e.g. final consumption expenditure, exports, imports, gross value added, etc.). The intermediate consumption is calculated by multiplying the respective coefficients of direct consumption and total resources. Other higher groups in SIOT may be derived as the difference between the total regional output/input of sectors and the overall regional intermediate consumption of sectors. The remaining items are derived either

by entering some superior data, or by estimate using the employment proportion to SLQ and calculating the others as residual. However, most of these items of the last step are not needed at all to calculate regional multipliers.

## 5. Computation of Regional SIOT

The SIOT, published for the Czech Republic (at the time the paper was processed, the latest version was for 2010), are divided into 82 sectors (or more precisely groups) and for the purpose of calculating the regional SIOT it was first necessary to aggregate data from the original 82 groups into 19 sections (this is the CZ-CPA classification, where each section contains several groups – it is therefore an aggregation of data at a higher hierarchical level), namely due to the fact that data concerning the employment structure must be available in the same structure as is the structure of SIOT in order to convert the national tables into the regional ones. Unfortunately, the data relating to the employment structure of the Pilsen Region (and other regions) are available only for 19 sections of CZ-CPA, and therefore the SIOT data had to be aggregated in this way. This fact naturally limits the number of resulting multipliers, which will be computed only for 19 sectors.

It was further decided that the Pilsen Region could expect intra-sector transactions,

**Tab. 3: Values of SLQ for industries in the Pilsen Region**

Agriculture, forestry and fishing	<b>A</b>	1.60398	Information and communication	<b>J</b>	0.50504
Mining and quarrying	<b>B</b>	0.55496	Financial and insurance activities	<b>K</b>	0.75554
Manufacturing	<b>C</b>	1.19583	Real estate activities	<b>L</b>	0.76215
Electricity, gas, steam and air conditioning supply	<b>D</b>	0.84098	Professional, scientific and technical activities	<b>M</b>	0.70320
Water supply, sewage, waste management, and rem. act.	<b>E</b>	1.07581	Administrative and support service activities	<b>N</b>	1.01377
Construction	<b>F</b>	0.87704	Public administration and defence; obligatory social security	<b>O</b>	0.97823
Wholesale and retail trade; repair of motor vehicles	<b>G</b>	0.96085	Education	<b>P</b>	0.99973
Transportation and storage	<b>H</b>	0.88635	Human health and social work activities	<b>Q</b>	1.05784
Accommodation and food service activities	<b>I</b>	0.90039	Arts, entertainment and recreation	<b>R</b>	1.30107
			Other service activities	<b>S</b>	0.60654

Source: Own calculations based on data from the Czech Statistical Office (2015a; 2015b)

and therefore the intra-sectoral flows in the main diagonal of the national SIOT were not deleted. Subsequently, the direct consumption coefficients matrix was calculated by the standard method.

The obtained coefficients were then recalculated using the FLQ formula, which appeared to be the most accurate method. To do this, it was necessary to calculate also SLQ and CILQ.

The values of SLQ are shown in Table 3. Where the value of SLQ is greater than 1, the industry is more concentrated in the Pilsen Region than in the rest of the country.

Similar results can be observed also in the CILQ formula, though it is calculated for all combinations of sellers and buyers; however, due to the limited extent of the article, the results will not be presented.

The last quotient is FLQ, which is calculated using CILQ and the formula compiled by Flegg and Tohmo (2013) for the calculation of  $\delta$  (the parameter R was calculated using the employment proportion). The value of R parameter for the Pilsen Region was 5.59%

and consequently the value of  $\delta$  parameter was 0.28, which approaches the mentioned value of 0.25 that Flegg and Tohmo determined as the "best value" in their work (2013). Also the value of parameter  $\lambda^*$  was determined – 0.49. The values of FLQ were determined using this parameter for the combination of all sectors. Not a single sector in the Pilsen Region showed zero employment, according to any measured quotient, and therefore no sector was deleted.

Table 4 gives the values of this quotient. Results greater than 1 are written in bold (sectors are marked by letters – see the names in Tab. 3). For example, the value of 1.4 for the industry A/B means that the industry A is able to satisfy the demands of the industry B regionally. Conversely, the requirements of the industry A (which is, according to the SLQ, highly concentrated in the Pilsen Region) cannot be satisfied by any other industry only regionally. Other similar, logical relations, especially in terms of the behaviour of the least concentrated industries towards the most concentrated ones, can be traced in Table 3 and 4.

**Tab. 4: Values of FLQ for industries in the Pilsen Region**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
A	0.8	<b>1.4</b>	0.7	0.9	0.7	0.9	0.8	0.9	0.9	<b>1.6</b>	<b>1.0</b>	<b>1.0</b>	<b>1.1</b>	0.8	0.8	0.8	0.7	0.6	<b>1.3</b>
B	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.4
C	0.4	<b>1.1</b>	0.6	0.7	0.5	0.7	0.6	0.7	0.6	<b>1.2</b>	0.8	0.8	0.8	0.6	0.6	0.6	0.6	0.4	1.0
D	0.3	0.7	0.3	0.4	0.4	0.5	0.4	0.5	0.5	0.8	0.5	0.5	0.6	0.4	0.4	0.4	0.4	0.3	0.7
E	0.3	0.9	0.4	0.6	0.5	0.6	0.5	0.6	0.6	<b>1.0</b>	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.4	0.9
F	0.3	0.8	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.8	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.3	0.7
G	0.3	0.8	0.4	0.6	0.4	0.5	0.5	0.5	0.5	0.9	0.6	0.6	0.7	0.5	0.5	0.5	0.4	0.4	0.8
H	0.3	0.8	0.4	0.5	0.4	0.5	0.5	0.4	0.5	0.9	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.3	0.7
I	0.3	0.8	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.9	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.3	0.7
J	0.2	0.4	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.4	0.2	0.3	0.2	0.2	0.2	0.4
K	0.2	0.7	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.7	0.4	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.6
L	0.2	0.7	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.7	0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.6
M	0.2	0.6	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.7	0.5	0.5	0.3	0.3	0.4	0.3	0.3	0.3	0.6
N	0.3	0.9	0.4	0.6	0.5	0.6	0.5	0.6	0.5	1.0	0.7	0.6	0.7	0.5	0.5	0.5	0.5	0.4	0.8
O	0.3	0.9	0.4	0.6	0.4	0.5	0.5	0.5	0.5	0.9	0.6	0.6	0.7	0.5	0.5	0.5	0.5	0.4	0.8
P	0.3	0.9	0.4	0.6	0.5	0.6	0.5	0.6	0.5	1.0	0.6	0.6	0.7	0.5	0.5	0.5	0.5	0.4	0.8
Q	0.3	0.9	0.4	0.6	0.5	0.6	0.5	0.6	0.6	<b>1.0</b>	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.4	0.9
R	0.4	<b>1.1</b>	0.5	0.8	0.6	0.7	0.7	0.7	0.7	<b>1.3</b>	0.8	0.8	0.9	0.6	0.6	0.6	0.6	0.6	<b>1.0</b>
S	0.2	0.5	0.2	0.4	0.3	0.3	0.3	0.3	0.3	0.6	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.3

Source: Own calculations based on data from the Czech Statistical Office (2015a; 2015b)

The coefficient matrix of national direct consumption (inputs) was multiplied by the identified FLQs, which resulted in the matrix of regional coefficients.

Subsequently, the aggregation of sectors with little economic activity with those using similar technology should be performed. Given the already low number of sectors that were aggregated at the beginning of the calculations,

this step was skipped and no further aggregation was carried out.

The last step was to calculate the entire regional I-O tables. The SLQ coefficients and employment proportions, by which the total resources, the gross value added and wages and salaries were estimated, were used for this calculation. Individual items of intermediate consumption (as well as the total intermediate

**Tab. 5: Regional input-output table for the Pilsen Region for 2010 (mil. CZK) – Part 1**

	A	B	C	D	E	F	G	H	I	J
A	1,206	6	4,242	27	2	15	134	6	405	0
B	12	18	1,875	1,136	8	110	1	8	0	0
C	1,766	213	62,064	641	590	3,677	3,069	1,449	1,022	331
D	57	27	1,613	1,266	48	85	195	351	114	29
E	33	13	579	67	675	59	37	14	28	0
F	53	17	578	53	120	6,096	104	454	57	11
G	375	31	6,060	89	272	461	2,465	516	215	127
H	90	146	1,698	404	47	222	857	2,729	23	48
I	11	2	54	11	8	96	123	133	43	13
J	11	1	258	15	8	43	157	90	19	350
K	81	12	550	63	38	240	342	386	33	19
L	21	1	183	14	62	195	916	115	207	86
M	89	13	1,040	28	80	2,168	744	79	87	78
N	24	17	555	19	71	338	546	352	130	97
O	16	2	31	7	18	13	1	27	0	2
P	5	0	21	8	2	7	24	22	1	10
Q	0	0	13	0	1	0	3	3	2	0
R	0	0	3	0	2	0	1	1	21	1
S	2	0	47	0	1	8	78	24	19	6
<b>Intermediate consumption (basic prices)</b>	<b>3,851</b>	<b>518</b>	<b>81,465</b>	<b>3,847</b>	<b>2,053</b>	<b>13,832</b>	<b>9,796</b>	<b>6,759</b>	<b>2,425</b>	<b>1,208</b>
Wages and salaries	2,351	229	19,217	413	833	3,946	7,783	3,560	1,298	816
Employers' social contributions										
Other taxes on production										
Other subsidies on production										
Consumption of fixed capital	2,834	482	33,011	5,137	1,682	8,093	11,314	6,234	2,422	1,888
Operating surplus, net										
Mixed income, net										
<b>Value added, gross</b>	<b>5,185</b>	<b>711</b>	<b>52,229</b>	<b>5,550</b>	<b>2,515</b>	<b>12,039</b>	<b>19,097</b>	<b>9,795</b>	<b>3,719</b>	<b>2,704</b>
<b>Output (basic prices)</b>	<b>9,037</b>	<b>1,229</b>	<b>133,694</b>	<b>9,397</b>	<b>4,568</b>	<b>25,871</b>	<b>28,892</b>	<b>16,553</b>	<b>6,144</b>	<b>3,912</b>
Import	10,304	3,365	209,714	6,180	2,940	16,087	11,882	10,371	3,645	1,955
<b>Total resources</b>	<b>19,340</b>	<b>4,594</b>	<b>343,408</b>	<b>15,578</b>	<b>7,508</b>	<b>41,957</b>	<b>40,775</b>	<b>26,924</b>	<b>9,790</b>	<b>5,867</b>

**Tab. 5: Regional input-output table for the Pilsen Region for 2010 (mil. CZK) – Part 2**

	K	L	M	N	O	P	Q	R	S
A	0	2	8	56	0	0	8	30	3
B	0	0	2	2	4	3	0	0	0
C	187	951	793	456	220	162	1,406	207	116
D	68	223	34	9	157	120	140	41	25
E	1	38	11	52	46	16	35	11	7
F	40	645	458	25	374	55	120	52	5
G	81	166	300	367	42	23	197	71	48
H	173	21	78	385	129	19	35	24	21
I	14	76	102	210	62	33	84	34	17
J	170	30	183	47	140	47	24	43	19
K	733	682	271	170	78	39	71	72	27
L	158	471	269	65	124	102	77	147	24
M	199	174	1,496	102	273	63	60	74	17
N	136	255	150	973	365	35	70	150	20
O	13	4	7	6	119	1	8	9	3
P	36	18	46	6	73	224	7	2	3
Q	1	4	1	1	8	0	127	2	1
R	0	15	5	3	1	0	3	327	30
S	37	9	12	8	0	6	41	14	44
<b>Intermediate consumption (basic prices)</b>	<b>2,046</b>	<b>3,785</b>	<b>4,225</b>	<b>2,943</b>	<b>2,217</b>	<b>948</b>	<b>2,512</b>	<b>1,313</b>	<b>430</b>
Wages and salaries	1,259	11	2,248	1,890	6,029	4,431	4,525	827	285
Employers' social contributions									
Other taxes on production									
Other subsidies on production									
Consumption of fixed capital									
Operating surplus, net									
Mixed income, net									
<b>Value added, gross</b>	<b>5,374</b>	<b>10,367</b>	<b>6,078</b>	<b>4,202</b>	<b>12,256</b>	<b>7,906</b>	<b>8,504</b>	<b>2,425</b>	<b>948</b>
<b>Output (basic prices)</b>	<b>7,420</b>	<b>14,152</b>	<b>10,303</b>	<b>7,145</b>	<b>14,473</b>	<b>8,854</b>	<b>11,016</b>	<b>3,738</b>	<b>1,378</b>
Import	3,250	3,405	6,366	5,347	3,716	1,514	3,370	2,498	329
<b>Total resources</b>	<b>10,670</b>	<b>17,557</b>	<b>16,669</b>	<b>12,492</b>	<b>18,189</b>	<b>10,368</b>	<b>14,387</b>	<b>6,236</b>	<b>1,707</b>

Source: Own calculations based on data from the Czech Statistical Office (2015a, 2015b)

consumption for the sectors) were calculated by multiplying the respective coefficients of direct consumption and overall resources. Other items were calculated as a residue (the outputs side was not calculated, because its values are not required for further calculations of input coefficients and output multipliers). When comparing the results of the regional table to the

national table, it was clear that in sectors where the direct consumption coefficient declined, the imports of goods increased correspondingly, which confirms the basic assumption of the location quotients' use. The final form of the I-O regional table is shown in Table 5, where again only letters are used for marking of each sector.

## 6. Sector Multipliers Related to the Culture

The last stage of the calculations was the computation of individual types of multipliers, i.e. the multipliers of output, gross value added, income, and employment. The values of multipliers are estimated using appropriate vectors (see section 2). In the case of the gross value added and income multiplier, these

vectors are calculated from the regional SIOT, i.e. originally from the national SIOT using the appropriate SLQ and employment proportion. It is evident from the calculation principle that the obtained vectors are not very accurate when compared with reality (unfortunately, the real data are not available), and therefore the resulting multipliers must be approached very carefully.

**Tab. 6: The values of chosen regional multipliers for the Pilsen Region in 2010**

Type of multiplier/ sector	Wholesale and retail trade; repair of mot. veh.	Transportation and storage	Accommodation and food service activities	Arts, entertainment and recreation	The highest value	The lowest value
	G	H	I	R		
Production	1.31	1.33	1.32	1.27	Construction: 1.45	Education: 1.12
Gross value added	0.57	0.47	0.47	0.49	Education: 0.81	Mining and quarrying: 0.20
Income	0.29	0.22	0.20	0.22	Education: 0.59	Real estate activities: 0.03
Employment	0.93	0.77	1.11	1.12	Education: 1.67	Mining and quarrying: 0.20

Source: Own calculations based on data from the Czech Statistical Office (2015a, 2015b)

Output and employment multipliers are thus the most accurate ones from the regional multipliers and the others should be used very carefully.

The values of individual multipliers are shown in Table 6.

Effects of culture are best expressed by the R sector called "Arts, entertainment and recreation," but others with similar effects are also shown in the table. The G sector is given because of retail trade, which includes e.g. purchases of food, fuels and other goods related to travel. The H sector is related to the public transport (buses, trains or planes) and, finally, there is the I sector that is connected with the accommodation of visitors and restaurant services for them. For clarity, there are also sectors with the highest and lowest values for the respective multipliers.

The values of output multipliers are above average (which is 1.28) for most sectors. For example, the value of 1.27 for the R sector means that if visitors buy tickets to a cultural

event in Pilsen (or elsewhere in the region) amounting to CZK 1 million, the production in the region will increase not only by one million, but through the further rounds of consumption also by another approx. CZK 270 thousand. Similarly, the other values of output multipliers may be interpreted. The highest value of the output multiplier in the Pilsen region can be observed for the Construction sector, where an increase in demand for production in this sector by of CZK 1 causes an increase in production of the entire region by CZK 1.45. As regards the analysed sectors, the multiplier for R sector, which represents "pure" cultural activities, has the lowest value of those four. That is logical, because culture does not have as many supplier-customer relations as the other selected sectors (especially in one region) and thus there is not such a big increase in production caused by other rounds of consumption. This is also proved by the sum of the consumption coefficients for each of these sectors which is, in the case of R sector,

the lowest of those four (R: 0.21, G: 0.24, H: 0.25, I: 0.25). The multipliers of gross value added express an increase of gross added value in the case of an increase in demand for production in a particular sector by one unit. Their values are rather below-average (the average is 0.51) in the Pilsen Region, except for the G industry. Yet, these values are not negligible, especially when compared with the lowest value showed by the sector of Mining and quarrying (0.20). For instance, the value of 0.49 for the R industry means that ticket purchases amounting to CZK 1 million will bring the gross added value amounting to CZK 490 thousand to the region (these are wages and salaries, employers' social contributions, net taxes on production, consumption of fixed capital, etc.) This value is the second highest regarding analysed sectors (first is sector G) which indicates strong representation of workforce in this sector. Already mentioned sector G has even higher value than is the value of total average, thus it has the biggest potential (from analysed sectors) to influence the regional gross value added in case of increased demand. Another is the income multiplier, which is focused solely on wage compensation (i.e. wages and salaries and employers' social contributions) and thus reflects an increase in this income due to an increase in demand for production of a particular sector by one unit. In this case, the values of selected sectors are slightly below average (0.23), again except for the G sector. The "Education" sector shows the highest value and the sector called "Real estate activities" shows the lowest value (this low value seemed somewhat strange, but it comes from the national SIOT, where the value of Wages and Salaries is very low for this sector). The interpretation of results is similar to the previous ones: the value of 0.22 for the R sector means that ticket purchases amounting to CZK 1 mil. will bring approximately extra CZK 220 thousand in wages and salaries to the region. These multipliers also reflect the representation of workforce in sectors and their values also increase and decrease the same way as the gross value added multipliers, because income is just one element of the gross value added.

The last type is the employment multiplier. Its value considerably differs for the selected sectors and reflects how many new jobs can be created in the economy as a result of an increase in demand for the particular industry

output by one unit, or in this case, by CZK 1 million (the data in SIOT are given in millions of CZK). The values of the I and R sectors were higher than 1 (i.e. an increase in demand for production of these industries amounting to CZK 1 mil. would create at least one job). In this case, the average is 0.87, thus the value for sector G is still above average. The lowest value in the Pilsen Region was recorded for the sector of Mining and quarrying and the highest value was recorded for the sector of Education.

Generally speaking, the multipliers of industries related to culture (even for the R industry itself) show relatively good values ranging around the average and thus these industries tend to greatly affect the economy of the Pilsen Region. The size of the total economic effect however, depends on the amount of money that is spent in region for goods and services of these sectors. The estimation of this amount caused by the Pilsen ECoC 2015 project is the aim of the currently on-going research.

## Conclusion

I-O modelling is a tool that has been used to understand the relationships between sectors for more than half a century. This tool is constantly evolving, as is the purpose of its use. In this paper, it was used to indicate the economic importance of culture, especially in relation to the project of Pilsen ECoC 2015.

A crucial part of this paper was to compute regional I-O tables using the selected method. In the Czech Republic, there are not many scholars who would deal with these issues and, therefore, a great emphasis was placed on explaining the procedure in order to initiate a discussion on this topic.

Subsequently, the values of sector multipliers related to culture were calculated. These, when compared to the others, showed values around the average, which is quite surprising for the underestimated cultural sectors. It indicates the importance of culture and its potential to influence the economy of the Pilsen Region. However, it is important to realize that culture can only affect the economy of the region if it is a case of big events of at least nationwide, but ideally international scope. The values of multipliers always apply, but the impact differs if there is a demand for the sector services amounting to several thousands of CZK in the case of a small event, or if the demand amounts

to a million of CZK as is the case of a big international festival. Another important factor is the origin of visitors. The less economic effect can be expected when the visitors are residents of the region, because they would spend their money in the region even without the existence of the event. Conversely, when the visitors are foreign tourists who would not come to the Czech Republic, or rather the Pilsen Region, without the existence of this event, the effects can be expected significant.

For events such as the European Capital of Culture 2015, the prerequisite is a high attendance, usually with a high proportion of foreign visitors as well. They spend their money not only on admission fees, but also on accommodation, meals, souvenirs and other services. Thus the great economic impact can be expected also in Pilsen (respectively the Pilsen Region). The fact that the main impacts are expected in the City of Pilsen, but not in the whole region for which multipliers are calculated, should not be seen as an error. Input-output analysis considers supplier-customer linkages within the whole region (including the city) and the results are not influenced by the fact, where the money was spent. Thus, although the money was spent in Pilsen, the suppliers of services and goods may be located outside the city, which affects the rest of the region. Usually, the economic impacts of cultural events are calculated even for the national level (e.g. Herrero et al., 2006).

At the moment when it is possible to determine the total spending of different groups of visitors in different sectors caused by the Pilsen ECoC 2015 project, the overall impact on the economy of the region may be calculated using the computed multipliers. These results can be compared with the funds spent on the coordination and organisation of the ECoC events and can help the city of Pilsen (which have financed most of the programme) to evaluate biggest events and chose which ones should be sustained and which should be cancelled. This process can also be applied repeatedly to assess the change in economic impact of selected events.

Economic effects of ECoCs can be very high, but they always depend on the type of cultural programme and its possibilities to attract visitors from other regions. In the history, there were some very successful ECoCs with great economic impacts (e.g. Liverpool

2008), but also less successful and smaller projects with no long term impacts (e.g. Maribor 2012). Great impacts are mainly caused by the investments into the local cultural and recreational infrastructure and partly by elaborated cultural programme that continuous afterwards. I-O analysis used in this paper was already applied for evaluation of few former ECoCs (e.g. Salamanca 2002, Liverpool 2008, Maribor 2012). Methodologies were similar, but unfortunately based on multipliers derived from SIOT that were published by the local statistical offices for a large area (country). The non-existence of SIOT for smaller regions is seen as the biggest methodological problem when evaluating ECoC using I-O analysis. The methodology presented in this paper shows the possible way to resolve that problem.

Pilsen ECoC 2015 made some big investments (e.g. new theatre) and created cultural programme that was seen by a large number of visitors. Together with the high values of calculated multipliers, it is clear that the economic impact of the project will be significant.

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**REGIONAL ECONOMIC EFFECTS OF THE EUROPEAN CAPITAL OF CULTURE PROJECT: THE USE OF INPUT-OUTPUT ANALYSIS****Marta Nosková**

*The topic of economic effects of culture has become very popular recently. Particularly in connection with the European Capital of Culture, various studies examining economic impacts or methodologies for their monitoring are annually processed and the results are often part of evaluation reports related to the individual European Capital of Culture projects. Given the fact that in 2015 the European Capital of Culture is Plzen in the Czech Republic, it has been appropriate to determine what multiplier effects can be expected in connection with this event. Therefore, the focus was not only on the sector called "Arts, entertainment and recreation," but also on the other related industries that can be affected by the increase of tourists (i.e. "Wholesale and retail trade, repair of motor vehicles", "Transportation and storage" and "Accommodation and food service activities"). Therefore, the regional input-output model has been calculated and then multipliers of production, gross value added, income and employment have been derived for the sectors related to culture, wholesale and retail, transport, accommodation and food. The results have showed that these industries have the potential to affect the economy of the region and it can therefore be assumed that the aforementioned events, which take place within the Pilsen European Capital of Culture 2015, will bring considerable financial resources to the region, mainly through attracting foreign tourists and tourists from other regions of the country. The derived multipliers are computed from data for 2010 (more recent are not available) and, of course, they can also be used to determine economic effects of other events.*

**Key Words:** *Economic effects, culture, input-output, the Pilsen Region, ECoC.*

**JEL Classification:** *R15.*

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# THE STRATEGIC LOCATION OF REGIONAL HEADQUARTERS FOR MULTINATIONALS IN AFRICA: SOUTH AFRICA AS A HOST COUNTRY

*John M. Luiz, Busi Radebe*

## Introduction

No company can operate at a global scale by centralizing all decisions and then farming them out to the entire world for implementation (Ohmae, 1989). The conditions in each market are too different and in some cases changes in market conditions are too rapid to accommodate long distance management. It is for this reason that many multinational companies have opted to establish regional headquarters (RHQs) in the different markets where they operate. The establishment of these regional offices allows multinational companies to have a local insight of the market, competition landscape and customer preferences. With such detailed insight, multinational companies are then able to formulate effective and responsive regional strategies. In addition, multinationals can improve competitiveness and differentiation against local companies by drawing from global resources such as finance, technology, bulk procurement, human capital and research to address regional customer requirements (Ambos & Birkinshaw, 2010; Ambos & Mahnke, 2010; Chen, 2008).

The importance and value of RHQs in the academic literature has generally focused on RHQs in industrialized countries (Asakawa & Lehrer, 2003; Doz & Prahalad, 1984; Hewett, Roth, & Roth, 2003; Piekkari, Nell, & Ghauri, 2010) although there has been an increasing focus on the Asian markets too (Holt, Gray, Purcell, & Pedersen, 2000; Lasserre, 1996). The result is that we do not yet fully possess an overall framework for understanding how value and decisions are devolved, how location decisions are made (certainly less so than with FDI flows), and how their structures and strategies are evolving to accommodate the

growth in emerging markets. For example, are MNEs devolving the same amount of value and decision-making powers to RHQs in emerging markets as they would if they were located in industrialized host countries? In terms of location of RHQs in emerging markets, how do MNEs deal with institutional voids? This issue becomes all the more pressing in Africa which arguably has amongst the most uncertain institutional environments. In this paper we examine the dominant criteria used by MNEs to choose their locations for RHQs in Africa by examining South Africa as a host country for the continent with specific reference to the advantages of agglomeration and the accompanying economies of scale, the role of distance, and a sound institutional environment. The hegemony of South Africa on the African continent lends itself as a natural entry point for multinationals seeking to do business in Africa (see Luiz and Charalambous (2009); Luiz and Stephan (2012)). The topic is important because thus far there is no literature focused on location criteria for RHQs in Africa and indeed very little on the role of MNEs in Africa in general and the continent increasingly represents the last frontier to international business.

## 1. Literature Review: Criteria for Identifying RHQs Location

RHQs are intermediaries between corporate headquarters and country branches or subsidiaries themselves located in a number of countries. Dicken (2003, p. 239) explains it as follows:

*Regional headquarter constitutes an intermediate level in the corporate organizational structure, having a geographical sphere of influence encompassing several countries...*

*Their primary responsibility is to integrate the parent company's activities within a region, that is, to coordinate and control the activities of the firm's affiliates (manufacturing units, sales offices, etc.) and to act as the intermediary between the corporate headquarters and its affiliates within its particular region.*

As organizations pursue foreign markets as part of their growth strategies, they are faced with the trade-off of local responsiveness and global integration. This has to be accommodated in their strategies and structures and in their organizational control (see Luiz and Visser (2014)). In response to this challenge, multinational organizations have embraced the concept of RHQs. The regionalization of the different regions such as the European Union, Association of South-East Asian Nations, and North American Free Trade Area has highlighted the relevance of RHQs (Lasserre, 1996). By establishing RHQs aligned to these economic regional groups, multinationals are able to simplify the segmentation of their global markets and formulate effective regional strategies. Through a regional presence, multinationals can also benefit from trade agreements that normally exist within the regional communities.

The number of RHQs has been increasing as more multinational organizations realize the benefits of improved responsiveness associated with regional strategies. Whilst the literature examining the importance of location factors for FDI is rich, much less is understood about how the location decisions for RHQs are made or integrated this into a theoretical framework (Birkinshaw, Braunerhjelm, Holm, & Terjesen, 2006; Laamanen, Simula, & Totstila, 2012). At a fundamental level, Holt et al. (2000) find nine dimensions used by multinational organizations in selecting the location of RHQs: favorable government incentives; low operating costs; low living costs; favorable financial environment; effective regional links; compatibility with home base; supportive business environment; economic IT infrastructure; and favorable employment relations. But making sense of these factors within a broader theoretical context of foreign locational decision making is still a challenge for international business. We contribute to this understanding by integrating these factors into three key themes within the international management literature: the role of spatial agglomeration, institutions and distance.

### 1.1 Spatial Agglomeration

Looking at the spread of RHQs globally reveals a concentration around key cities or what Friedmann (1986) has termed 'world cities'. These cities are increasingly used as basing points by global capital often housing corporate headquarters of MNEs or their regional offspring, and progressively bringing 'control functions' together. They are usually important centers of global transport and centers of communication and information. Part of the explanation for these spatial agglomeration effects has been captured by the work of the 'new economic geographers' based upon the economic analysis of agglomeration production on the assumptions of increasing returns and imperfect competition. Porter (1998) has applied this to his work on clusters (geographically concentrated groupings of interlinked firms) that enhance firm competitiveness through better access to suppliers, employees, and information, economies of scale, innovation facilitation, and reduced transaction costs. Birkinshaw et al. (2006) show that MNEs move to locations that are more attractive in terms of industrial agglomeration, and applying this concept to RHQs, Tan (2007, p. 74) maintains that for effectively managing their global empire, MNEs prefer to locate their RHQ in large nodal cities and service hubs where global reach, the flow of instruction, ideas and data to regional offices, branch plants, affiliates and subsidiaries can be more efficiently coordinated and controlled. Therefore MNEs prefer to move to and stay in locations with the characteristics of (1) strategic positioning with sufficient transport and communication infrastructure; (2) high quality external services with a particular type of labor market, especially people skilled in information processing; (3) rich in social and cultural amenities; and (4) good institutional social factors including people's working attitude, loyalty, productivity, skill, etc. Tan (2007) raises another interesting point around the need for face-to-face contact that MNEs still require even with the phenomenal ICT developments. The problems of asymmetric information loom large in a competitive market economy and a healthy relationship between contracting parties may grow through regular contact and relational proximity which enhances trust and reduces transaction costs. Whilst standardized financial information may be cheap and quick to transmit with current

communication technology, the quality of non-standardized information may decline sharply as a result of distance between parties. Tan uses the example of a business rumor which spreads rapidly through global networks but traders further from the source find it harder to verify the information to act on it. All this reinforces the importance of agglomeration for RHQs in key cities with the best access points and which act as epicenters of global financial transactions.

## 1.2 Institutional Voids

The MNEs headquarters location literature has often focused on traditional push and pull variables associated with the attractiveness of the business climate in different destinations (Birkinshaw et al., 2006; Laamanen et al., 2012). In developing countries, institutional voids make the business environment more complex and often raise the cost of doing business because the rules of the game are not clearly defined and are subject to manipulation. It is clear that organizations are merely a component of the broader institutional framework which affects our economic interactions. So for example, the transaction costs of doing business in a country could be raised by either underdeveloped formal institutions or by destructive informal rules and norms – weak property rights, discretionary power on the part of the state, the unpredictability of the investment environment, the lack of informal social capital structures, the impact of distributional conflict mobilized along ethnic lines, and the direct disruptive impacts of political instability. These institutional voids often provide severe challenges for MNEs from the developed world because of their lack of experience of doing business in this sort of milieu (see Khanna and Palepu (2010)). In general they come from countries where governments have a long tradition of courting business by lowering costs associated with doing business through the easing of tax burdens, the provision of various incentives, strict laws prohibiting corruption, and of course high levels of political stability. These conditions very seldom apply in the developing world where governments often have a very ambivalent relationship with business and where populist anti-business sentiments is often just below the surface.

In general, business in developing countries faces much larger regulatory burdens than those in developed countries. They face three

times the administrative costs, and nearly twice as many bureaucratic procedures and delays associated with them. And they have fewer than half the protections of property rights of rich countries (World Bank, 2005, p. 3). This is most certainly the case in Africa and the World Bank's Doing Business datasets illustrate the comparatively higher costs of doing business in Africa versus more developed countries. African economies are slowly starting to liberalize and the environment is therefore gradually becoming more familiar. A number of African countries already have business environments which approximate that in the industrialized world – South Africa being a case in point and the latter is therefore often used as a platform for investment into the rest of the continent. We have also seen large improvements in the regulatory environments in countries like Ghana, Uganda, Mauritius, Rwanda, Botswana, Namibia, and Senegal. Nonetheless doing business in Africa is exceptionally 'foreign' to most MNEs as it is a continent they have little experience of and where weak institutions are the norm. This raises the risk of doing business in these countries and the associated transaction costs. MNEs are therefore likely to search for the most familiar business environment where the rules of the game approximate that of their home countries.

## 1.3 The Role of Distance

Ghemawat (2001) argues that companies routinely exaggerate the attractiveness of foreign markets because they lose sight of the vast difficulties of pioneering new, often difficult territories. He goes on to say that most of the costs and risks of doing business in a new market result from barriers created by distance. Whilst some have argued that geography no longer matters because of developments in ICT and transport which are shrinking the world, he maintains that distance still matters and that companies must explicitly account for it when making decisions about global expansion. Laamanen et al. (2012) find that a central location which minimizes distance represents a pull factor which increases the attractiveness of HQ location. This can be applied to locational decisions for RHQs as well.

Ghemawat (2001) maintains that distance between two countries can manifest itself along four basic dimensions, namely cultural, administrative/political, geographic and econo-

mic. We highlight two of these. 1) Cultural distance – The country’s cultural attributes such as religion, social norms, race and language can influence how people interact with other people or institutions and influence the choices consumers make. In choosing a location for RHQs, multinational companies prefer destinations with a much smaller cultural distance from the home country so as to minimize the risks of ‘mistakes’ that arise from cultural distance. 2) Economic distance – The wealth or income of consumers is the most important economic attribute that creates distance between countries. Rich countries engage in relatively more cross-border economic activity relative to their economic size than do their poorer counterparts. Most of this activity is with other rich countries. However, this is rapidly

changing with the growth of South-South trade and the emergence of greater co-operation amongst emerging markets. In establishing regional headquarters, it would therefore make sense for multinational companies to look at the most economically successful countries in the targeted region.

**2. Research Methodology**

A semi-structured interview survey process using one-on-one interviews that incorporated both closed as well as open-ended questions was used. The population of the research covered foreign multinational organizations that have a presence in South Africa and the sample, in turn, focused on local market leaders in their respective sectors. All respondents were either country managing directors or part of the

**Tab. 1: List of multinationals that formed part of study**

No.	MNE	Home Country	Sector	Revenue Currency	Global Revenue for 2010
1	Accenture	US	Technology	Dollar	\$21 billion
2	BMW	Germany	Motor Vehicle	Euro	€60.5 billion
3	Dell	US	Technology	Dollar	\$52.9 billion
4	Deloitte	UK	Audit and Consulting	Dollar	\$26.6 billion
5	GEA	Germany	Manufacturing	Euro	€4.4 billion
6	IBM	US	Technology	Dollar	\$99.9 billion
7	Mercedes Benz	Germany	Motor Vehicle	Euro	€97.8 billion
8	Microsoft	US	Technology	Dollar	\$62.5 billion
9	MSA	US	Manufacturing	Dollar	\$977 million
10	Nissan	Japan	Motor Vehicle	Yen	¥9.4 trillion
11	Quadrem	US	Supply Chain Services	Dollar	\$500 million
12	SAP	Germany	Technology	Euro	€12.5 billion
13	SAS	US	Technology	Dollar	\$2.43 billion
14	Vodafone	UK	Telecommunications	Pound	£44.5 billion
15	Cargill	US	Financial Services	Dollar	\$107.9 billion
16	US Bank MNE	US	Financial Services	Dollar	\$86.6 billion
17	US Audit and Advisory MNE	US	Audit and Advisory	Dollar	\$26.6 billion
18	French Manufacturing MNE	France	Manufacturing	Euro	€20.9 billion
19	US Software MNE	US	Technology	Dollar	\$26.8 billion
20	US Technology MNE	US	Technology	Dollar	\$40 billion

Source: Company Annual Reports

senior management team. Five companies participated in the study on condition that the name of the company not be mentioned in the results. Tab. 1 summarizes a list of companies that participated in the study, their home country, industry and global revenue.

Unfortunately, none of the multinational companies reported their revenues at country level, which would have allowed us to indicate the market share of these companies in Africa. However, our sample represents leading companies within the global markets. For example, Accenture and IBM are the top two technology consulting firms in the world. BMW, Mercedes and Nissan are major players in the motor vehicle sector. Microsoft, SAP and SAS are market leaders in the global software industry. The sample is thus relatively large given the finite number of multinationals operating in South Africa and the focus on market leaders. To further ensure consistency, a mixed method approach was followed to consolidate qualitative feedback with the quantitative survey data. The research instrument was standardized and consistent for each respondent. Issues around reliability and validity were addressed by conducting face-to-face interviews which ensured that none of the questions asked had any form of ambiguity. Also the questions asked in this questionnaire touched on long term strategic positions of the different multinationals and thus none of the discussion issues could be influenced by the foremost events that are currently taking place. Therefore, there was no major concern that the reliability of this research could be compromised.

Part of the questionnaire examined the criteria influencing the location of RHQs and this used a Likert scale as a basis to determine the relative importance of each of the factors and it required a more involved statistical analysis before the data could be used and correctly interpreted. This is because the survey data captured is of an ordinal nature and cannot necessarily be assumed to be linearly correlated with the underlying attitudes of the Likert scale of the survey i.e. one cannot directly, accurately interpret responses from the point scale without some mathematical means of normalizing or rescaling it first. Stacey (2005) has developed a distribution-fitting approach which allows for the conversion of such data into a more representative form which yields

results of greater accuracy and validity. This allowed for each factor to be interpreted and ranked. The approach calculates item means and standard deviations of the sample, rather than respondent level data. Respondent level data can however be generated from estimated threshold values and the estimated means and standard deviations. In the case of normal underlying distributions, the rescaled values can be calculated as the mean or expected value of the truncated normal distribution between the two threshold values. This is given in the formula:

$$Y_{k,j} = \frac{\int_{\tau_{k-1}}^{\tau_k} x \cdot e^{-\frac{(x-\mu)^2}{2\sigma^2}} dx}{\int_{\tau_{k-1}}^{\tau_k} e^{-\frac{(x-\mu)^2}{2\sigma^2}} dx} \quad (1)$$

where  $Y_{k,j}$  is equal to the rescaled value for the  $k^{th}$  ordinal response to the  $j^{th}$  survey item, and are the estimated mean and standard deviation of the normal distribution fitted to the responses to the  $j^{th}$  survey item (Stacey, 2005, p. 21).

When analyzing the results of the distribution-fitting analysis performed on the survey data, Stacey's (2005) statistical methodology imply that the following interpretations needed to be made to identify factors as *very important*, *important* and *less important*. If the mean for an investment factor response was appreciably greater than zero ( $\mu \gg 0$  as determined by the hypothesis test) then that factor is statistically significantly more important than the overall average importance of all the factors and can hence be interpreted as being *very important* relative to other factors. If the mean for an investment factor response was very close to zero then it can be interpreted as being *important* (the average) relative to other factors. If the mean for an investment factor response was appreciably less than zero then it can be interpreted as being *less important* relative to other factors.

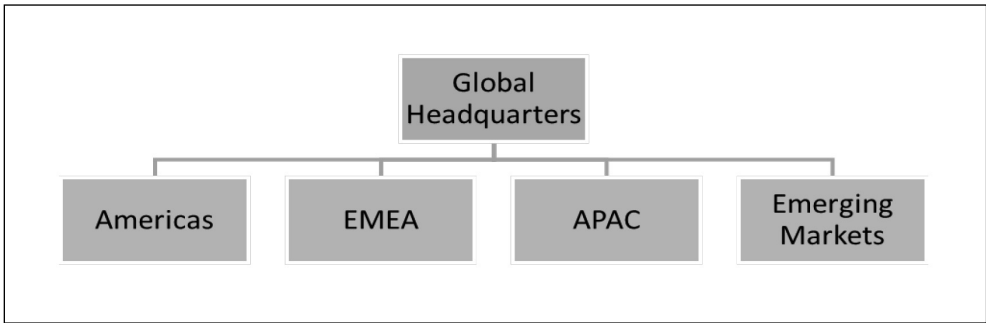
### 3. Results and Discussion

#### 3.1 Regional Organization of MNEs

Respondents were asked to indicate how their companies split the global market into different regions. As reflected in Fig. 1, most multinational companies are broken down into three main regions, namely, Europe, Middle East and Africa (EMEA); Americas; and Asia Pacific (APAC).

A slight deviation from the above regionalization is where the multinationals have split the countries into Europe, Africa and Latin America (EALA), North America (NA) and Asia-Pacific (APAC). Another deviation is where a number of multinationals have split the region of Americas into two regions, namely, North America and South America. In addition to the three main regions, a number of

Fig. 1: Common regional breakdown of multinationals



Notes: EMEA: Europe, Middle East and Africa, APAC: Americas; and Asia Pacific

Source: own

multinationals have also grouped countries into a category called ‘Emerging/Growth Markets’. These are countries identified as future drivers of the multinational’s growth. To further simplify management, some multinationals take the regionalization of countries to a lower level by introducing sub-regions. It is worth mentioning that a few multinationals still used the global headquarters to host the leads of the different regions as opposed to having RHQs in one of the countries within the respective region.

The respondents were also asked to indicate the region to which South Africa belongs and the host country of that region’s RHQs – see Tab. 2. Where multinationals had Africa as a sub-region, South Africa always served as the RHQs. When probed about the reason for hosting the RHQs in the respective countries, 30% of the respondents indicated that it was based on the revenue contributions of the countries in a specific region. With the exception of emerging markets, the country with the highest revenue contribution normally served as the host. This confirms results

reported in Birkinshaw et al. (2006) that location tends to follow business activity overseas. The geographic location of a country was also mentioned as a reason on two occasions. The country that is central to the countries within the region got the preference. Two respondents touched on Dubai’s incentives as a reason for hosting the RHQ for Emerging Markets.

#### 3.2 Importance of Location Factors

Based on the available literature, factors which were identified as variables which have been put forward as drivers of the RHQs location decision were constructed into a questionnaire. Senior executives from multinationals operating in South Africa were asked to indicate the importance of each factor as if they were making a location decision. In addition to this, the respondents were asked to rate South Africa as positive or negative in the respective factor. The results are presented in Tab. 3 and for each factor the ratings given by the respondents and the mean determined from the distribution-fitting analysis are shown (Stacey, 2005).

Tab. 2: Regional allocation of South Africa and RHQ host country

No.	MNE	Region or Sub-region where SA is allocated	RHQ host country
1	Accenture	SPAI	Spain
2	BMW	EMEA	Germany
3	Dell	Emerging markets	Dubai
4	Deloitte	EMEA	UK
5	GEA	Africa	South Africa
6	IBM	CEEMEA – Emerging markets	Dubai
7	Mercedes	EMEA	Germany
8	Microsoft	MEA	Turkey
9	MSA	Africa, Middle East and Latin America	South Africa
10	Nissan	Emerging markets	France
11	Quadrem	Africa	South Africa
12	SAP	Emerging markets	Spain
13	SAS	Africa	South Africa
14	Vodafone	EMEA	UK
15	Cargill	EMEA	Switzerland
16	US Bank MNE	EMEA	UK
17	US Audit and Advisory MNE	EMEA	UK
18	French Manufacturing MNE	MEA	Egypt (Relocating to SA)
19	US Software MNE	EMEA	UK
20	US Technology MNE	EMEA	UK

Source: own

The importance of the respective factors in our study is reflected in Fig. 2. The graph was plotted using the standardized mean of each factor calculated using Stacey's (2005) analysis method. As we move away from the center of the radar graph, the interpreted level of importance increases from less important to very important. In summary, six factors were interpreted as very important, seven factors were interpreted as average in importance and the remaining five factors were interpreted as less important – see Tab. 4.

From Tab. 3 the factor that was interpreted as being most important overall was the *availability of a skilled workforce*. Running RHQs requires highly skilled professionals. Even for companies that believe in the deployment of expatriates, there will be a demand for locals

that have the correct set of skills. This is becoming more important as MNEs recognize the value of local knowledge assets and regional innovation relays as identified by Asakawa and Lehrer (2003). Multinationals are increasingly reconceptualized as a distributed and differentiated networks governed by cooperative systems (Ambos & Birkinshaw, 2010) and thus RHQs need to function as mobilizers of knowledge which requires appropriate levels of human and social capital.

However, only 20% of the respondents felt that South Africa featured positively in this dimension. The concern raised regarding South Africa is the small pool of professionals that have the necessary skills to occupy positions at the RHQs. As a result of this shortage, companies have to pay a premium to attract and

**Tab. 3: Results of Stacey's distribution-fitting analysis as regards the importance of location factors for RHQs – Part 1**

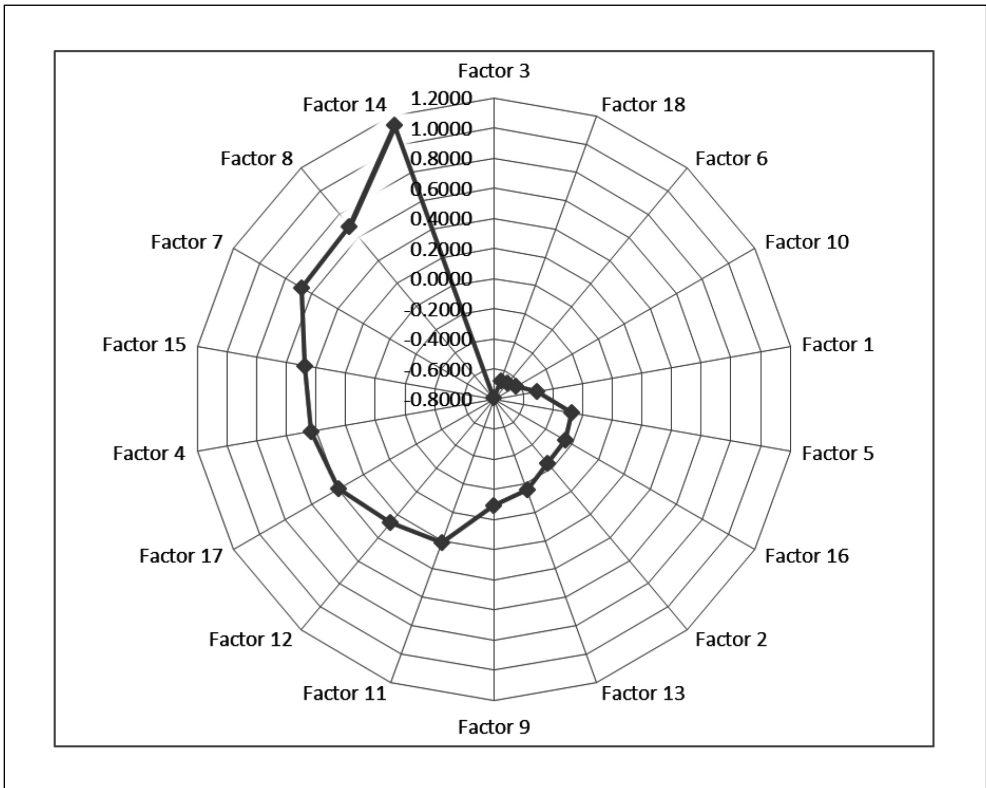
	Government Incentives	Low Operating Costs	Low Living Costs	Favorable Financial Environment	Effective Regional Links	Home Country Compatibility	Supportive Business Environment	Economic IT Infrastructure	Favorable Employment Relations
<b>Observed</b>									
Not Important	2	0	2	0	1	1	0	0	0
Less Important	4	5	7	0	4	8	0	1	4
Important	7	6	6	3	4	4	1	0	4
Very Important	4	4	5	8	8	7	7	7	7
Extremely Important	3	5	0	9	3	0	12	12	5
	20	20	20	20	20	20	20	20	20
<b>Solver parameters</b>									
$\mu$	-0.3281	-0.1101	-0.5602	0.4431	-0.1381	-0.4511	0.6459	0.6592	0.0151
$\sigma$	0.7733	0.7758	0.6006	0.5383	0.7057	0.5799	0.4703	0.7045	0.7274
<b>Expected</b>									
Not Important	1.7667	1.0358	1.7601	0.0074	0.8016	1.1194	0.0002	0.0392	0.5637
Less Important	5.0914	3.9024	7.1709	0.4328	3.9596	6.3149	0.0619	0.6104	3.1075
Important	5.1499	4.8430	6.3171	2.4184	5.3146	6.7521	0.9214	1.9681	4.7329
Very Important	5.3157	6.1195	4.0549	8.4114	6.4801	4.9042	7.0555	5.9177	6.7984
Extremely Important	2.6762	4.0994	0.6969	8.7300	3.4441	0.9094	11.9610	11.4645	4.7975
<b><math>\chi^2</math> contributions</b>									
Not Important	0.0308	1.0358	0.0327	0.0074	0.0491	0.0127	0.0002	0.0392	0.5637
Less Important	0.2339	0.3087	0.0041	0.4328	0.0004	0.4497	0.0619	0.2486	0.2564
Important	0.6646	0.2764	0.0159	0.1399	0.3252	1.1217	0.0067	1.9681	0.1135
Very Important	0.3257	0.7341	0.2203	0.0201	0.3565	0.8956	0.0004	0.1979	0.0060
Extremely Important	0.0392	0.1979	0.6969	0.0084	0.0573	0.9094	0.0001	0.0250	0.0085
<b>Sum (27.84175998)</b>	<b>1.2942</b>	<b>2.5528</b>	<b>0.9699</b>	<b>0.6086</b>	<b>0.7884</b>	<b>3.3891</b>	<b>0.0694</b>	<b>2.4789</b>	<b>0.9481</b>
<b>Solver thresholds</b>	<b>Standardised thresholds</b>								
$T_1$	-1.3728	$T_1$	-1.7799						
$T_2$	-0.6409	$T_2$	-0.8889						
$T_3$	-0.1314	$T_3$	-0.2686						
$T_4$	0.5292	$T_4$	0.5355						
<b>Standardised parameters</b>									
$\mu$	<b>-0.5081</b>	<b>-0.2427</b>	<b>-0.7907</b>	<b>0.4307</b>	<b>-0.2768</b>	<b>-0.6578</b>	<b>0.6776</b>	<b>0.6938</b>	<b>-0.0903</b>
$\sigma$	<b>0.9414</b>	<b>0.9444</b>	<b>0.7311</b>	<b>0.6553</b>	<b>0.8591</b>	<b>0.7059</b>	<b>0.5725</b>	<b>0.8576</b>	<b>0.8855</b>
t-value	-2.4137	-1.1493	-4.8365	2.9396	-1.4408	-4.1676	5.2936	3.6179	-0.4561

**Tab. 3: Results of Stacey's distribution-fitting analysis as regards the importance of location factors for RHQs – Part 2**

	Home and Host Country Political Relations	Government Attitude Towards Business	Rule of Law	Favorable Political Climate	Availability of Skilled Workforce	Size of Local Market	Access to Regional Markets	Government Cleanliness	Geographic Position
<b>Observed</b>									
Not Important	3	0	0	0	0	0	1	0	1
Less Important	4	1	2	3	1	1	1	0	8
Important	5	3	4	8	1	4	6	4	5
Very Important	7	10	6	4	4	5	10	7	4
Extremely Important	1	6	8	5	14	10	2	9	2
	20	20	20	20	20	20	20	20	20
<b>Solver parameters</b>									
$\mu$	-0.4317	0.2655	0.3091	-0.0389	1.0185	0.4803	-0.1196	0.4110	-0.4628
$\sigma$	0.7707	0.5182	0.7630	0.6587	0.9671	0.7774	0.6151	0.6060	0.6865
<b>Expected</b>									
Not Important	2.2201	0.0157	0.2749	0.4287	0.1341	0.1713	0.4162	0.0324	1.8498
Less Important	5.6401	0.7871	1.8558	3.1793	0.7277	1.3208	3.5513	0.7933	6.1031
Important	5.1720	3.6353	3.5063	5.2760	1.4826	2.8216	5.8801	2.8818	5.7543
Very Important	4.8428	9.4535	6.6320	7.2311	3.7843	6.1873	7.2366	7.8383	4.8077
Extremely Important	2.1250	6.1085	7.7309	3.8848	13.8713	9.4990	2.9158	8.4541	1.4851
<b><math>\chi^2</math> contributions</b>									
Not Important	0.2740	0.0157	0.2749	0.4287	0.1341	0.1713	0.8189	0.0324	0.3904
Less Important	0.4769	0.0576	0.0112	0.0101	0.1018	0.0779	1.8329	0.7933	0.5896
Important	0.0057	0.1110	0.0695	1.4064	0.1571	0.4922	0.0024	0.4339	0.0989
Very Important	0.9609	0.0316	0.0602	1.4438	0.0123	0.2278	1.0552	0.0897	0.1357
Extremely Important	0.5956	0.0019	0.0094	0.3201	0.0012	0.0264	0.2876	0.0352	0.1786
<b>Sum (27.84175998)</b>	<b>2.3131</b>	<b>0.2178</b>	<b>0.4252</b>	<b>3.6091</b>	<b>0.4065</b>	<b>0.9956</b>	<b>3.9971</b>	<b>1.3845</b>	<b>1.3932</b>
<b>Solver thresholds</b>	<b>Standardised thresholds</b>								
$T_1$									
$T_2$									
$T_3$									
$T_4$									
<b>Standardised parameters</b>									
$\mu$	-0.6342	0.2145	0.2676	-0.1561	1.1311	0.4760	-0.2543	0.3916	-0.6721
$\sigma$	0.9382	0.6308	0.9288	0.8019	1.1773	0.9463	0.7488	0.7377	0.8358
t-value	-3.0230	1.5204	1.2887	-0.8704	4.2969	2.2495	-1.5187	2.3743	-3.5962

Source: own

Fig. 2: Radar graph reflecting importance of location factors



Source: own

retain talent and this can contribute to higher operating costs. Some executives pointed out that this shortage of skills also contributes to a high attrition rate as professionals change jobs in search for the highest paying organization. Another negative consequence of this phenomenon is the small number of professionals that have gone through the ranks of the organization and therefore have a deep understanding of the business and its challenges.

The next factor identified in order of importance was the *economic IT infrastructure*. ARHQ must coordinate and control the activities of the MNE's affiliates within a particular region, acting as an effective channel of transmitting instructions and information. As a result MNEs have invested in expensive IT systems that ensure real time integration with systems

throughout the world. For example, most manufacturing companies have sophisticated Supply Chain Management systems that must always be online to manage inventory and the ordering of components for assembly plants in the region. All these systems rely on the fact that the RHQs will always be online. In addition to being the communication touch point with global headquarters, many RHQs are also used to host the shared services centers used by the individual countries within the region. Even though most executives agree that South Africa's IT infrastructure is reliable, there is a concern about the price. One executive from a multinational bank indicated that they pay seven times more for bandwidth in South Africa as compared to Europe. Another executive from a global consulting firm indicated that telecommunication costs

Tab. 4: Summary of interpreted importance of location factors

Factor #	Factor Description	Interpreted Importance	Ranking
Factor 14	Availability of skilled workforce	Very Important	1
Factor 8	Economic IT infrastructure	Very Important	2
Factor 7	Supportive business environment	Very Important	3
Factor 15	Size of local market	Very Important	4
Factor 4	Favorable financial environment	Very Important	5
Factor 17	Government cleanliness	Very Important	6
Factor 12	Rule of law	Important	7
Factor 11	Government attitude towards business	Important	8
Factor 9	Favorable employment relations	Important	9
Factor 13	Favorable political climate	Important	10
Factor 2	Low operating costs	Important	11
Factor 16	Access to regional markets	Important	12
Factor 5	Effective regional links	Important	13
Factor 1	Favorable Government incentives	Less important	14
Factor 10	Political relations between home and host country	Less important	15
Factor 6	Compatibility with multinational's home country	Less important	16
Factor 18	Geographic position	Less important	17
Factor 3	Low living costs	Less important	18

Source: own

account for about 30% of their operating costs. Some respondents argued that some of the benefits derived from tax incentives in the Contact Centre and BPO businesses are eroded by the high telecommunications costs. Respondents argued that the country is still paying a significant price for the legislation that allowed Telkom to operate as a state-run monopoly.

A *supportive business environment* was interpreted as being *very important* and ranked third. This factor focuses on the availability of reliable suppliers, presence of key technology suppliers, and consistent physical infrastructure. This confirms the findings of Birkinshaw et al. (2006) that the more attractive the potential host country's perceived business climate, the greater the likelihood of MNE location. Next was the *size of the local market*. During the interviews, most of the respondents confirmed that countries that host regional headquarters often have the biggest economies in that region. Despite South Africa's relatively low economic

growth, many respondents concur on the country's significance as the biggest economy on the African continent. One of the executives indicated that South Africa is amongst the Top 10% revenue contributors out of a total of 51 countries where his company has a presence. Many referred to the country's sound fiscal policies and the gradual emergence and growth of the black middle class as signs for potential future growth.

A *favorable financial environment* was interpreted as being very important overall and 65% of the respondents felt that South Africa featured positively. All the respondents highlighted the importance of stability and predictability of financial indicators. As part of the multinational's strategic management, RHQs are expected to compile business plans and revenue forecasts that are compiled in the currency of the multinational's home country. Currency fluctuations make long term planning very difficult. Respondents mentioned that RHQs often fund their working capital from

loans received from global headquarters. Sudden changes in the currency can have a significant impact on the RHQs' ability to service the loan. In countries characterized by unstable and high inflation, forecasting and planning becomes even more difficult. Most respondents commended the inflation targeting policy adopted by the South African Reserve Bank. Such a framework makes it easy for companies to compile long term plans as they have a comfortable view of the threshold values that can be assigned to the inflation rate in their financial models.

The final factor that was rated as being very important was *government cleanliness*. Corruption in government has the potential to inhibit economic growth and scare off potential investors. Given that government is often one of the biggest spenders in an economy, respondents whose companies do business with government felt that corruption would make it impossible for them to win any government tenders as it is against their governance frameworks and value systems. They indicated that lack of corruption is especially important during the period of economic recession as spending by governments through stimulus packages helps to keep business afloat. The view on South Africa is that corruption has not reached crisis stage although it is becoming more problematic. Nonetheless compared to the rest of the continent it is still rated highly but respondents warn that if corruption is allowed to grow, it will impact service delivery and this can result in social unrest and political instability.

Of the six factors that were rated very important, four are related to the benefits of agglomeration, and three to a sound institutional framework. Distance did not feature. This pattern continues as we move into the category of seven factors that were rated of average importance with the first four emphasizing the institutional environment. The *rule of law* emerged seventh overall. Business cannot operate efficiently in an environment of lawlessness. Within the South African context, high levels of crime are a concern to a number of executives. Despite these challenges, executives from multinationals are comfortable with other aspects of the rule of law in South Africa. These include the enforcement of contracts and resolution of disputes. All believe that the judicial system in South Africa is independent and are comfortable

with its impartiality and fairness when dealing with contractual matters and dispute resolution. The next factor was *government attitude towards business* where 90% of the respondents felt that South Africa featured positively. The expectation of the business community is that government must create an environment that is conducive for business to flourish. Many respondents viewed the South African government as being friendly towards business. They commended the existence of formal structures such as the National Economic Development and Labor Council (NEDLAC). Through this vehicle, government, labor, business and community organizations collaborate in finding solutions and negotiate on economic, labor and development issues facing the country. In addition to NEDLAC, the country's leadership also created multiple forums that allow government to engage the business community on matters affecting the country. However, some executives have warned about the negative impact of policy uncertainty. They pointed out the discussions around nationalization of mines and banks as examples of policy uncertainty that has a negative impact on South Africa hosting future RHQs.

In ninth place were *favorable employment relations*. There is a general view amongst the respondents that the employment relations in South Africa are on par with those implemented in developed countries such as Germany and France. However local rules are seen as stringent when compared to rules in other developing markets. Some executives have questioned the wisdom of having rules that are on par with the developed economies when South Africa is still trying to attract foreign investment. This is a very sensitive issue in South Africa and the debate is often clouded by emotions related to the apartheid legacy. There are those executives who strongly believe that the stringent rules are necessary to protect workers from the exploitation that was prevalent during the apartheid years. On the other side, there are those who feel that workers have too many rights that scare off foreign investors. One executive indicated that the current labor laws make it very difficult for employers to deal with non-performance. Many executives however commended the predictability of the South African labor framework. This is especially important for industries that must

meet service level agreements with overseas markets as they can make contingency plans where necessary.

A *favorable political climate* emerged next in importance. One executive touched on the risk premium that a multinational company can suffer by doing business in a politically unstable country. This risk emanates from the fact that most multinationals have insurance policies covering their employees and assets. By doing business in an unstable country, the organization's risk profile can be negatively impacted and the company can be expected to pay higher insurance premiums to compensate for the risk exposure. He indicated that the matter is taken so seriously that high risk countries require special approval before his organization can send any of its employees to work in the respective country. There is an acknowledgement that not all stable countries have a strong democracy and free political activity. There are a number of well-known authoritarian governments that are running very stable countries and have created an environment favorable to business. Multinationals seem to be satisfied to invest where there is political stability even if that stability is associated with limited political activity and freedom of expression.

*Low operating costs* was interpreted as being of average importance overall. A number of respondents indicated that multinationals have responded to this issue by introducing operating models that allow them to tap the cheapest labor irrespective of location. For example, many multinationals have established global delivery centers that service their RHQs throughout the world. The global delivery centers create an opportunity for a RHQ's finance function, for example, to be performed in India where the cost for accountants is cheaper. There is however an acknowledgement that these global delivery centers come with their own challenges such as time zone differences and language barriers. Therefore countries that have a pool of skilled and affordable local workers still have an advantage. Closely linked to the concept of global delivery networks is the emergence of new technologies that deal with the problem of high labor costs. An example of these technologies is the concept of cloud computing which allows companies to host the entire IT infrastructure in a central data center where the required skills are available

in abundance. Local RHQs are then charged based on the use of the central infrastructure but do not have to worry about the skills required for ongoing maintenance or enhancements.

The last two factors that emerge as being of average importance although at the bottom of this list are related to distance namely *access to regional markets* and *effective regional links*. With many of the developed economies still emerging out of recessions or dealing with a major debt crisis, respondents felt that untapped markets within the continent provide great opportunities for growth. Regional integration and the formation of regional economic blocks such as the Southern African Development Community (SADC) are viewed as strong building blocks towards regional integration and effective trade across the member countries. South Africa's leading role within the SADC region is viewed as a position of strength and further entrenches the country's status as the gateway to Africa. Even though the regionalization of the continent has been in existence for a number of years, many respondents felt that a lot of work still needs to be done. The movements of goods and labor within the SADC region for example still has a long way to go before it can reach the levels experienced in integrated regional communities such as the EU. The road and rail infrastructure within the continent still requires serious investment as it impedes the simple and cost effective movement of goods. Even though African countries have worked towards regional integration, some of the respondents referred to a peculiar alignment to historical colonial divisions. Former British, French or Portuguese colonies were much more open to doing business with their former colonial masters. One of the executives from a technology consulting firm referred to an example where their client in Angola prefers getting services from their office in Portugal rather than from South Africa.

Five factors come out as being less important starting with *favorable government incentives*. Only 30% of the respondents viewed South Africa as featuring positively on this factor. Despite its overall rating of less important, this factor featured highly with multinationals in the manufacturing sector. In line with the government's drive to boost this sector, a number of incentives were critical in driving the location decision in South Africa. The most prevalent of these incentives is the

Motor Industry Development Program (MIDP) applicable in the motor vehicle manufacturing sector. The program was designed to help the industry adjust and increase its global competitiveness in the post-apartheid trade policy environment. The savings derived from the program also help offset the costs associated with South Africa's geographic location which is often far from the export markets. In addition to the MIDP, South Africa is also made attractive by the fact that it is a beneficiary of the Africa Growth and Opportunity Act (AGOA) introduced by the USA government in 2000. AGOA makes provision for trade preferences and duty free entry to the USA of certain goods from Sub-Saharan Africa. A number of manufacturers are taking advantage of this incentive and use South Africa as an export base to the US. For example, BMW South Africa only sells 30% of their vehicles to the local market and the rest are exported with the US being the biggest export destination.

Even though the above incentives can be important, many of the senior executives expressed doubts about their sustained value. They argued that many countries have introduced incentives to a point that it is difficult for any country to use incentives as a differentiator. They also raised questions about the sustainability of government incentives. To highlight doubts on the sustainability of tax incentives, one executive referred to tax incentives used by Ireland to attract multinational companies to its shores. Many commentators argue that it is a matter of time before Ireland is forced to revise its generous tax incentives as a measure to address their current debt crisis. The question in everyone's mind is whether all the multinationals that relocated to Ireland will vote with their feet and seek a new location that provides better incentives.

The next three factors are related to distance. *Political relations between home and host country* and *compatibility with multinational's home country* rank only 15<sup>th</sup> and 16<sup>th</sup>. Hostility between countries is not good for business but there was a general view amongst the respondents that good relations do not necessarily translate into good business. Also by their very nature, multinationals expect to operate in very diverse countries that do not resemble their home country and are glued together by the organizational culture which transcends country differences.

*Geographic position* appears in second last position. Most executives felt that globalization and the emergence of new technologies have made this factor less significant to the RHQs location discussion. The emergence of technologies such as video conferencing and telepresence make it possible for people to simulate a virtual boardroom discussion. In addition multinational companies have also invested substantially in closely integrated IT systems. These systems allow executives at the global headquarters to have real time access to the business activities in each RHQ. In addition to cost savings, the implementation of these technologies is in line with environmental and green initiatives. Corporate companies are able to reduce their carbon footprint by discouraging unnecessary flights to the RHQs. Even though the implementation of telecommunication technologies has made this factor less important, some executives indicated that bandwidth costs and network penetration makes it difficult for Africa to exploit these technologies to a maximum. Also executives whose companies focus on exporting goods to places such as Europe, the USA and Asia, touched on the negative impact of high shipping costs from their South African bases because of distance.

The least important factor was *low living costs*. The living costs in a RHQs host country seemed relevant only to countries that have a large expatriate contingent deployed to run the office. Given that most multinationals operating in South Africa have a limited dependence on expatriates, it is not surprising that this factor has the lowest mean of all 18 factors.

## Conclusion

Multinationals are aiming to strike a balance between local responsiveness and global integration. We find that the dominant criteria used by MNEs to choose their locations for RHQs in Africa are linked to the advantages of agglomeration and the accompanying economies of scale, and a sound institutional framework which provides a predictable business climate. In emerging markets which often suffer from institutional voids and thus higher country risk profiles where the rules of the game are uncertain, MNEs choose to locate in the environment which is most familiar to its home rules and use it as a springboard to do business in more 'hostile' milieus. The

new growth opportunities are almost invariably located in countries with less attractive institutional setups and MNEs attempt to mitigate that risk by choosing the most favorable rules within that region. Distance is shown to be less important in an era of globalization and technological innovation which allows distance to be navigated. This is not to say that geography does not matter as agglomeration effects demonstrate that whilst distance is less important, location still matters because of the benefits of increasing returns as a result of agglomeration.

The implications for managers looking to do business in Africa is to recognize that this is continent still consolidating its transition to a more familiar business environment. Africa is opening up to international business on an unprecedented scale. In many respects it represents a frontier to global capital which is seeking out new, growing and emerging markets. Whilst Africa is still very much on the periphery of world markets and remains a tiny player on the international stage, it is beginning to actively court foreign companies and has done so by addressing the institutional business environment. Understanding the environment of business in Africa will allow commercial entities to make informed decisions about the risks and prospects of the African landscape. Given the unique business environment it will be a difficult region to manage successfully from centralized headquarters and thus using RHQs with local knowledge has real advantages. South Africa is a useful launching pad as an entry point to the continent because of its sound infrastructure and institutions, its relatively large and diversified economy and its more recognizable landscape for MNEs from the developed world. Furthermore, South African companies have been at the forefront of the recent push by corporations into the continent and thus have built up solid networks and expertise in this regard. The research suggests that other developing and emerging regions may find similar results with MNEs choosing to establish RHQs so as to gain knowhow into local conditions especially where the institutional environment is unpredictable. MNEs may therefore choose to locate their RHQs in countries within these regions which have sounder institutional milieus as part of their risk mitigation strategies of operating in these regions.

As discussed, South Africa emerges very favorably as a suitable host for RHQs for multinationals wishing to do business in Africa. However, we need to note some limitations of this paper which present themselves as fruitful areas for further research. First, the study is conducted at a point in time on a continent which is seeing dramatic changes and extraordinary economic growth rates. South Africa's economic dominance in Africa is declining and that may open up new host possibilities. Over the last decade the rapid growth in Dubai saw it become a potential competitor to host RHQs for the Africa and Middle East region. However this has been short lived and a number of multinationals have recently shifted back to South Africa. But it is worth noting the dynamics of the broad region make the final outcome uncertain. Second, our relatively small sample makes it impossible to statistically identify industry specific differences. Additional areas for research include an analysis of whether the same amount of value and decision-making autonomy is decentralized to RHQs in different regions. Do São Paulo, Johannesburg and Singapore elicit the same amount of value decentralization for multinationals hosting their Latin American, African and Asian operations there? Lastly, we have indicated that a number of multinational companies have introduced what they call 'Emerging Markets' as an additional region. It would be useful to conduct a study to determine the criteria used by multinationals to locate RHQs for the 'Emerging Markets' group of countries or whether these are going to remain subservient to geographic boundaries.

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## Abstract

**THE STRATEGIC LOCATION OF REGIONAL HEADQUARTERS FOR MULTINATIONALS IN AFRICA: SOUTH AFRICA AS A HOST COUNTRY****John M. Luiz, Busi Radebe**

*Multinationals enterprises are aiming to strike a balance between local responsiveness and global integration. The establishment of regional offices allows multinational companies to have a local insight of the market, competition landscape and customer preferences. With such detailed insight, multinational companies are then able to formulate effective and responsive regional strategies. The importance and value of regional headquarters in the academic literature has generally focused on them in industrialized countries. The result is that we do not yet fully possess an overall framework for understanding how value and decisions are devolved, how location decisions are made and how their structures and strategies are evolving to accommodate the growth in emerging markets. The study examines the dominant criteria used by multinational enterprises to choose their locations for regional headquarters in Africa by examining South Africa as a host country for the continent. We find that the main criteria are linked to the advantages of agglomeration and the accompanying economies of scale, and a sound institutional framework which provides a predictable economic climate. In emerging markets which often suffer from institutional voids and thus higher country risk profiles, multinationals choose to locate in the environment which is most familiar to its home rules and use it as a springboard to do business in more 'hostile' milieus. The implications for managers looking to do business in Africa is to recognize that this is a continent still consolidating its transition to a sounder institutional environment. Given the unique business environment it will be a difficult region to manage successfully from centralized headquarters and thus using regional headquarters with local knowledge has real advantages.*

**Key Words:** Foreign direct investment, multinational enterprise, Africa; regional headquarters, MNE-host country relations.

**JEL Classification:** M16.

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# FACTORS OF TOURISM'S COMPETITIVENESS IN THE EUROPEAN UNION COUNTRIES

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## Introduction

Tourism is currently among the most dynamically growing branches of the national economy and a major sector of employment. It is an important area of activity of contemporary society, as well as one of the largest and most profitable industries globally.

Tourism competes with acquiring tourists and its competitiveness is based on the attractive natural resources and elements of cultural heritage as well as their adequate exposure and use (Pompurová & Šimočková, 2014). The advantage in this respect is of particular significance to regions in an economic slump, which stand to find a source of additional or key income and reduced unemployment.

Review of various literature points to significant dependence between the development of tourism and competitiveness of states and regions. The results of literary reviews and empirical research are presented in this article, including statistical analysis of these dependences. The empirical research focuses on both factors constituting sources of competitive advantage and its outcomes. These factors include the capacity of tourist accommodation establishments, their arrivals and their average expenditure during tourism trips. This includes both domestic and outbound trips. The competitiveness of the European Union member states is based on three factors representing output competitiveness, i.e. GDP, gross value added and final consumption expenditure. The data are adopted from official public statistics of the European Union, available with Eurostat.

It is the objective of the paper to present and evaluate the dependences between competitiveness of the European Union member states and selected factors determining competitiveness of tourism in these states.

The following hypotheses have been adopted for the purposes of this objective:

H1: Availability of accommodation establishments, a major factor of a regions' tourist competitiveness, is highly varied throughout European Union member states.

H2: There is a high, statistically significant correlation between availability of accommodation establishments and tourism arrivals in a given country in the European Union member states.

H3: There is a high, statistically significant correlation between competitiveness of these states and expenditures on tourism services in the European Union member states.

These hypotheses have been verified by means of Hellwig's method of constructing taxonomic indices based on partial diagnostic variables. It helps to rank states in respect of various aspects under discussion as determined by diverse diagnostic variables.

## 1. Competition and Competitiveness

Competition and competitiveness are present wherever there are private ownership as a means of production and an economy of goods. They are fixtures and core parts of the market economy. They are not identical, however.

Competitiveness is determined by a number of factors, both short- and long-term. To be competitive, an entity must first stand out in the market – be recognised.

*"Competitiveness is given in various definitions in literature. It most commonly denotes the ability of certain entities to compete in a given market segment. The notion of competitiveness may be applied to each degree of aggregation, i.e. to an individual product, an enterprise, a sector, industry, region or the national economy"* (Nawrot & Zmysłony,

2009, p. 55-56). Therefore, both a business and a territorial unit like a city, community or region can be said to compete. However, competition among businesses is the most important instance of the phenomenon in connection with economic development.

Competitiveness of enterprises is based on and is a part of competition. Thus, competitiveness can be described as a firm's ability to compete with other enterprises. It also has a variety of other senses, though.

In economic terms, competition is rivalry among entrepreneurs for profits from the sale of goods and services, for selling and supplying markets and for workers. It can be developed provided there are independent enterprises in the market, there are agents responding to market signals and impulses and both enterprises and agents have free access to the market.

*“Competitors attempt to realise similar goals, which means actions taken by some interfere with or even prevent others from attaining the same objectives”* (Wolak-Tuzimek et al., 2015, p. 37).

Competitiveness is multi-dimensional as it concerns states (macro scale), sectors, industries, parts of economy (mezzo scale), groupings of countries (mega scale),

enterprises (micro scale), commodities or services (micro-micro scale). “Competitiveness as a microeconomic category relates to organisations, e.g. enterprises or plants. It is multi-dimensional and perceived in relations among: a business entity, its potential, opportunities and skills versus market structure and strategic opportunities available there” (Markova et al., 2014, p. 88).

Particular definitions of competitiveness vary, as illustrated by the table below.

Competition exists in every sphere of economic life. It causes both negative and positive economic effects. When the particular definitions of competitiveness offered by literature are compared, it can be noted the concept means both a capacity for rivalry with competitors and a current competitive standing. At present, competition is not only rivalry but also an opportunity for cooperation between business partners.

Competitiveness is regarded as a natural development in economic life and the key source of wealth. It promotes not only rivalry among competitors but also cooperation as they jointly look for the best solutions to problems. Today, competition is not only rivalry, but also an opportunity for cooperation between business partners as well (Ślusarczyk, 2011).

**Tab. 1: Selected definitions of competitiveness**

Author	Definition
K. Markovics	Competitiveness means, essentially, “the liability and skill for market contention and the skill for position gained and a permanent commitment that are indicated especially by successful expansion of business, market share and profitability”.
F. A. von Hayek	A procedure of discovery in conditions where there is full freedom of action in the market.
A. L. Alarcon	Ability of a region, industry or individual enterprise to compete in markets where they operate in parallel with improvement in living standards of society.
M. E. Porter	Competitiveness of an economy is measured as productivity as a value of products by a unit of labour. The author suggests defining determinants of productivity for particular sectors and enterprise groupings.
R. Huggins	Competitiveness is the capacity for using individual, specific and valuable resources which are difficult for competitors to imitate.
The Global Competitiveness Report	Competitiveness is a set of institutions, principles and factors determining standards of national productivity.

Source: own elaboration based on Bray (1941, p. 327); The Global Competitiveness Report 2014-2015, p. 4; Porter (1990, p. 71); Markovics (2005, p. 13); Huggins (2003, p. 89); Alarcon (2004, p. 92)

**Tab. 2: Positive and negative effects of competition**

Positive effects of competition	Negative effects of competition
Competitors occasionally support market segments unattractive to other businesses.	It reduces the numbers of jobs and living standards in countries losing the competitive struggle. Differences of living standards in particular global regions are expected to widen due to growing income disparities.
Competitors can drive growth of a sector by financing market development. Such firms may incur some costs of standardising products or approving new technologies. Their image (if they are prestigious) can in addition improve reliability of an entire sector.	If everyone competes against everybody else, the value of competitiveness is lost.
Competitors jointly incur costs of countering new enterprises in a sector.	It only reflects one dimension of social and human history, i.e. the spirit of rivalry. It boosts effectiveness of actions at the expense of human relations.
Competition is the key driver of cost reduction, product improvement, and technological change.	By determining acceptable directions, it restricts the process of individual and social life and development. Excessive competition leads to its mass rejection by the public and to polarisation of social groups.
Competition provides continuous value: in the field of production, by cutting unit costs without lowering quality; in respect of work and management methods, it boosts effectiveness.	Representatives of competing enterprises corrupt state officials, who may make decisions favouring these enterprises, „spoiling“ the public image of the state and its representatives. Such bribery is a result of inefficiency of state institutions.
Competition increases value by continuous verification of products and services offered by an enterprise to improve them.	Discrediting competitors and their products before the public by unfair advertising or other illegal measures.
Competition creates innovation, which is evident in the launching of new products, among other things.	

Source: Frączek (2009, p. 8)

## 2. Tourism as a Form of Economic Activity

Tourism is a multi-dimensional, psychological, social, economic, geographical and cultural phenomenon. Therefore, the very notion of tourism and its definitions have long been controversial. These debates concern not only the question which trips should be considered as tourism but also the broader issues of defining tourist demand and supply. In extreme cases, tourism is interpreted either as travel that involves sightseeing and wandering for pleasure and in the free time (the narrow and most common notion of tourism) or as any travel that involves an influx of funding in the

case of arrivals and its outflow in the case of departures (the broad approach represented by some travel analysts) (Gilbert, 1990). Several definitions of tourism are presented below.

The development of tourism may be evaluated on both the global, national, regional and local scales. In this economic perspective, tourism is a complex market of goods, capital and labour where a variety of services are exchanged (Cabaj & Kruczek, 2007). Demand or desire of the public to spend their leisure in a variety of ways, is the key to development of tourism seen in this light.

Tourism is an important and contemporary area of economic and social life. Tourist activity

**Tab. 3: Selected definitions of tourism**

Author	Definition
W. Hunziker	All relations and developments associated with travel and stay in a location by arrivals if not motivated by the desire to settle and therefore unrelated to any gainful activities.
R. W. McIntosh & Ch. R. Goeldner	The sum total of phenomena and relations arising from interactions between tourists, service providers, governments and receiving communities in the process of attracting and hosting tourists and other visitors.
K. Przeclawski	All geographical mobility associated with voluntary, temporary changes of location, rhythm, environment, living and personal contact with the (natural, cultural or social) visited environment.
WTO	All activities by individuals who travel and stay outside of their everyday surroundings for an uninterrupted maximum of a year for rest, work or other purposes.

Source: Hunziker (1951, p. 1); McIntosh and Goeldner (1986); Przeclawski (1996, p. 30); Panasiuk (2006, p. 24)

is a measure of living standards and an indicator of progress in societies. The development of tourism is a major driver of socio-economic dynamics. Its importance is demonstrated by its high capacity for generating new jobs, improvement of local life quality and enhancing competitiveness of regions. In parallel, tourism contributes to the discovery of the most precious cultural and environmental resources that, once highlighted, improves the internal and external image of a country, region or location.

Tourism is among the fastest growing sectors of the economy as it reflects dynamics and scope of coordinated social development and sustainable progress. A number of countries, provinces and regions have achieved well-rounded social and economic growth by developing the tourist economy and the range of necessary support measures including a complementary infrastructure and an active well-educated society. In doing so, they organise an adequate living standard and fulfil the basic social requirement.

Tourism is the starting point for the development of regions for several reasons.

1. As a service, it requires significant human capital, which is rare in the global economy. Tourism cannot work without the human factor, hence its huge impact on the job market.
2. Growing revenue in this sector translates into genuine creation of new jobs.
3. It is a powerful instrument of regional

policies that eliminates social and economic disparities as it transfers demand from rich to less wealthy and less developed regions.

4. It is crucial in adding value that stimulates and boosts the morale of the local communities.
5. It helps to reconcile nations in conflict, overcome stereotypes, and broaden knowledge and intellectual development.
6. It's a perfect stimulator of local communities and regions.

The 2010 Madrid Declaration stresses the need to improve competitiveness of the tourism sector in line with principles of sustainable development and affirms the EU's goal for tourism generated added value. This achieved through an integrated approach to tourism and supplemental actions of the member states. Actions for tourism should focus around four pillars (Polska Organizacja Turystyczna, 2012, p. 19):

1. Stimulating competitiveness of the tourist sector in Europe,
2. Support for development of high-quality sustainable and responsible tourism,
3. Consolidation of Europe's image as a set of quality tourist destinations in line with principles of sustainable development,
4. Full use of the potential of various EU policy areas and financial instruments for the development of tourism.

Tourism is among the fastest-growing sectors of the global economy as confirmed

by statistics of the World Tourism Organisation (UNWTO) and World Travel and Tourism Council (WTTC), recording a steady, uninterrupted rise of both numbers of tourists and tourism revenue after the Second World War.

### 3. Sources of Competitive Advantage in Tourism

Each entity in the market attempts to gain a competitive advantage, that is, to stand superior to other competitors. It is a relative indicator of economic operations – it helps an entity to offer products or services conforming to customer expectations as being better than those offered by competitors. This product can be of better quality, lower price, better service or more complete satisfaction of the customers' needs.

Specialist literature provides a range of definitions of competitive advantage. Some interesting interpretations of the term are given below:

- *“All that distinguishes the products of a firm or the firm itself to its advantage from its competitors in the eyes of end users.”* (Fahey, 1989, p. 18).
- Something owing to which a firm achieves better performance or simply does things better than its competitors (Aaker, 1989).

- *“Ability of an entity to do something its competitors are incapable of doing, or at least doing it better than them.”* (Rue & Holland, 1986, p. 432).
- *“Strengths of an organisation compared to its present and probable future competitors.”* (Stoner, 1982, p. 113).
- *“Ability to pursue a present and future strategy that competitors are unable to realise.”* (Barney, 1991, p. 102).

To gain a lasting competitive advantage, an entity should offer more attractive services or products than those proposed by the competition.

A competitive advantage is increasingly gained owing to factors which assure additional benefits from launching of new-quality products and services which provide for a highly profitable flexibility of demand (Sieradzka, 2015).

Specialist literature encompasses two main trends analysing sources of competitive advantage, are demonstrated in the following table.

M. E. Porter (2001) points to four sources of competitive advantage:

- Demand conditions, in particular, demanding customers and their needs that emerge earlier than elsewhere.
- Presence of related and supporting sectors.

**Tab. 4: Main lines of thinking on sources of competitive advantage**

Trend	Description
Positional approach (industrial organization theory)	- Based on analysing the specific nature of a sector where an entity operates. - Significance of the environment and its effect on decisions and actions are emphasised. This approach was developed and propagated in the 1980s by M. Porter, who believed an entity's capacity for dealing with competitive forces better than other market players do is the starting point for a competitive advantage. In this context, a firm's competitiveness depends on the intensity of five competitive forces in a sector.
Resource based view of the firm	- Competitive advantage is a result of unique resources (skills, competences) of an entity, including knowledge, organisation of operations, management methods, experience, brand and patents that help to prevent or restrict actions by the competition. - The resultant competitive advantage is attained as competitors find it difficult to acquire comparable or similar resources determining success. Analyses in accordance with the resource-based view not only assess key competences but also identify new requirements, new products that will provide a foundations for building new key competences.

Source: own elaboration based on Porter (1985); Wernerfelt (1984)

- Production factors that encompass both tangible and intangible resources.
- Context of strategy and business rivalry, that is, legal regulations, incentives and customs governing types and intensity of local rivalry.

In reference to the tourist service sector, the first three sources of competitive advantage listed above are well recognised by the theory of tourist region.

Demand conditions are considered with regard to: intensity of tourist traffic, its directions and structure, tourist's profile (age, permanent residence, education), expenditure during tourist events, preferences and expectations of tourists. Developments are determined and forecasts are presented.

Economic analysis of tourism's impact on the economy normally takes into account the effects of both tourism in a narrow sense (often termed the tourist industry) and broader definition (commonly referred to as the tourist economy), the latter encompassing a wider supporting sectors including catering, the souvenir industry, commerce, construction, insurance or banking. The fundamental parameters determine the comprising contribution of the tourist industry to GNP and employment. In the case of related sectors, researchers commonly encounter the difficulty of estimating the impact of tourism on development, since these sectors depend on a range of factors other than tourism.

The theory of tourist region highlights tourist attractions, treated as principal sources of tourist traffic. Broadly speaking, these include (Kusa, 2008):

- Natural attractions: landscape, climate and other geographical features.
- Man-made attractions: historic buildings and infrastructure.
- Cultural attractions: tradition and folklore, religion, museums, special events.
- Social attractions: lifestyle of residents and local communities.

Tourist attractions are the root cause of emergence of tourist regions and necessary but insufficient conditions for development of tourist traffic. They must be supplemented with a set of facilities and institutions providing the material and organisational base without which natural and cultural assets would remain unexplored or even inaccessible (Gołembski, 1998). These factors are defined as tourist infrastructure.

## 4. Methods

Factors determining tourist competitiveness were evaluated by means of the Hellwig's method (Hellwig, 1968). It provides for a construction of a synthetic measure founded on partial diagnostic variables that represent various aspects of a phenomenon under discussion (Dyr & Ziółkowska, 2014).

Successive stages of the research involved:

- Creating a set of diagnostic characteristics.
- Normalisation of diagnostic characteristics.
- Calculation of taxonomical indices.

The diagnostic characteristics were listed considering the indicators available in public statistics of the European Union (Eurostat) concerning diverse aspects of tourist competitiveness and competitiveness of the EU-28 member states (Tab. 5). The source assured comparability and a relatively high reliability of statistics. Each factor and each diagnostic variable was assigned a unique symbol (identifier) to distinguish it from other variables and to assign them with specific numerical values. All the figures relate to 2013 – the most recent year for which full data are available.

To assess tourist competitiveness, the characteristics were normalised by standardising  $j^{\text{th}}$  variable of  $i^{\text{th}}$  microregion. The calculations employed the formulas below:

- Stimulants:

$$t_{ij} = \frac{x_{ij} - \bar{x}}{S_j} \quad (1)$$

- Destimulants:

$$t_{ij} = -\frac{x_{ij} - \bar{x}}{S_j} \quad (2)$$

where:

$t_{ij}$  – standardised value of  $j^{\text{th}}$  index in  $i^{\text{th}}$  territorial unit,

$x_{ij}$  – value of  $j^{\text{th}}$  characteristic in  $i^{\text{th}}$  territorial unit,

$\bar{x}$  – arithmetic mean of characteristic  $j$ ,

$S_j$  – standard deviation in distribution of characteristic  $x_j$ .

Using final sets of standardised diagnostic indicators, Hellwig's taxonomical indices of competitiveness, i.e. synthetic indices for each variable selected and partial indices for aspects

**Tab. 5: The diagnostic variable set of the tourism competitiveness**

Taxonomical Index		Diagnostic Variables	
Symbol	Name	Symbol	Name
X1	The competitiveness of the EU Member States	X <sub>1,1</sub>	GDP per capita
		X <sub>1,2</sub>	Gross value added per capita
		X <sub>1,3</sub>	Final consumption expenditure per capita
X2	Capacity of tourist accommodation establishments	X <sub>2,1</sub>	Number of hotels and similar accommodation
		X <sub>2,2</sub>	Number of holiday and other short-stay accommodation
		X <sub>2,3</sub>	Number of bed-places in hotels and similar accommodation
		X <sub>2,4</sub>	Number of bedrooms in hotels and similar accommodation
X3	Arrivals at tourist accommodation establishments	X <sub>3,1</sub>	Arrivals number of residents at hotels and similar accommodation
		X <sub>3,2</sub>	Arrivals number of non-residents at hotels and similar accommodation
		X <sub>3,3</sub>	Total arrivals number at tourist accommodation establishments
		X <sub>3,4</sub>	Arrivals of residents – holiday and other short-stay accommodation
		X <sub>3,5</sub>	Arrivals number of non-residents –holiday and other short-stay accommodation
X4	Average expenditure of tourism trips (1 night or over) - Domestic trips	X <sub>4,1</sub>	Average total expenditure per night
		X <sub>4,2</sub>	Average expenditure on accommodation per night
		X <sub>4,3</sub>	Average total expenditure per trip
		X <sub>4,4</sub>	Average expenditure on accommodation per night
X5	Average expenditure of tourism trips (1 night or over) – Outbound trips	X <sub>5,1</sub>	Average total expenditure per night
		X <sub>5,2</sub>	Average expenditure on accommodation per night
		X <sub>5,3</sub>	Average total expenditure per trip
		X <sub>5,4</sub>	Average expenditure on accommodation per night

Source: own

of the particular areas, were computed for each member state.

Hellwig’s method employs a matrix of standardised variables to determine a standard object of the following coordinates:

$$O = [x_{0j}] \tag{3}$$

where:

$x_{0j} = \max_i \{t_{ij}\}$  – for stimulants,

$x_{0j} = \min_i \{t_{ij}\}$  – for destimulants,

$t_{ij}$  – standardised value of  $j^{th}$  index in  $i^{th}$  territorial unit.

Only the stimulants formula was used to calculate the synthetic competitiveness index of micro regions as de-stimulants were absent from the characteristics to be assessed.

Euclidean distance from the standard object was subsequently determined:

$$d_{i0} = \sqrt{\sum_{j=1}^m (t_{ij} - x_{0j})^2} \tag{4}$$

where:

$d_{i0}$  – Euclidean distance between  $i^{th}$  and the standard object,

$t_j$  – standardised value of  $j^{th}$  index in  $i^{th}$  territorial unit,  
 $i = 1, 2, \dots, n$ ,  
 $j = 1, 2, \dots, m$ ,

Given these assumptions, the synthetic index can be computed as:

$$S_i = 1 - \frac{d_{i0}}{d_0} \quad (5)$$

where:

$d_{i0}$  – Euclidean distance between  $i^{th}$  and the standard object,

$d_0$  – critical distance of a given unit from the standard:

$$d_0 = \bar{d}_{i0} + 2 \cdot S_0 \quad (6)$$

$\bar{d}_{i0}$  – arithmetic mean of taxonomical distances between  $i^{th}$  and the standard object:

$$\bar{d}_0 = \frac{1}{n} \cdot \sum_{i=1}^n d_{i0} \quad (7)$$

$S_0$  – standard deviation of taxonomical distances between  $i^{th}$  and the standard object:

$$S_0 = \sqrt{\frac{1}{n} \sum_{i=1}^n (d_{i0} - \bar{d}_0)^2} \quad (8)$$

The synthetic competitiveness index  $S_i$  is in the range [0,1] as part of this model. The maximum value of  $S_i$  (1) represents the so-called standard, that is, a state where all the variables analysed are maximum.

In this method, the greater the synthetic index, the higher the tourist competitiveness. Differences between the indices also point to development gaps of the particular European Union member states.

## 5. Competitiveness of the European Union Member States

The competitiveness pyramid frequently serves to evaluate competitiveness of states and regions. The concept, developed for the

purposes of the commission, identifies factors deciding changes of competitiveness. Factors reflecting economic development and quality of life are at the top of the pyramid (Gardiner, Martin, & Tyler, 2004).

To evaluate competitiveness of the European Union member states in order to verify the hypotheses postulated in this article, 3 diagnostic variables at the top of the competitiveness pyramid were employed, namely:

- GDP per capita,
- Gross value added per capita,
- Final consumption expenditure per capita.

Values of diagnostic variables and the algorithm for calculation of the synthetic taxonomical index to represent competitiveness of the European Union member states are shown in Table 6. The resultant values of the synthetic competitiveness index corroborate the universally accepted opinion on a considerably varied competitiveness of the EU-28 member states and the relatively low competitiveness of Central European states. Therefore, a detailed analysis of results is not undertaken in this respect.

## 6. Sector of Tourism and Competitiveness of the EU Member States – the Authors' Research

### Capacity of tourist accommodation establishments

Availability of accommodation establishments is a major factor of tourist competitiveness. The lack of well-developed tourist facilities, in particular, accommodation establishments, restricts and often even prevents access to other tourist attractions (e.g. mountain trails, sea beaches, monuments, etc.).

The following diagnostic variables were used to construct the taxonomical index of availability of accommodation establishments.

- Number of hotels and similar accommodation.
- Number of holiday and other short-stay accommodation.
- Number of beds in hotels and accommodation facilities.
- Number of rooms in hotels and similar accommodation.

**Tab. 6: Calculation of the synthetic competitiveness index of EU-28 member states**

Member State	Variable Value			Standardized Variable Value			Euclidean Distance	Synthetic Index
	$x_{1,1}$	$x_{1,2}$	$x_{1,3}$	$t_{1,1}$	$t_{1,2}$	$t_{1,3}$	$d_{1,0}$	$S_1$
Belgium	35,600	18,274	31,700	0.621	0.781	0.609	4.245	0.507
Bulgaria	5,600	3,525	4,852	-1.179	-1.494	-1.175	7.468	0.132
Czech Republic	14,900	7,430	13,381	-0.621	-0.892	-0.608	6.486	0.246
Denmark	45,100	22,026	38,905	1.191	1.360	1.087	3.386	0.606
Germany	34,200	19,516	31,365	0.537	0.973	0.586	4.266	0.504
Estonia	14,200	7,307	12,426	-0.663	-0.911	-0.671	6.561	0.238
Ireland	38,000	17,151	34,968	0.765	0.608	0.826	4.057	0.529
Greece	16,500	11,819	14,606	-0.525	-0.214	-0.527	6.096	0.292
Spain	22,500	13,061	20,512	-0.165	-0.023	-0.134	5.531	0.357
France	32,100	17,936	28,970	0.411	0.729	0.427	4.525	0.474
Croatia	10,200	6,198	8,657	-0.903	-1.082	-0.922	6.947	0.193
Italy	26,500	16,384	24,275	0.075	0.490	0.116	5.033	0.415
Cyprus	21,000	14,220	19,270	-0.255	0.156	-0.217	5.583	0.351
Latvia	11,600	7,116	10,007	-0.819	-0.940	-0.832	6.775	0.213
Lithuania	11,800	7,387	10,649	-0.807	-0.898	-0.789	6.722	0.219
Luxembourg	83,100	26,194	75,338	3.472	2.003	3.507	0.000	1.000
Hungary	10,200	5,346	8,542	-0.903	-1.213	-0.929	7.012	0.185
Malta	17,800	10,096	15,626	-0.447	-0.480	-0.459	6.103	0.291
Netherlands	38,700	17,412	34,967	0.807	0.648	0.826	4.015	0.533
Austria	38,100	20,553	34,021	0.771	1.133	0.763	3.947	0.541
Poland	10,300	6,336	9,246	-0.897	-1.060	-0.883	6.909	0.197
Portugal	16,200	10,590	14,170	-0.543	-0.404	-0.556	6.198	0.280
Romania	7,200	4,465	6,357	-1.083	-1.349	-1.075	7.278	0.154
Slovenia	17,500	9,503	15,167	-0.465	-0.572	-0.489	6.172	0.283
Slovakia	13,600	7,713	12,409	-0.699	-0.848	-0.673	6.557	0.238
Finland	37,300	20,512	32,139	0.723	1.127	0.638	4.069	0.527
Sweden	45,500	21,307	40,354	1.215	1.249	1.184	3.325	0.614
United Kingdom	31,500	20,479	28,102	0.375	1.122	0.370	4.495	0.478
Arithmetic Mean	25,242.9	13,209.2	22,535.0	0.0	0.0	0.0	5.349	0.378
Standard Deviation	16,666.1	6,481.6	15,055.7	1.0	1.0	1.0	1.628	0.189
Variation Coefficient	66.0%	49.1%	66.8%	-	-	-	-	50.0%
Max	83,100	26,194	75,338	3.472	2.003	3.507	7.468	1.000
Min	5,600	3,525	4,852	-1.179	-1.494	-1.175	0.000	0.132

Source: own

Values of diagnostic variables and the algorithm for calculation of the synthetic taxonomical index to represent availability of accommodation establishments are shown in Table 7. Availability of accommodation in the

EU-28 member states is greatly varied – the variation coefficient for the total numbers of establishments and beds ranges from 140% to 220%. The variation becomes even greater when numbers of establishments are referred to

**Tab. 7: Calculating the Taxonomical Index of capacity of tourist accommodation establishments**

Member State	Variable Value				Standardized Variable Value				Euclidean Distance	Synthetic Index
	$x_{2,1}$	$x_{2,2}$	$x_{2,3}$	$x_{2,4}$	$t_{2,1}$	$t_{2,2}$	$t_{2,3}$	$t_{2,4}$		
Belgium	1,713	2,839	128,641	59,671	-0.484	-0.347	-0.529	-0.530	7.221	0.247
Bulgaria	2,055	890	262,196	118,107	-0.454	-0.422	-0.330	-0.354	7.098	0.260
Czech Republic	6,301	3,163	317,875	137,257	-0.082	-0.334	-0.248	-0.296	6.812	0.290
Denmark	514	174	87,129	43,293	-0.589	-0.450	-0.590	-0.579	7.385	0.230
Germany	34,692	14,105	1,757,624	948,667	2.406	0.090	1.889	2.151	4.288	0.553
Estonia	404	916	31,989	15,321	-0.599	-0.421	-0.672	-0.664	7.443	0.224
Ireland	2,462	4,915	155,660	66,576	-0.419	-0.266	-0.489	-0.509	7.113	0.258
Greece	9,675	24,014	773,214	401,196	0.214	0.474	0.428	0.500	5.532	0.423
Spain	19,610	25,630	1,867,823	914,263	1.084	0.537	2.053	2.048	4.217	0.560
France	17,171	3,620	1,258,942	629,471	0.871	-0.316	1.149	1.189	5.399	0.437
Croatia	897	60,585	161,957	77,157	-0.556	1.893	-0.479	-0.477	6.029	0.371
Italy	33,316	121,879	2,233,823	1,089,770	2.286	4.269	2.596	2.577	0.610	0.936
Cyprus	792	138	84,715	41,782	-0.565	-0.451	-0.594	-0.584	7.378	0.231
Latvia	255	269	22,594	11,508	-0.612	-0.446	-0.686	-0.675	7.476	0.220
Lithuania	414	1,402	27,793	13,468	-0.598	-0.402	-0.678	-0.669	7.436	0.225
Luxembourg	243	121	15,028	7,836	-0.613	-0.452	-0.697	-0.686	7.490	0.219
Hungary	2,064	1,676	173,156	71,041	-0.453	-0.392	-0.463	-0.495	7.193	0.250
Malta	153	17	41,626	18,420	-0.621	-0.456	-0.658	-0.654	7.465	0.222
Netherlands	3,510	2,338	244,145	113,813	-0.327	-0.366	-0.357	-0.366	7.018	0.268
Austria	13,073	6,692	601,483	293,702	0.511	-0.197	0.173	0.176	6.105	0.363
Poland	3,485	5,974	274,297	134,417	-0.329	-0.225	-0.312	-0.304	6.882	0.282
Portugal	2,331	852	309,918	137,511	-0.430	-0.424	-0.260	-0.295	7.035	0.266
Romania	2,292	3,013	214,771	106,542	-0.433	-0.340	-0.401	-0.388	7.078	0.262
Slovenia	639	284	44,472	22,102	-0.578	-0.446	-0.654	-0.643	7.432	0.225
Slovakia	1,439	1,296	92,261	38,690	-0.508	-0.406	-0.583	-0.593	7.322	0.236
Finland	828	372	136,891	57,447	-0.562	-0.442	-0.516	-0.536	7.317	0.237
Sweden	2,045	1,131	235,752	117,228	-0.455	-0.413	-0.370	-0.356	7.110	0.259
United Kingdom	40,272	41,495	2,018,172	902,998	2.895	1.152	2.276	2.014	3.184	0.668
Arithmetic Mean	7,237.3	11,778.6	484,783.8	235,330.5	0.0	0.0	0.0	0.0	6.431	0.329
Standard Deviation	11,409.0	25,788.0	673,651.7	331,568.2	1.0	1.0	1.0	1.0	1.579	0.165
Variation Coefficient	157.6%	218.9%	139.0%	140.9%	-	-	-	-	-	50.0%
Max	40,272	121,879	2,233,823	1,089,770	2.895	4.269	2.596	2.577	7.490	0.936
Min	153	17	15,028	7,836	-0.621	-0.456	-0.697	-0.686	0.610	0.219

Source: own

1 km<sup>2</sup> of a state under analysis. In consequence, the range of the synthetic competitiveness index – the quotient of maximum and minimum indices – is 4.

Dependence between availability of accommodation establishments and competitiveness of regions is very low – Pearson correlation coefficient is 0.09. This implies the standard of tourist facilities in the EU-28 member states is not decided by macroeconomic factors. It can be surmised that tourist attractiveness of regions and eagerness of residents to provide tourist services are important.

Italy, the UK, Spain, Germany and France are among states with the top standard of tourist accommodation. These are large states. It only seems natural, therefore, that plenty of accommodation establishments are provided there. On the other hand, correlation between the taxonomical index of their availability and area of particular states is merely 0.51 (average correlation). This is due to the fact that in small countries with attractive natural conditions for tourism and happily visited by foreign tourists, there are relatively many accommodation establishments. In effect, states like Malta, Croatia or Cyprus exhibit highest values of the taxonomical index of accommodation establishments per unit of territory. This grouping also comprises large states like Italy, the United Kingdom, Austria and Greece. Both those 'small' and 'large' are highly attractive to tourists. These factors appear to be a key to location of accommodation establishments. Good conditions for tourism may encourage commitment of private capital to development of accommodation facilities and undertaking of tourism operations.

Slovakia and Poland are among states with relatively poor provision of accommodation establishments. This may suggest these states fail to take full advantage of their natural resources. This applies to Slovakia with numerous natural parks, mountain resort with long term tradition, such as High and Low Tatras etc. as well as to Poland, with a relatively long coast line, considerable area of lakes and attractive mountain trails.

### **Arrivals at tourist accommodation establishments**

The following diagnostic variables were employed to construct the taxonomical index of tourist traffic in the EU-28 member states:

- Arrivals of residents at hotels and similar accommodation.
- Arrivals of non-residents at hotels and similar accommodation.
- Total arrivals at tourist accommodation establishments.
- Arrivals of residents – holiday and other short-stay accommodation.
- Arrivals of non-residents - holiday and other short-stay accommodation.

Values of diagnostic variables and the algorithm for calculation of the synthetic taxonomical index to represent arrivals of accommodation establishments are shown in Table 8.

There is a high, statistically significant dependence between tourist arrivals in particular states and availability of accommodation establishments. The Pearson linear correlation coefficient is 0.81. This affirms the postulate that the availability of tourist facilities is an extremely important factor of regions' tourist competitiveness. Most tourists arrive in countries like France, Germany, Spain, Italy or the UK. These are large states with excellent availability of bed-places. The correlation between area of a state and tourist arrivals is far lower than between availability of beds and the arrivals.

There is a low correlation between tourist arrivals and competitiveness of states – the coefficient is 0.19. This may indicate tourists pay scant attention to macroeconomic standing of countries they intend to visit. On the contrary, a weaker competitive standing may boost tourist arrivals. For instance, Bulgaria and Romania are among the EU states of the poorest competitiveness. Relatively many tourists come there. Analysis of tourist packages offered by travel agencies in Poland suggests holidays in these countries are much cheaper than in the substantially more competitive Italy, Spain or Greece.

### **Expenditure of tourism trips**

Geographical variation of competitiveness according to volumes of travel expenditure was estimated on the basis of the following diagnostic variables:

- Average total expenditure per night.
- Average expenditure on accommodation per night.
- Average total expenditure per trip.
- Average expenditure on accommodation per night.

Tab. 8:

## Calculating the Taxonomical Index of Arrivals at tourist accommodation establishments

Member State	Variable Value ['000]					Standardized Variable Value					Euclidean Distance	Synthetic Index
	$x_{3,1}$	$x_{3,2}$	$x_{3,3}$	$x_{3,4}$	$x_{3,5}$	$t_{3,1}$	$t_{3,2}$	$t_{3,3}$	$t_{3,4}$	$t_{3,5}$	$d_{2,0}$	$S_2$
Belgium	3,947	6,228	14,152	2,226	1,065	-0.439	-0.252	-0.390	-0.183	-0.159	7.007	0.307
Bulgaria	2,611	2,754	5,847	410	64	-0.493	-0.539	-0.570	-0.562	-0.681	7.625	0.246
Czech Republic	5,046	7,327	15,408	1,760	417	-0.395	-0.162	-0.363	-0.281	-0.497	7.124	0.295
Denmark	2,454	1,699	6,437	629	307	-0.500	-0.626	-0.557	-0.516	-0.554	7.583	0.250
Germany	94,619	27,603	149,395	17,273	2,372	3.239	1.511	2.543	2.955	0.522	2.459	0.757
Estonia	756	1,798	2,981	284	142	-0.569	-0.618	-0.632	-0.588	-0.640	7.715	0.237
Ireland	7,012	1,831	0	401	271	-0.315	-0.615	-0.697	-0.564	-0.573	7.580	0.250
Greece	5,526	10,491	21,819	2,368	3,118	-0.375	0.100	-0.224	-0.154	0.910	6.369	0.370
Spain	42,569	41,252	101,673	5,231	6,564	1.127	2.637	1.508	0.443	2.706	3.470	0.657
France	78,661	34,067	153,694	16,090	4,462	2.591	2.045	2.637	2.708	1.611	1.425	0.859
Croatia	889	4,673	12,206	481	3,718	-0.563	-0.380	-0.432	-0.547	1.223	6.888	0.319
Italy	42,650	39,989	103,863	7,060	6,374	1.131	2.533	1.556	0.825	2.607	3.189	0.685
Cyprus	438	1,947	2,388	3	24	-0.582	-0.605	-0.645	-0.647	-0.701	7.776	0.231
Latvia	377	1,132	1,839	126	85	-0.584	-0.673	-0.657	-0.621	-0.670	7.785	0.230
Lithuania	647	1,098	2,460	534	143	-0.573	-0.675	-0.644	-0.536	-0.640	7.723	0.236
Luxembourg	68	763	1,044	27	54	-0.597	-0.703	-0.674	-0.642	-0.686	7.828	0.226
Hungary	3,626	4,007	9,317	1,094	162	-0.452	-0.435	-0.495	-0.419	-0.629	7.442	0.264
Malta	147	1,293	1,461	2	19	-0.593	-0.659	-0.665	-0.647	-0.704	7.814	0.227
Netherlands	11,504	10,017	34,050	6,645	1,944	-0.133	0.060	0.041	0.738	0.299	5.954	0.411
Austria	9,366	18,164	32,940	1,522	2,673	-0.219	0.733	0.017	-0.330	0.679	6.111	0.396
Poland	12,429	4,687	23,401	5,505	489	-0.095	-0.379	-0.190	0.501	-0.459	6.652	0.342
Portugal	6,142	7,783	15,901	456	216	-0.350	-0.124	-0.352	-0.553	-0.602	7.258	0.282
Romania	4,961	1,595	7,919	1,185	106	-0.398	-0.634	-0.525	-0.400	-0.659	7.517	0.257
Slovenia	613	1,640	3,340	350	340	-0.574	-0.631	-0.625	-0.575	-0.537	7.670	0.241
Slovakia	1,704	1,423	4,003	606	175	-0.530	-0.649	-0.610	-0.521	-0.623	7.662	0.242
Finland	6,857	2,458	10,840	396	173	-0.321	-0.563	-0.462	-0.565	-0.624	7.483	0.260
Sweden	14,069	3,469	24,608	1,699	424	-0.029	-0.480	-0.163	-0.293	-0.493	7.001	0.308
United Kingdom	54,014	18,788	104,768	12,570	2,476	1.592	0.784	1.575	1.974	0.576	3.574	0.647
Arithmetic Mean	14,775.2	9,284.9	30,991.3	3,104.8	1,370.6	0.0	0.0	0.0	0.0	0.0	6.489	0.358
Standard Deviation	24,653.5	12,120.8	45,647.4	4,794.5	1,919.4	1.0	1.0	1.0	1.0	1.0	1.811	0.179
Variation Coefficient	166.9%	130.5%	143.4%	154.4%	140.0%	-	-	-	-	-	27.9%	50.0%
Max	94,619	41,252	153,694	17,273	6,564	3.239	2.637	2.637	2.955	2.706	7.828	0.859
Min	68	763	0	2	19	-0.597	-0.703	-0.697	-0.647	-0.704	1.425	0.226

Source: own

**Tab. 9: Calculating the Taxonomical Index of average expenditure of tourism trips (1 night or over) – domestic trips**

Member State	Variable Value				Standardized Variable Value				Euclidean Distance	Synthetic Index
	$x_{6,1}$	$x_{6,2}$	$x_{6,3}$	$x_{6,4}$	$t_{6,1}$	$t_{6,2}$	$t_{6,3}$	$t_{6,4}$	$d_{6,0}$	$S_6$
Belgium	76.35	24.69	317.62	102.71	1.136	0.866	1.720	1.318	2.888	0.670
Bulgaria	24.44	6.05	106.76	26.43	-0.823	-0.767	-0.614	-0.632	6.522	0.255
Czech Republic	16.75	3.74	60.04	13.4	-1.113	-0.970	-1.132	-0.966	7.165	0.182
Denmark	86.46	28.03	203.67	66.03	1.518	1.158	0.459	0.380	3.566	0.593
Germany	77.88	32.17	274.23	113.29	1.194	1.521	1.240	1.588	2.345	0.732
Estonia	29.67	6.19	64.82	13.51	-0.626	-0.755	-1.079	-0.963	6.813	0.222
Ireland	71.90	26.18	199.23	72.55	0.968	0.996	0.409	0.547	3.693	0.578
Greece	25.58	4.26	261.13	43.46	-0.780	-0.924	1.095	-0.197	5.884	0.328
Spain	32.11	7.13	147.7	32.82	-0.533	-0.673	-0.161	-0.469	6.076	0.306
France	50.03	12.73	258.47	65.78	0.143	-0.182	1.065	0.374	4.650	0.469
Croatia	31.80	7.25	152.05	34.68	-0.545	-0.662	-0.113	-0.422	6.031	0.311
Italy	52.78	20.15	319.5	121.96	0.247	0.468	1.741	1.810	3.376	0.615
Cyprus	38.20	8.87	136.91	31.8	-0.304	-0.520	-0.281	-0.495	5.946	0.321
Latvia	17.81	2.86	41.13	6.6	-1.073	-1.047	-1.341	-1.139	7.378	0.158
Lithuania	18.10	5.45	49.44	14.88	-1.062	-0.820	-1.249	-0.928	7.091	0.190
Luxembourg	93.80	20.25	192.2	41.5	1.795	0.477	0.332	-0.247	4.415	0.496
Hungary	20.28	8.36	64.81	26.7	-0.980	-0.565	-1.079	-0.626	6.675	0.238
Malta	49.54	17.94	122.25	44.28	0.124	0.274	-0.443	-0.176	5.208	0.405
Netherlands	29.04	13.08	109.23	49.2	-0.649	-0.151	-0.587	-0.050	5.769	0.341
Austria	102.12	49.52	341.63	165.67	2.109	3.041	1.986	2.927	0.000	1.000
Portugal	18.11	3.59	79.48	15.75	-1.062	-0.983	-0.916	-0.906	7.026	0.198
Romania	23.60	4.89	90.52	18.76	-0.855	-0.869	-0.794	-0.829	6.775	0.226
Slovenia	36.61	15.04	96.93	39.82	-0.364	0.020	-0.723	-0.290	5.738	0.345
Slovakia	35.60	11.37	118.65	37.9	-0.402	-0.301	-0.483	-0.339	5.851	0.332
Finland	71.52	15.25	194.23	41.42	0.954	0.039	0.354	-0.249	4.806	0.451
United Kingdom	72.26	29.97	215.78	89.49	0.982	1.328		0.980	2.828	0.677
Arithmetic Mean	46.20	14.80	162.20	51.2	0.000	0.000	0.000	0.000	5.174	0.409
Standard Deviation	26.50	11.40	90.30	39.10	1.000	1.000	1.000	1.000	1.792	0.205
Variation Coefficient	57.3%	77.1%	55.7%	76.4%	-	-	-	-	34.6%	50.0%
Max	102.10	49.50	341.60	165.70	2.109	3.041	1.986	2.927	7.378	1.000
Min	16.80	2.90	41.10	6.60	-1.113	-1.047	-1.341	-1.139	0.000	0.158

Source: own

Synthetic competitiveness indices as per the expenditure criterion were calculated for domestic and foreign trips separately – the results are summarised in Tables 9 and 10. Two states, Poland and Sweden, were excluded as Eurostat fails to provide reliable data concerning the variables analysed.

The figures in Tables 9 and 10 suggest spending on foreign trips is far greater than on domestic travel. This is due to substantial diversity of prices in countries of destination. In addition, costs of transport are much higher in the case of foreign travel.

**Tab. 10: Calculating the Taxonomical Index of average expenditure of tourism trips (1 night or over) – domestic trips**

Member State	Variable Value				Standardized Variable Value				Euclidean Distance	Synthetic Index
	$x_{6,1}$	$x_{6,2}$	$x_{6,3}$	$x_{6,4}$	$t_{6,1}$	$t_{6,2}$	$t_{6,3}$	$t_{6,4}$	$d_{6,0}$	$S_6$
Belgium	123.47	38.51	988.42	308.28	1.214	0.958	1.415	1.112	2.237	0.714
Bulgaria	42.98	13.01	329.26	99.69	-1.207	-0.980	-1.335	-1.055	6.534	0.165
Czech Republic	61.62	15.78	422.13	108.13	-0.647	-0.770	-0.947	-0.967	5.931	0.242
Denmark	103.12	37.48	657.62	239.03	0.602	0.879	0.035	0.393	3.275	0.582
Germany	102.73	43.89	875.85	374.19	0.590	1.366	0.945	1.797	2.172	0.722
Estonia	68.48	25.94	466.34	176.67	-0.440	0.002	-0.763	-0.255	4.957	0.367
Ireland	105.82	29.04	824.29	226.19	0.683	0.238	0.730	0.259	3.499	0.553
Greece	49.05	10.00	630.42	128.52	-1.025	-1.209	-0.079	-0.755	5.996	0.234
Spain	76.58	17.67	700.95	161.69	-0.196	-0.626	0.216	-0.411	4.952	0.367
France	113.79	32.55	991.00	283.5	0.923	0.505	1.425	0.855	2.827	0.639
Croatia	57.68	15.86	427.90	117.68	-0.765	-0.764	-0.923	-0.868	5.924	0.243
Italy	100.16	34.49	822.20	283.17	0.513	0.652	0.721	0.851	3.017	0.615
Cyprus	83.98	18.10	939.43	202.43	0.026	-0.593	1.210	0.013	4.455	0.431
Latvia	59.76	17.26	381.28	110.11	-0.703	-0.657	-1.118	-0.947	5.953	0.239
Lithuania	58.47	13.24	452.17	102.4	-0.741	-0.963	-0.822	-1.027	6.072	0.224
Luxembourg	119.48	40.10	779.98	261.77	1.094	1.078	0.545	0.629	2.613	0.666
Hungary	53.98	12.79	303.88	71.99	-0.876	-0.997	-1.441	-1.343	6.574	0.160
Malta	131.38	29.66	1,020.15	230.28	1.453	0.285	1.547	0.302	3.109	0.603
Netherlands	73.08	27.18	705.41	262.39	-0.302	0.097	0.234	0.636	4.073	0.480
Austria	146.93	63.28	906.75	390.5	1.920	2.840	1.074	1.967	0.493	0.937
Portugal	39.45	9.97	408.70	103.27	-1.314	-1.211	-1.003	-1.018	6.572	0.160
Romania	39.31	9.55	369.40	89.75	-1.318	-1.243	-1.167	-1.158	6.723	0.141
Slovenia	58.24	19.32	307.85	102.14	-0.748	-0.501	-1.424	-1.029	6.070	0.225
Slovakia	72.20	25.32	567.93	199.16	-0.328	-0.045	-0.339	-0.021	4.640	0.407
Finland	151.53	38.94	872.87	224.32	2.059	0.990	0.933	0.240	2.604	0.667
United Kingdom	67.55	34.72	728.71	374.49	-0.468	0.670		1.800	3.335	0.574
Arithmetic Mean	83.10	25.90	649.30	201.20	0.0	0.0	0.0	0.0	4.408	0.437
Standard Deviation	33.20	13.20	239.8	96.20	1.0	1.0	1.0	1.0	1.710	0.218
Variation Coefficient	40.0%	50.8%	36.9%	47.8%	-	-	-	-	-	50.0%
Max	152	63	1,020	391	2.059	2.840	1.547	1.967	6.723	0.937
Min	39	10	304	72	-1.318	-1.243	-1.441	-1.343	0.493	0.141

Source: own

There is a high, statistically significant dependence between volumes of tourism expenditure and competitiveness of the EU member states. The Pearson linear correlation coefficient equals 0.76 for spending on outbound trips and 0.65 on domestic travel. This difference arises from greater opportunities

for using tourist services available to residents of highly competitive regions, since a greater competitiveness of states and regions generates higher household incomes and the potential for greater spending on tourist services.

The correlation coefficient between competitiveness of states and tourism

expenditure is lower in respect of domestic travel. Fluctuations in this grouping are much greater, though – the variation coefficient for the variable under consideration ranges from 55% to 77%. For parallel factors in foreign trips, the same variations are from 36% to 50%.

Spending on tourism is at a maximum in highly competitive states – Austria, Germany, UK. Average spending of an Austrian on an inbound trip is nearly eight times that of a Latvia.

Average expenditure of Slovak citizens on domestic trips are approx. 25% lower than the EU average and as much as 3-4 times lower than in the most competitive states. On the other hand, this spending is around 2-3 times greater than in countries of minimum competitiveness. The differences are somewhat narrower in the case of foreign travel. Expenditure by Slovaks are approx. 15% lower than the EU average, twice lower than in the states with maximum standards of competitiveness and twice greater than in the least competitive countries. This variation reflects Slovakia's standing in the competitiveness ranking of the European Union member states.

### Conclusion

Tourism is currently one of the most dynamically developing sectors of economy. It provides huge opportunities for socio-economic development. The international 'tourist industry' is among the fastest growing branches of the economy. It is therefore important to determine factors that improve competitiveness of tourism to the maximum extent.

In theory, the creation and promotion of a competitive market are offer based on local heritage, standards of tourist attractiveness or infrastructure development, are key to enhancing competitiveness and provision of continuing competitive advantage.

Analysis of statistics concerning competitiveness of tourism in the European Union countries was based on Hellwig's method and demonstrated all the hypotheses postulated are correct.

1. There is a considerable geographical diversity of accommodation establishments in the European Union member states. This is proved with the variation coefficient for the total number of accommodation establishments and beds ranging from 140% to 220%. What is more, dependence

between availability of accommodation establishments and competitiveness of regions is very weak (Pearson correlation coefficient of 0.09). This means that the standard of tourist facilities in the EU-28 member states is decided not by macroeconomic factors but tourist attractiveness of regions and readiness of their populations to provide tourist services.

2. There is a high, statistically significant dependence between tourist arrivals to individual states and availability of accommodation establishments there. Pearson correlation coefficient is 0.81. This implies availability of tourist facilities is an extremely important factor to tourist competitiveness of regions
3. Tourism expenditure is far greater on outbound rather than domestic travel. There is a high, statistically significant dependence between competitiveness of the European Union member states and spending on tourist services. Pearson correlation coefficient is 0.76 for spending on outbound trips and 0.65 on inbound travel. This arises from the fact that residents of highly competitive regions tend to use tourist services more frequently since a greater competitiveness of states leads to higher household incomes and, as a consequence, allows for higher expenditure on tourism services.

In general, competitiveness of tourism is a complex phenomenon from the viewpoint of both theory and economic practice. This is due to two fundamental elements. First, it is affected by multiple factors, all of which must be treated in an international context. Second, two levels of analysis, macroeconomic and microeconomic, overlap.

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## Abstract

**FACTORS OF TOURISM'S COMPETITIVENESS IN THE EUROPEAN UNION COUNTRIES****Vanda Maráková, Tadeusz Dyr, Anna Wolak-Tuzimek**

*Tourism is one of the most rapidly blossoming sectors of economy and its economic and social significance is expressed both in numbers (share in GNP, employment) and in a range of as important uncountable characteristics like expansion of a region, more intense development, building the spirit of local communities, actions preventing social exclusion or education of future generations for state progress. A number of countries, provinces and regions have achieved well-rounded social and economic growth by developing tourist economies and a range of necessary supporting measures, including complementary infrastructure, active and well-educated society by organising adequate living standards and fulfilling basic social requirements, etc. It is therefore important to determine factors that improve competitiveness of tourism to maximum extent.*

*The objective of this paper is to evaluate dependences between competitiveness of the European Union member states and selected factors determining competitiveness of tourism in these states. A set of factors determining competitiveness of tourism is introduced, that is, capacity of tourist accommodation establishments, arrivals at tourist accommodation establishments, average expenditure of tourism trips (1 night or over) – domestic trips, average expenditure of tourism trips (1 night or over) – outbound trips, tourism domestic trips (1 night or over), tourism outbound trips (1 night or over) and their impact on levels of competitiveness is determined. Considerable geographical variation of availability of accommodation establishments in the European Union member states and high, statistically significance correlations between availability of accommodation establishments and numbers of tourists arriving in a given states and between competitiveness of the EU states and tourism expenditure are identified.*

**Key Words:** Competitiveness, tourism, sources of competitive advantage.

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# THE COOPERATION BETWEEN ENTERPRISES: SIGNIFICANT PART OF THE INNOVATION PROCESS – A CASE STUDY OF THE CZECH MACHINERY INDUSTRY

*Jan Stejskal, Beáta Mikušová Meričková, Viktor Prokop*

## Introduction

In recent years we have been able to see the growing importance of knowledge in the context of the emerging knowledge-based global economy (Miotti & Sachwald, 2003; Carmeli, Gelbard, & Reiter-Palmon, 2013; Prokop & Stejskal, 2015). Tödttling and Trippel (2005) suggest that there is widespread agreement in academic literature that knowledge, learning, and innovation are key to economic development and the competitiveness of enterprises or regions (and nations). Generating innovation has come to be seen as a productive topic in economics and has also been becoming increasingly related to enterprise's ability to absorb external information, knowledge, and technologies (Negassi, 2004; Lichtenthaler, 2011). It is commonly accepted that (i) innovations are brought forward through an interactive process of knowledge generation, diffusion, and application; (ii) innovations are increasingly seen as fundamental to the competitiveness of enterprises and economies; and (iii) knowledge is critical to the process of innovation (Tether & Tajar, 2008; Tödttling, Lehner, & Kaufmann, 2009). Tomlinson (2010) states that knowledge transfer definitively leads to greater levels of both product and process innovation. Knowledge can be generated internally or acquired externally (what an organization knows determines what it can do) and R&D cooperation is a fundamental ingredient for the division of innovative labor (Fritsch & Lukas, 2001; Stejskal & Hájek, 2015). We can state that entrepreneurship and innovation are fundamental drivers of economic growth, the creation of wealth in an

economy, and enterprise's long-term survival, profitability, and sustainable growth (Myšková, 2010; Classen et al., 2012; Acemoglu, Gancia, & Zilibotti, 2012; Kim et al., 2012).

Therefore, enterprises that want to succeed in the market are increasingly looking for partners with whom they can collaborate effectively and gain a competitive advantage (Stejskal & Hájek, 2012). It is clear that the role of R&D cooperation within the innovation process has recently increased (Xia, Danping, & Yue, 2012). This fact is supported by several studies that confirm the importance of cooperation – e.g. De Faria, Lima and Santos (2010); Tomlinson (2010) and Beers and Zand (2014). Collaboration with other enterprises and institutions in R&D is a decisive way to make external resources usable (Becker & Dietz, 2004). Enterprises and countries use the experience acquired (knowledge developed) by other enterprises (or countries) to build their own knowledge capital (Negassi, 2004). Becker and Dietz (2004) also suggest that the importance of R&D cooperation has risen steadily as a consequence of the growing complexity, risks, and costs of innovation and that enterprises engaged in the innovation process are aware of the necessity of establishing R&D cooperation to obtain expertise that cannot be generated in-house. But the question is which partner is the most suitable for innovative industrial enterprises. Enterprise cooperates with various partners for various reasons. Therefore, it is not possible to specify a universal partner that would be suitable for all enterprises in all sectors. De Faria, Lima, and Santos (2010) state that the factors influencing the importance

attributed to cooperation activities are different from the ones behind the decision to cooperate. Enterprises are able to cooperate with four different types of R&D partners: (i) competitors, (ii) suppliers, (iii) customers, and (iv) universities and research institutes (Belderbos, Carree, & Lokshin, 2004).

Finding a suitable partner for cooperation is a complicated process, because these partners are different for each sector. A number of studies have addressed the issue of collaboration in the manufacturing industry – e.g. Fritsch and Lukas (2001); Becker and Dietz (2004); Veugelers and Cassiman (2005); Tomlinson (2010). However, none of these studies examine the effectiveness of cooperative chains or compare the results for the industry. Such information could help managers appropriately target efforts to find suitable partners for cooperation.

The research presented in this article examines the impact of important partners in one of the sectors of manufacturing industry – the machinery industry (engineering). The paper intends to analyze the issues of (i) the importance of collaboration between enterprises and other partners through enterprises' innovative behavior and the overall growth of their performance and (ii) the efficiency of public subsidies from national and European funds. The paper will analyze both of these for the Czech Republic's machinery industry by using original multiple linear regression models based on the data from the Community Innovation Survey carried out in the Czech Republic for the period of 2010-2012. The remainder of the paper is structured as follows. The second section discusses the theoretical background and hypotheses. The data methodology, results, and their analysis are presented in the third section. The final section consists of conclusions and recommendations.

## 1. Theory and Hypotheses

Since the late 1980s, it has become increasingly acknowledged that spillovers of knowledge from external sources have an important impact on innovation processes and economic development and that the role of innovation as a factor of competitiveness and technological progress have combined to make enterprises intensify and expand their innovative capabilities (Miotti & Sachwald, 2003; Fritsch & Franke, 2004; Acs, Audretsch, & Lehmann, 2013; Alfaro & Chen, 2013). Negassi (2004) suggests that

the rise of inter-enterprise cooperation did not begin until the beginning of the 1980s.

A number of studies and researchers suggest that human capital factors play an important role in spurring regional growth and that regions (or enterprises) function as incubators of creativity and innovation (Lee, Florida, & Acs, 2004; Bartelsman, Dobbelaere, & Peters, 2014; Uramová & Koziak, 2008). The growing importance of knowledge processes is supported by Florida, who defined the new concept of learning regions, which are becoming focal points for knowledge creation and learning in the new age of global, knowledge-intensive capitalism (Florida, 1995). Institutional economics is another theoretical concept that supported the role of knowledge and innovation. Richard Nelson – one of the main proponents of this theory – described the three main issues of institutional economics: (i) technology and technological innovation; (ii) concepts of enterprises, their principles of operation, and their relation to competitors or subcontractors; and (iii) institutions (Blažek & Uhlíř, 2011). The endogenous growth theory, in which knowledge represents an input into the process of generating innovative activity in the economy, gives new insights into the role of knowledge in economic growth (Acs, de Groot, & Nijkamp, 2002).

As we can see, knowledge has been playing an important role in theoretical concepts in recent years. However, in-house production of innovation is no longer sufficient. Therefore, enterprises use R&D partnerships to access knowledge and build global R&D networks (Miotti & Sachwald, 2003; Beers & Zand, 2014; Hájková & Hájek, 2014), and adopt open innovation approach to use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation (Chesbrough, 2006; Chesbrough & Crowther, 2006). Tether (2002) states that the relationship between innovation and cooperation is not straightforward and that most enterprises still develop their new products, processes, and services without forming cooperative arrangements for innovation with other organizations. However, enterprises that engage in R&D and are attempting to introduce innovations at a higher level (i.e. innovations that are new to the market rather than new to the enterprise) are much more likely to engage in cooperative arrangements for innovation and

are able to access and leverage strategically critical resources to support the enterprise's innovation process (Tether, 2002; Classen et al., 2012). In fact, enterprises looking to improve their competitiveness need to develop two kinds of competences: (i) technological, which allows enterprises to add value to products and processes, and (ii) network, by which enterprises are able to link their organization to other players in the market to allow interactions beyond organizational boundaries (Ritter & Gemünden, 2004).

The relative importance of cooperation on innovative activity varies and depends upon a number of factors, i.e. the number of cooperative ties and the context in which network relations exist (Tomlinson, 2010). Belderbos et al. (2004) explored heterogeneities in the determinants of innovating enterprises' decisions to engage in R&D cooperation, differentiating between four types of cooperation partners (competitors, suppliers, customers, and universities and research institutes – representing institutional cooperation). The determinants of R&D cooperation differ depending on the types of cooperation: (i) the positive impact of enterprise size, R&D intensity, and incoming source-specific spillovers is weaker for competitor cooperation, reflecting greater concerns about appropriability and (ii) institutional spillovers are more generic in nature and positively impact all types of cooperation (Belderbos et al., 2004). Negassi (2004) analyzed the situation among French enterprises and suggested that the crucial determinants for the commercial success of innovations are enterprise size, market share, R&D intensity, and human capital. This study also pinpointed that spillover measurements (the acquisition of machine tools, foreign patents, licenses) and technological opportunities have a positive impact on innovation. Segarra-Blasco & Arauzo-Carod (2008) divided a propensity for R&D cooperation with other enterprises and institutions into three approaches: (i) the transaction cost approach (cooperative R&D projects enable the costs and risks of R&D activities to be shared and the dissemination of the results to be protected); (ii) the strategic management approach (cooperative behavior is a way of accessing additional resources and this leads to competitive advantages, see more Gavurova (2012); and (iii) the industrial

organization approach (which focuses on knowledge spillovers between partners).

Universities constitute one of the cooperation partners; however, enterprises do not cooperate with them very often. Veugelers and Cassiman (2005) used Community Innovation Survey data to analyze Belgian manufacturing enterprises and showed that (i) only a small fraction of innovative enterprises use science (i.e. universities and public research laboratories) as an important information source in their innovation process and (ii) cooperating with universities cannot be analyzed in isolation from the overall innovation strategy of the enterprise, because cooperating with universities is complementary to other innovation activities such as providing their own R&D, sourcing public information, and cooperating with other partners. Decision-making concerning suitable cooperative partners that will produce commercial results is missing from this study. Further studies (Belderbos, Carree, & Lokshin, 2004) argued that cooperation with competitors and universities impacted innovation output levels positively but cooperation with customers negatively – these findings are in contrast with lead-users concept (Von Hippel, 1986; 2005). This concept defines lead users as users whose present strong needs will become general in a marketplace months or years in the future and states that user-centered innovation is a very powerful and general phenomenon supporting innovative activities, therefore there is a need for further investigation of the relationship between enterprises and customers. Cooperation on innovation with domestic universities causes the growth of knowledge capital. In fact, universities are able to significantly influence the regional economy, play an important role in innovation performance, and are also linked to social effects (Mohammadi & Karami, 2014). The obvious implications of applying an increase in social capital (typically on the market) is also missing from this study. Universities are regarded as a key factor in national innovation plans and strategies by many authors (e.g. Goddard, Robertson, & Vallance, 2012; Watkins et al., 2015). Diez-Vial & Montoro-Sanchez (2014) show a positive relationship between the technological knowledge obtained from universities and the innovation carried out by enterprises. We can conclude that universities play an important role in the global knowledge economy and represent key points

of international contact, which is complicated for many reasons – such as mobility issues, the use of technology, or collaboration (Deiaco, Hughes, & McKelvey, 2012; Altbach, 2013). Therefore, we proceed from the arguments mentioned above and hypothesize that:

*H<sub>1</sub>: Enterprises that cooperate on innovative activities in the machinery industry in the Czech Republic demonstrate a greater growth of their performance than the ones that do not cooperate. In most cases, these enterprises participate in groups of enterprises that positively influence innovative creation within the group.*

This assumption is based on a series of analyses. De Faria, Lima and Santos (2010) analyzed the effects of cooperation on the overall performance of enterprises and on innovation and R&D performance. They state that (i) enterprise's decision to cooperate on innovation is driven by the fact that cooperation is an efficient way to improve the probability of the success of innovation projects and (ii) cooperative enterprises have, on average, higher overall performance levels and higher R&D intensity than non-cooperative enterprises. Belderbos, Carree and Lokshin (2004) also suggested that cooperating enterprises are generally engaged in innovative activities to a greater degree and demonstrated the impact of cooperation on productivity growth. Cooperation with different partners leads to learning opportunities with regard to both cooperation and innovation skills and hence is expected to enhance enterprise's innovation performance (Beers & Zand, 2014). Chesbrough & Appleyard (2007) also suggested that to make strategic sense of innovation networks, collaborations, ecosystems, communities, and their implications for competitive advantage, open innovation concept and strategy are needed.

Participation in a group of enterprises presents another opportunity for cooperation, and it also supports the contention that innovations do not arise independently. This issue was also analyzed by a number of authors (e.g. Lodefalk, 2010; Hashi & Stojčić, 2013; Dachs & Peters, 2014).

As we demonstrated previously, innovation creation can be supported by cooperation with universities, because they positively impact innovation output levels. University-industry collaboration can be regarded as a determinant

of innovation, because more innovative enterprises tend to be more interested in collaborating with universities (Oyelaran-Oyeyinka & Abiola Adebowale, 2012; López et al., 2014). This assumption leads us to the next hypothesis:

*H<sub>2</sub>: Enterprises in the machinery industry in the Czech Republic that cooperate with universities and public research centers demonstrate a greater growth of their overall performance.*

The previous hypotheses focus only on the importance of cooperation. However, many collaborations are often supported by public funds (Matt, Robin, & Wolff, 2012; Hottenrott & Lopes-Bento, 2014). In recent years, increasingly inefficient spending of public funds and subsidies has been resulting in additional spending on innovation by enterprises but has not lead to additional innovation output (Hashi & Stojčić, 2013). Therefore, let us define further hypothesis:

*H<sub>3</sub>: In the Czech Republic, public funding in the machinery industry is being provided in an inefficient way.*

## 2. Data Methodology and Analysis of Research Results

A harmonized questionnaire of EU Member States from the Community Innovation Survey (CIS) carried out in the Czech Republic for the period of 2010-2012 by combining sample (stratified random sampling) and exhaustive surveys was used for the data collection. The CIS is a survey of innovation activity in enterprises that is designed to provide information on the innovativeness of sectors by enterprise type, the different types of innovation, and various aspects of innovation development, e.g. objectives, sources of information, public funding, and innovation expenditures (Eurostat, 2015). The CIS questionnaire was used to examine the impacts of cooperation by many other authors (e.g. Miotti and Sachwald (2003); Belderos, Carree and Lokshin (2004); Veugelers and Cassiman (2005); Tether and Tajar (2008); De Faria, Lima and Santos (2010). In total, data on 5,151 Czech enterprises with at least 10 employees were obtained (with a response rate greater than 60%). For the purpose of this study, we filtered 284 enterprises, i.e. only enterprises from the machinery industry, into our data group – specifically, enterprises covering NACE categories 29-30.

For analyzing the relationship between variables, a multiple linear regression model was used (regression models are commonly used for this kind of research, e.g. Schneider and Spieth (2013); Laeven, Levine and Michalopoulos (2015)). This model was adapted to investigate the relationship between one dependent variable, represented by the growth of total turnover between the years 2010-2012, and independent variables (see Tab. 1). Eurostat does not provide number of variables suitable for analyzing, input data from other source will not ensure the causality, therefore, for further research we investigate to analyze the growth of total turnover. Multiple linear regression models take the general form shown below (Chatterjee & Hadi, 2013; Wu et al., 2013):

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \varepsilon \quad (1)$$

where y is the dependent variable;  
 $x_1, x_2 \dots x_n$  are independent variables;  
 $\varepsilon$  is an error term accounting for the variability in y that cannot be explained by the linear effect of the n independent variables;  
 $\beta_1, \beta_2 \dots \beta_n$ , called the regression parameters or coefficients, are unknown constants to be determined (estimated) from the data.

Firstly, before we composed the models, verification whether the data from CIS were correlated was conducted by using Spearman's test. Spearman's coefficient ( $r_s$ ) measures the strength of the linear relationship between each two variables when the values of each variable are rank-ordered from 1 to N, where N represents the number of pairs of values (the N cases of each variable are assigned the integer values from 1 to N inclusive and no two cases share the same value). The difference between ranks for each case is represented by  $d_i$ . The general formula for Spearman's rank correlation coefficient takes the general form as follows (Weinberg & Abramowitz, 2002; Borradaile, 2013):

$$r_s = 1 - \frac{6 \sum d_i^2}{N^3 - N} \quad (2)$$

All calculations were made in statistical software STATISTICA (StatSoft Inc., 2011). Values of Spearman's test rejected the hypothesis that the data are correlated at the level of significance  $p < 0.05$ . After fulfilling

the first prerequisite (uncorrelated data) and refusal to multicollinearity in the model, the analysis itself was conducted. Subsequently, several multiple linear regression models were created to analyze the hypotheses. In total, the final model (Model 1) describing the situation in the Czech Republic's machinery industry used 17 variables (1 dependent, 10 independent categorical, and 6 independent continuous). All variables are listed in Tab. 1. The correlation coefficient R of Model 1 had a value of 0.979 and the coefficient of determination  $R^2$  was 0.958. It means that regression line nearly perfectly fits the data. The P-value for this model was calculated at 0.000 (the value is rounded to three decimal places). The P-value showed that this model was significant at  $p < 0.01$ ; therefore, the null hypothesis, that the model is not significant, was rejected. Therefore, Model 1 can be regarded as significant.

Before we test the hypothesis, it is necessary to describe the results provided by Model 1 (see Tab. 2). The results in Tab. 2 show that seven variables positively influence the dependent variable. We can see that the introduction of product innovation affects the growth of performance in all cases (independently, with other enterprises, and with universities and research institutes). When the enterprise introduced product innovations separately without cooperation, this variable is significant at  $p < 0.05$  (0.047). Conversely, if enterprise collaborates in the development of product innovations, it is possible to observe that this cooperation has a greater impact on the creation of innovations. When enterprises use other enterprises to cooperate, the value was measured at 0.002 (0.004 for cooperation with universities). Both values are significant at the higher level of significance ( $p < 0.01$ ). When process innovation was implemented, we can see that the enterprise's performance is most affected when enterprises introduce innovations alone or with universities and research institutions. In both cases, the p-value is measured at 0.000, which is significant at a significance level of  $p < 0.01$ . On the other hand, the introduction of process innovations in collaboration with other enterprises proved to be insignificant. Participation in group of enterprises (GP) and cooperation on technical innovation activities (CO) are among the other significant variables that affect the growth of total turnover.

Tab. 1: Input variables

Dependent variable	Independent variables (categorical)	Independent variables (continuous)
Growth of total turnover	Part of a group of enterprises (GP)	Total innovation expenditure/total turnover (RTOT/TOT)
	Introduction of product innovation: a) innovation was developed independently by the enterprise (INPRI); b) innovation was developed in collaboration with other enterprises (INPRE); c) innovation was developed in collaboration with universities and research institutes (INPRU)	In-house R&D expenditure/total turnover (RRDIN/RTOT)
	Introduction of process innovations: a) innovation was developed independently by the enterprise (INPSI); b) innovation was developed in collaboration with other enterprises (INPSE); c) innovation was developed in collaboration with universities and research institutes (INPSU)	External R&D expenditure/total turnover (RRDEX/RTOT)
	Public financial support from the EU (FUNEU)	Acquisition of equipment/total turnover (RMAC/RTOT)
	Regional and/or national public financial support (FUNGMT)	Acquisition of external knowledge/total turnover (ROEK/RTOT)
	Cooperation on technical innovation activities (CO)	Acquisition of other innovation activities/total turnover (ROTH/RTOT)

Source: own

Legend: introduction of product innovation = introduction of a new or improved product/service; introduction of process innovations = new or improved method of production or provision of services, also including distribution and storage, providing business support activities, or significant changes in technology, equipment, or software)

Tab. 2: Variables used in Model 1

Variables	p	sd
RTOT/TOT	0.689	1.739
IN/RTOT	0.694	0.011
RMAC/RTOT	0.610	0.009
GP	0.037**	1.342
INPRI	0.047**	1.479
INPRE	0.002***	1.511
INPRU	0.004***	1.312
INPSI	0.000***	1.082
INPSE	0.359	0.684
INPSU	0.000***	1.007
FUNEU	0.755	0.768
CO	0.000***	0.706

Source: own

Legend: p = p-value; sd = standard deviation; \*\*\*significant at  $p < 0.01$ ; \*\*significant at  $p < 0.05$

The results in Tab. 2 allow us to confirm hypothesis  $H_1$  and show that innovation does not arise in isolation, respectively of course innovations can occur in isolation, however cooperation could be positively affected by innovation creation. The variable CO was analyzed as one of the most significant variables with greater influence on the enterprises' performance (0.000\*\*\*). Moreover, participation in a group of enterprises that showed strong chains was measured as significant. We can say that external sources of knowledge gained from innovative collaboration currently represent an important competitive element; therefore, enterprises often opt for external cooperative partners that have a significant impact on their overall performance in creating innovation (e.g. INPRE, INPRU, INPSU – see Tab. 2). A number of foreign studies confirm this fact: Clausen (2013); Gallego, Rubalcaba, and Suárez (2013); and Stock, Totzauer, and Zacharias (2014).

The results in Tab. 2 also allow us to test hypothesis  $H_2$ . Collaboration with universities and research institutes plays an important role in the machinery industry in the Czech Republic. In both cases (product and process innovation), there are significant interactions between variables. For product innovation, the importance of cooperation with these institutions and with other enterprises outweighed the creation of innovation independently. For process innovation, creating innovation with universities and research institutes and creating these innovations independently is

gaining in importance (creating innovations in collaboration with other enterprises is insignificant in this case). Robin and Schubert (2013) also analyzed the impact of cooperation with public research on enterprises' product and process innovations by using the CIS. They examined that cooperating with public research increases product innovation but has no effect on process innovation, which depends more on the enterprises' openness. In our analysis, cooperation with public research increases enterprises' performance for both product and process innovation; therefore, we can confirm hypothesis  $H_2$ . Model 1 also provided a number of additional higher order interactions that support our hypothesis  $H_2$ . Tab. 3 shows that cooperation with the public sector can contribute to significant ties in some cases (more than when this type of cooperation is not used). The results in Tab. 2 show that if the enterprise performs product innovation independently (INPRI), the influence on the measured value of the enterprises' performance was 0.047 (significant at  $p < 0.05$ ). If there is a subsequent interaction with INPRU or INPSU, the resulting value was 0.001 (significant at  $p < 0.01$ ). Cooperation in the creation of product innovations has proven to be more significant in both cases – cooperation on product and process innovation. For process innovation, it was revealed that only INPRU cooperation leads to positive effects (leading to the same value of 0.000). The combination of INPSI\*INPSU was analyzed to be insignificant in this case.

**Tab. 3: The Influence of Public Cooperation on Enterprises' Innovative Activity**

	INPRU	INPSU
INPRI	0.001*** (1.323)	0.001*** (1.303)
INPSI	0.000*** (0.691)	0.807 (1.175)

Source: own

Legend: \*\*\*significant at  $p < 0.01$ ; the values of standard deviations are in brackets

Even though INPSU proved to be insignificant, further analysis revealed a combination of variables with INPSU that led to important results (e.g. the combination with the INPSI variable). The combination of variables INPSU\*INPRU or INPSU\*INPRE showed a positive interaction that influenced the enterprises' overall performance. The value

of these impacts were measured identically at 0.001 (significant at  $p < 0.01$ ).

To test hypothesis  $H_3$ , we analyzed the impact of public subsidies on enterprises' performance. Tab. 2 shows that the provision of public subsidies from EU funds (FUNEU) was insignificant (0.755). Therefore, we included the variable FUNGMT and created Model 2

to analyze whether public funds increase the enterprises' performance. The correlation coefficient  $R$  from the second regression model showed a value of 0.979. The coefficient of determination  $R^2$  was 0.959. The  $p$ -value of this model was measured at 0.000. The  $p$ -value showed that this model was significant at  $p < 0.01$ . Therefore, the null hypothesis was rejected. Model 2 is regarded as significant. However, the results showed that there are

no significant interactions influencing the enterprises' performance. This result allows us to confirm hypothesis  $H_3$ , in which we argued that there is inefficiency in providing public subsidies. The results in Tab. 2 also confirm this claim (FUNEU is insignificant in Model 1).

However, we also found positive combinations of variables that confirm the significant influence of European public funds in Model 1.

**Tab. 4: Variables with a positive impact on public subsidies**

	FUNEU
CO	0.000*** (0.392)
GP	0.000*** (0.965)
GP*INPSI	0.000*** (0.464)
CO*INPSI	0.000*** (0.403)

Source: own

Legend: \*\*\*significant at  $p < 0.01$ ; the values of standard deviations are in brackets

The results in Tab. 4 not only show that the importance of cooperation and participation in a group of enterprises positively influences the spending of public funds but also confirm that it is possible for well targeted public spending to lead to effective results. When public funds are provided to enterprises individually, no significant interactions were found and the  $p$  value was measured at 0.755 (see Tab. 2). Conversely, strong ties influencing enterprises' performance emerge when public support is targeted correctly and the combination of FUNEU\*CO or FUNEU\*GP exists. These values are 0.000 (significant at  $p < 0.01$ ). Other strong ties occurred at the higher order interactions. The combination of GP\*INPSI\*FUNEU or INPSI\*CO\*FUNEU showed significant interactions with a value of 0.000, which are also significant at  $p < 0.01$ . Even though an inefficient use of public resources occurs in most cases, it is possible to find cases where they are used effectively. Czarnitzki and Lopes-Bento (2014) came to a similar conclusion. They suggested that public funding triggers socially beneficial research projects (but they don't talk about economic efficiency, which is often missing in these projects) and that the co-existence of national and European policies does not lead to crowding-out effects when compared to

a hypothetical world with a closed economy and no supplemental European policies.

## Discussion and Conclusions

The intent of this paper was to analyze whether enterprises' collaboration on innovative activities in the Czech Republic's machinery industry has a positive impact on their overall performance by examining three research hypotheses. The results of the regression models that were composed allowed us to confirm individual hypotheses. Hypothesis  $H_1$  indicates the need to systematically promote cooperation between enterprises and other partners and create groups of enterprises that have an impact on the growth of enterprises' overall performance. This finding confirm the concept of open innovation that is based on different research streams and suggest that valuable ideas can come from inside or outside the enterprise and can go to market from inside or outside the enterprise as well (Chesbrough, 2006; Chesbrough & Appleyard, 2007), therefore, cooperation is seen as a crucial way to increase enterprises' growth of turnover. The results of hypothesis  $H_2$  allow us to state that enterprises in the Czech Republic's machinery industry that cooperate with universities and public research centers demonstrate

a greater positive influence on their overall performance. Universities represent important collaborative partners in the Czech Republic's machinery industry. These collaborations between enterprises and universities positively affect enterprises' creation of innovation – both product and process. Therefore, we recommend continuing to support these types of cooperation in the machinery industry in the Czech Republic and creating links between enterprises and universities. This remains true in the case that enterprises do not receive support from public budgets. We argue that there is inefficient provision of public aid in the machinery industry in the Czech Republic, which is possibly caused by excessively granting public funding without directly monitoring its impact; this was subsequently confirmed by hypothesis H3. A number of projects financed by the European Union arise only in order to exploit these funds, without anyone to oversee the effectiveness of these projects. Excessive bureaucracy is another reason that leads to inefficiency when providing public aid. On the other hand, advanced analysis showed that, if public funding is properly targeted, it may be effective and powerfully influence enterprises' collaboration activities and overall performance. Therefore, it is necessary to adopt an appropriate way to provide public support to the machinery industry in the Czech Republic. It should be noted that innovative activities are essential parameter strategic (i.e. long-term) performance. Relevant data in an appropriate time range are critical to the explanatory power of every similar research. The limitation of this research is a smaller range of the analyzed sample. For this reason, the generalizability of result is limited.

We recommend that governments put more emphasis on adapting subsidies to specific entrepreneurial activities and promoting the emergence of common linkages between enterprises and universities. In future research, we plan to analyze the issue of collaboration partners and providing public subsidies to other industries in the Czech Republic and subsequently compare the results with those of other European countries.

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**THE COOPERATION BETWEEN ENTERPRISES: SIGNIFICANT PART OF THE INNOVATION PROCESS – A CASE STUDY OF THE CZECH MACHINERY INDUSTRY****Jan Stejskal, Beáta Mikušová Meričková, Viktor Prokop**

*In recent years, we have been able to see the growing importance of knowledge in the context of the emerging knowledge-based global economy. It is commonly accepted that (i) innovations are brought forward through an interactive process of knowledge generation, diffusion, and application; (ii) innovations are increasingly seen as fundamental to the competitiveness of enterprises and economies; and (iii) knowledge is critical to the process of innovation. The relative importance of cooperation on innovative activity varies and depends upon a number of factors, i.e. the number of cooperative ties and the context in which network relations exist. The determinants of R&D cooperation differ depending on the types of cooperation: (i) the positive impact of enterprise size, R&D intensity, and incoming source-specific spillovers is weaker for competitor cooperation, reflecting greater concerns about appropriability and (ii) institutional spillovers are more generic in nature and positively impact all types of cooperation. The question is the effectiveness of different types and subjects of cooperation. This article aims to analyze the impact of (i) the cooperation and participation in the group of enterprises; (ii) cooperation with universities; (iii) the provision of state aid; on overall enterprises' performance. Analysis was performed on data from Community Innovation Survey (CIS) carried out in the Czech Republic between the period 2010-2012 by using own multiple linear regression models. The results confirm the importance of cooperation between enterprises and the positive impact of participation of enterprises in the enterprise groups. Cooperation with universities and research organizations also has a positive impact on the performance of enterprises in the machinery industry in the Czech Republic. We also show that there were inefficient provisions of public aid in machinery industry in the Czech Republic.*

**Key Words:** Cooperation, innovation, knowledge transfer, machinery industry.

**JEL Classification:** O11, O14.

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# SUPPLIER INVOLVEMENT IN NEW PRODUCT DEVELOPMENT: A CASE STUDY FROM THE SEMICONDUCTOR INDUSTRY

*Özalp Vayvay, Maria Manuela Cruz-Cunha*

## Introduction

For the last years, global competition has strengthened the significance of a company's ability to introduce new products, while responding to increasingly dynamic markets with customers rapidly changing needs, and thus claiming for shortening the time required to design, develop and manufacture, as well as for cost reduction, increased reliability, quality improvement and sustainability. In this context, firms are implementing a wide variety of different techniques, management processes and development strategies in their quest for shorter development cycles and permanent business alignment with the market requirements (Cunha & Putnik, 2006).

Competition in the global world has dramatically increased throughout the last three decades because, among other factors, (1) technology is complex and changes rapidly, and it is nearly impossible for any company to possess all the technical expertise needed to develop a complex product on time; (2) the amazing developments in information and communication technologies (ICT) that provided unprecedented ease of connection, communication and collaboration in real time with any point in the world, and hence unprecedented efficiency in global design, management, information and decision making processes, and (3) the global geopolitical changes that, from the business point of view, provided a global free market both of clients, suppliers and subcontractors.

The shortening of the cycle time as a means of introducing new products more quickly into the market gave the involvement of suppliers in the design phase a fundamental importance, along with the sharing of information and responsibility with suppliers (Carlile, 2002; Hou et al., 2006; Olson et al., 1995; Page, 1993; Ragatz et al., 1997; Tomek & Chromcová,

2002; Twigg & Slack, 1999; Veryzer, 1998). New Product Development (NPD) is a must in this global competition. NPD is a process that intends to assure competitiveness and innovation, as the launch of a new product or service will put the company to a better position than competitors (De Brentani et al., 2010).

The main purpose of the paper is to demonstrate the importance of supplier involvement in NPD, buyer-supplier relationships and their effects on buyer's NPD process, highlighting the benefits of supplier involvement, the barriers, the strategic aspects and industry aspects. The theory presented in the paper is supported by a case study performed in 2012 in a company of the semiconductor industry sector (designated as "the Company"). Companies in semiconductor industry follow many NPD processes in shorter time scales; the technological changes happen fast, while projects are complex and require special expertise. Companies invest in R&D resources and capabilities, and tend to be involved with different partners to satisfy the market needs and trends.

The case study represents the NPD process in The Company. The Company is a supplier itself and develops, manufactures and delivers high technology products to the buyers, who deliver consumer products to the communications, digital, computer, automotive and industrial areas. Besides helping to understand NPD in the semiconductor industry, the contribution and findings of this work are clear: the results achieved confirm the findings of studies referred in the literature review, and confirm that the semiconductor industry sector requires a closer and more complex relationship structure with suppliers. In this sector, design and production are linked together with special expertise, performance, quality and cost criteria. The Company's NPD process

is involving the buyers, the suppliers and the competitors at various levels (definition of technological roadmap, R&D in manufacturing technologies, alliances with equipment and CAD-development suppliers, etc.).

Section two introduces the theory related to the topic, section three introduces some information about the semiconductor industry and section four introduces the case study. Section five discusses the main findings, relating them with the literature, and the last section concludes the study.

### 1. Literature Review

This section includes a literature review on the topics related to this research.

#### 1.1 Innovation and Competitiveness

One of the classical definitions of "innovation" is the process of making improvements by introducing something new; it may refer to both radical and incremental changes to products, processes or services, and implicitly it means bringing solutions to problems (Baregheh et al., 2009). Innovation has always been at the center of competitiveness, with academics and practitioners devoting significant amounts of effort and resources to the identification of organizational and individual correlates of innovation for five decades (Cooper, 1998).

Coming out from the Latin *innovationem*, noun of action from *innovare*, which in turn comes from *innovatus*, innovation means to renew or change into new (*novus*). Innovation means, according to the Merriam-Webster Online Dictionary, (1) the introduction of something new or (2) a new idea, method, or device.

Companies can be competitive by providing better manufacturing and service delivery, but sustaining the competitive advantage over time requires competitive and evolving skills in developing new products and services (Chen & Muller, 2010; Lengnick-Hall, 1992). The technological changes happen rapidly and the effects of globalization are increasing in the current business environment. The competitive advantage for many corporations now lies in their ability to effectively implement on-going product, service, and process innovations (Zhang et al., 2004). Product innovation cycles become shorter and more frequent. Innovation becomes a strategic tool, and the companies will be forced to exploit synergies between

products, services and processes (Smart et al., 2007).

Several authors (Smart et al., 2007; Swink, 2006; Tomala & Sénéchal, 2004) emphasize the outcomes of innovations that add competitive advantage: meet new consumer needs, offer a wider range of products and services, increase the quality and the reliability of existing products, succeed in new markets, reduce environmental damage, satisfy legislation, regulations and standards, increase production flexibility, reduce costs and improve the performance of the various product linked services.

Product innovation requires knowledge creation, dissemination and application, since it is a knowledge-based process (Terziovski & Sohal, 2000). But it also involves creativity; as Tomala and Sénéchal (2004) state, design activities are problem-solving and object construction activities designed to satisfy various constraints and fall under the heading of creativity. Another requirement for innovation is collaboration among different parties, like customers, norms and standards organizations, distributors and competitors (Emden et al., 2006; Nieto & Santamaria, 2007; Oke & Idiagbon-Oke, 2010; Sammarra & Biggiero, 2008; Swink, 2006; Tomala & Sénéchal, 2004).

Tidd et al. (1997) introduce a topology of innovation networks, presented in Table 1. In this typology, organizations come together to share knowledge, develop innovative practices, create new technologies and products, and obtain economic growth.

#### 1.2 Supplier Involvement

The supplier is a participant in the innovation networks (Smart et al., 2007), and according to Petersen et al. (2005) companies benefit from supplier involvement in NPD mainly in three areas: design, development and manufacturing.

It is possible to gain volume, design and technology capabilities through strategic supply chain management (Auramo & Ala-Risku, 2005; Chang et al., 2006). Supplier involvement in NPD brings new competences, fast penetration to new markets and resource conservation to the buyer (Wagner & Hoegl, 2006). Supplier involvement reduces new product development time and manufacturing cycle time, and has increasing impact on responsiveness to market uncertainties Incorporating suppliers in project

Tab. 1: Typology of Innovation Networks

Type of innovation network	Primary purpose (innovation target)
New product or process development consortium	Sharing knowledge to create and market a new product or process concept.
Sectoral forum	Shared concern to adopt and develop good practices across a sector or product market.
New technology development consortium	Sharing knowledge in joint research projects in newly emerging technologies.
Emerging standards	Exploring and establishing standards around innovative technologies and developments.
Supply chain learning	Developing and sharing innovative good practices in shared product development across a value chain.
Cluster	Exploiting innovation synergies in a regional group of companies, to gain economic growth.
Topic network	Mix of companies to gain traction on key new technology.

Source: adapted from Tidd et al. (1997)

teams enhances the information and expertise exchange regarding new ideas and technology; and through efficient communication and information exchange links the delays can be reduced, enabling the completion on time (Mclvor et al., 2006). Inemek and Tuna (2009) present a very comprehensive and deep analysis of NPD benefits and of supplier evaluation and selection criteria, based on a literature review covering the period 1990-2007.

Since the complexity of the products is increasing, in-depth knowledge and specialization are required. Outsourcing to specialized suppliers can reduce the internal complexity of projects and provide extra resources to reduce the critical path (Mclvor et al., 2006; Sammarra & Biggiero, 2008); many complex products are provided with the cooperation of external suppliers. Involving suppliers early in development is an important issue in terms of product quality (Wagner & Hoegl, 2006).

Potential problems can be identified early, what improves the product time-to-market (Forslund & Jonsson, 2010), increases quality, eliminates rework and reduces the development and production cost (Hou et al., 2006; Mclvor et al., 2006; Primo & Amundson, 2002; Wagner & Hoegl, 2006). With the improved buyer-supplier relationships, suppliers have project concerns and take responsibilities in it (Mclvor et al., 2006), improve buyer's performance, and

share risks (Chang et al., 2006; Wagner & Hoegl, 2006). Supplier involvement allows companies to focus only on their core businesses (Hou et al., 2006; Mclvor et al., 2006; Reed & Walsh, 2002).

On the other hand, some studies show that there is no positive effect of supplier involvement in product development (Gotzamani & Theodorakioglou, 2010; Lam & Chin, 2005; Li et al., 2010; Van Echtelt et al., 2008). There is resistance of the buyer or supplier to share proprietary information, as well as reluctance to a different design culture (Bstieler & Hemmert, 2008). There is also resistance of design personnel to an increasing level of supplier involvement during the design process (Li et al., 2010). Cooperative culture and trust should be established at both sides (Bstieler & Hemmert, 2008).

Some authors refer that the buyers want to protect core competences, and therefore limit the supplier involvement in R&D activities related to the company's core business (Wagner & Hoegl, 2006). Suppliers are also uncomfortable when the buyer requests the supplier's cost information, because of: (1) lack of trust in the buyer and lack of confidence in the accuracy of their own cost structures; (2) cost information may be used by the buyer to exercise power over the supplier. It is therefore difficult to persuade the supplier to share this information. Beside this, the suppliers require more active participation in buyer's cost

reduction program during the contract life time rather than just having cost discussions at the time of contractual period (Mclvor et al., 2006).

Supplier involvement can be ineffective in rapidly changing and technically complex environments and can create delays in the product development in case of high technology uncertainty (Mclvor et al., 2006). Product development with the suppliers can be more expensive and slower, when the supplier makes the management of projects more complex (Hartley et al., 1997; Wagner & Hoegl, 2006). The buyers create a competitive buyer-supplier relationship where they negotiate with different suppliers for an optimum buy, what causes lack of trust and commitment at supplier's side. The policies for the level and time of supplier involvement may not be available, unclear or inconsistent for the employees of the buyer company (Mclvor et al., 2006). The buyer's systems of exchange information can be incompatible with the suppliers one, creating obstacles to data sharing. And buyer's engineers that are not trained in the supplier's products, so invalid data, and inadequate guidelines, can cause communication problems (Mclvor et al., 2006). The cultural differences between buyer and supplier can put barriers to supplier involvement. The embedded culture of both sides should be changed for the cooperative nature of supplier involvement (Homburg et al., 2009; Mclvor et al., 2006; Ruey-Jer et al., 2010). The geographical distances and language, the inappropriate team structures, the lack of work coordination, the protection of intellectual property rights and the lack of competent suppliers can be listed as other barriers (Homburg et al., 2009; Ruey-Jer et al., 2010).

Table 2 summarizes benefits and barriers of supplier involvement in the NPD process.

### 1.3 Strategic Implications of Supplier Involvement in NPD

The strategic implications of supplier involvement in NPD can be grouped under five items: the extent of involvement, the nature of buyer-supplier relationship, the degree of information exchange, supplier involvement at the organizational and project level, and building a buyer-supplier project team. The five items detailed below reveal the effecting factors that should be considered in decision about the supplier involvement in NPD. When

and how to involve suppliers in NPD is critical for the success of the joint activities.

Complex and innovative products require the early involvement of supplier in NPD such as definition and planning phase of a new product. The nature of buyer-supplier relationship should be supported by trust, reliability, openness, support, flexibility, commitment, shared interdependence, shared expertise, shared responsibility and power in NPD. The information exchange links should be more robust than the traditional supplier relations. Information contains more sensitive and complex data. Communication is more frequent and it involves more people from both buyer and supplier side. Supplier involvement is differentiating at organizational level depending on type of product and sub-systems, supplier performance and capabilities. Coordinating project tasks between buyer and supplier are also critical for the success. The fifth item emphasizes the human aspect. Buyer and supplier establish a project team during the NPD process. Team structure, cultures, personalities and competencies of members are very important to successful supplier involvement in NPD.

#### The Extent of Involvement

This aspect points emphasizes the timing of supplier involvement and degree of competition among suppliers (Mclvor et al., 2006); firms can benefit from early involvement of suppliers when NPD is considered. The different timings for involving suppliers are discussed in the literature. (Mclvor et al., 2006) describes three phases for involvement: concept stage, detail engineering stage and process engineering stage. In (Wagner & Hoegl, 2006), early stage of supplier involvement includes research on concepts, technologies and innovative solutions in the definition phase of products and the definition of common technical and commercial objectives. (Hartley et al., 1997) emphasizes the involvement during idea generation and project planning of a new product, since design specifications are mainly affecting a product's performance, quality, and cost and only incremental improvements can be made after production has started. And know-how NPD projects that utilize supplier knowledge require early involvement during idea generation, technical/commercial definition (Wagner & Hoegl, 2006). Early involvement provides time

**Tab. 2: Benefits and barriers of supplier involvement in NPD process**

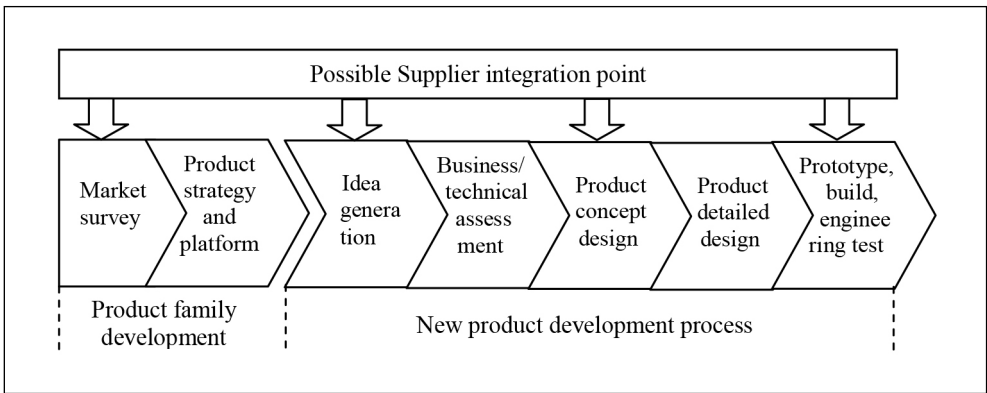
Categories	Benefits	Barriers
Competences & Capabilities	Extra volume capability (Chang et al., 2006)	
	Extra design capability (Chang et al., 2006)	
	Extra technology capability (Chang et al., 2006)	
	Reduced internal complexity of projects (Mclvor et al., 2006)	
	Buyers focus on their core businesses (Hou et al., 2006; Reed & Walsh, 2002)	Buyers want to protect core competences by limiting supplier involvement in activities related to core business (Wagner & Hoegl, 2006)
	New competences (Lawson et al., 2009; Wagner & Hoegl, 2006)	The lack of competent suppliers (Wagner & Hoegl, 2006)
	Improved performance (Chang et al., 2006; Englhardt, 1993; Lawson et al., 2009; Petersen et al., 2003; Song & Di Benedetto, 2008; Wagner & Hoegl, 2006)	
	Shared responsibilities and risks (Chang et al., 2006; Englhardt, 1993; Wagner & Hoegl, 2006)	
Greater information and knowledge sharing (Knudsen, 2007; Lawson et al., 2009; Petersen et al., 2003)	Firms from their own industry tend to contribute similar knowledge, which ultimately may endanger the creation of new knowledge and therefore more radical product developments (Knudsen, 2007)	
Time	Reduced NPD time (Chang et al., 2006; Forslund & Jonsson, 2010; Primo & Amundson, 2002)	Product development is slower when supplier makes project management more complex (Wagner & Hoegl, 2006)
		Frequent phone-calls and meetings with the suppliers make the processes slower (Wagner & Hoegl, 2006)
	Reduced manufacturing cycle (Chang et al., 2006)	
	Reduced critical path by extra resources (Mclvor et al., 2006)	
	Fast move to new markets (Wagner & Hoegl, 2006)	
	Early identification of problems (Hartley et al., 1997; Hou et al., 2006; Wagner & Hoegl, 2006)	
	Elimination of rework by early involvement (Hou et al., 2006; Wagner & Hoegl, 2006)	
Fast response to market uncertainties (Chang et al., 2006)	Delays in the product development in case of high technology uncertainty (Mclvor et al., 2006)	

Source: simplified from Inemek & Tuna (2009)

to know each other and to build a partnership-like relationship. Suppliers of non-critical and simple items can join during engineering or prototype stages. Figure 1 presents the timings for supplier involvement in NPD (Hou et al., 2006), and states that the suppliers contribute to the design more in early stages such as product family development and product concept design. They can introduce new technologies, design solutions and suitable materials. At later stages, when the buyer defines the specification, the contribution would be weaker.

Supplier involvement in NPD is compliant with concurrent engineering (CE) concept that suggests parallel and collaborative design, development and production activities, early communication of different groups in design process, cross-functional teams and early supplier involvement (Liker et al., 1996; Reed & Walsh, 2002). The degree of competition among suppliers is related to the number of possible suppliers at the time of involvement; if there are more than one supplier that can be selected, there is competition between them.

**Fig. 1: Timings for supplier involvement in NPD**



Source: Hou et al. (2006)

**The Nature of Buyer-Supplier Relationship**

Managing relationships among many companies in a chain of buyers and suppliers is required to establish supplier involvement in product development. Especially, technologically complex designs and product uncertainties stress the importance of close partnership with suppliers and interface management (McIvor et al., 2006). Partnership, strategic alliances and contract management are types of relationships with suppliers (McIvor et al., 2006; Wagner & Hoegl, 2006). Companies establish partnerships with suppliers to benefit from their technological expertise in development, design and manufacturing (Wagner & Hoegl, 2006). Buyer-supplier relationships evolve from traditional relationships to strategic alliances and the joint activities with suppliers through strategic alliances are reducing the customer total cost of installation and ownership (Wagner

& Hoegl, 2006). NPD related benefits of those activities can be the joint development of new technologies, accuracy and quality of products and on-time deliveries. there exist three types of alliances: maintenance, repair, and operation (MRO) product alliances, engineering alliance and engineered product alliances. Engineering alliances provide the supplier’s involvement in NPD.

Wagner and Hoegl (2006) distinguish projects in terms of supplier involvement level and mention that the relationship structure at “know-how projects” is different than “capacity projects”. The know-how projects are those where supplier’s knowledge is mostly technological. They are innovative projects, since they are knowledge-based and the effort is spent to introduce new products. Suppliers are responsible for critical modules or systems. They are highly integrated and involved very

early in the projects. The relationship is close like partnership. Shorter time-to-market of new products and reduced costs force the buyers to involve suppliers in know-how projects. The capacity projects focus on getting extra R&D resources and gaining R&D flexibility. This enables the reduction of internal R&D headcounts and resources that are seen as cost items. They are less innovative, such as changing an existing product. Suppliers are responsible for less critical components or sub-systems. Their involvement time is not critical and their integration is limited. The relationship is more traditional.

The both buyer and supplier have its embedded culture at organizational and project level. Involving suppliers requires a cooperative environment where joint problem solving and decision-making activities are occurring and therefore cultures of buyer and supplier should be aligned. There is a need of change in cultures and establishment of a shared culture to overcome the barriers (Gotzamani & Theodorakioglou, 2010).

Trust, reliability, openness, support, flexibility, commitment and appropriate governance of interfirm relationships are important features of buyer-supplier relationship in an NPD project (Binder & Clegg, 2007; Chang et al., 2006; Mclvor et al., 2006; Wagner & Hoegl, 2006). Flexibility and support are rephrased in (Chang et al., 2006) as the supplier responsiveness to product changes, delivery time and volume changes, assistance in product and process design and innovation.

One of the significant benefits of involving suppliers is to gain new technical competencies (Wagner & Hoegl, 2006). However, cooperativeness of the supplier can be more important than its technical competence in consideration of its selection for the future projects (Mclvor et al., 2006). The longer and more stable relationships are better for the joint efforts (Wagner & Hoegl, 2006). A cooperative work provides the match of goals of both supplier and buyer and win-win environment.

Wagner & Hoegl (2006) suggests that supplier should also be able to provide outside point of view beside its technical competence that will bring more system understanding and more innovative solutions. (Hua & Wemmerlöv, 2006) examined the personal computer market that is rapidly changing and found that the innovative supplier actions are positively

affecting the buyer's innovations. Innovation frequency is highly related to close buyer-supplier relationships and the link between them is stronger when the buyers face a tough competition.

The level of dependency affects the relationship. A cooperative relationship suggests a shared interdependence and expertise, distributed responsibility and power (Mclvor et al., 2006). Suppliers are expected to take responsibility for development, design, integration, manufacture, qualification, delivery, target performances and quality for the items those they provide (Wagner & Hoegl, 2006).

Supplier development (SD) activities and supplier optimization bring more competitive supplier capabilities (Chang et al., 2006). The rapidly changing environment introduces the development of new products, services and suppliers. The buyer quality relies highly on the quality of their multiple suppliers and it becomes more important in this environment to ensure the supplier quality through supplier quality improvement (SQI) programs (Walker & Hon III, 1988). Reed and Walsh (2002) found that SD enhances indirectly the technology capabilities of small suppliers by providing processes of technology innovation and technology future view. Beside this, it strengthens the buyer-supplier relationship and builds mutual trust, since it enables better communication links and sharing strategic data such as technology roadmaps. As a result, the suppliers are able to follow the technology and to involve more in NPD.

Johnson et al. (1997) mention the environmental considerations of the buyers that want to be more competitive by responding to customers' requests for environment protection. This forces them to have or manage suppliers during development and manufacturing of new products according to environmental awareness.

### **The Degree of Information Exchange**

Communication is needed for an effective team-work, problem solving and decision making activities; an information exchange system should be structured between firms and teams. In a successful product development with supplier involvement, the teams are encouraged for external communication, and co-development communication links should be provided between firms. Multi-organizational product development is a strategic choice for

the companies that produce many products containing different technologies, such as telecommunication products (McIvor et al., 2006).

Design and quality specifications, cost, inventory, forecasts, schedules, production plan, material requirements, test processes, tools and production process can be shared data between buyers and suppliers to develop a new product on-time with required features, quality and price (McIvor et al., 2006). Trust is important when sharing such sensitive information and the level of communication becomes a critical issue. Supplier and manufacturer plant visits, electronic data interchanges (EDI) automate purchasing systems, information systems, computer-to-computer links with key suppliers are mentioned as types of information exchanges (McIvor et al., 2006).

### **Supplier Involvement on the Organizational and Project Level**

In (Wagner & Hoegl, 2006) two domains are mentioned as critical for the success of supplier involvement; (1) contingency factors on the organizational level and (2) the management of supplier involvement on the project level.

Contingency factors on the organizational level concern product architecture, type of design and development interaction with suppliers, partnering relationships, evaluation of supplier's performance, R&D, manufacturing, assembly and logistics capabilities.

In modular product architecture, functional elements have one-to-one mapping to physical components and there are standardized interfaces between sub-modules, therefore design can be split easily between buyer and different suppliers. In integral product architectures, designs are complex, a functional element consists of many physical components, a change of a component requires the change of another component, and therefore it is difficult to manage the involvement of suppliers in the projects and innovation processes. As a result, supplier involvement depend on the product architecture and the design and development interactions with suppliers which can be classified as "none", "white box", "gray box", "black box" or "traditional", "advanced" and "integrated" subcontracting (Wagner & Hoegl, 2006). For example, at a "white box" design, the buyer has the whole internal view of the supplier's sub-system. At a "gray box" design, the buyer has the limited internal view of the

supplier's sub-system. These two designs can be result of joint design activities. The "black box" designs meet the buyer's functional requirements and buyer does not how these are implemented internally. Supplier involvement can be limited when the buyer uses an existing part. If a new part design is required, supplier can contribute more to buyer's new project.

A cooperative buyer-supplier relationship also depends on organizational structures. Partnership with suppliers is a critical organizational factor and depends on that the buyer provides cooperative environment, open communication, a high level of trust and commitment.

Evaluation of suppliers is needed to get a better performance from supplier involvement. The buyer firm can select supplier and distribute responsibility according to the performance, R&D, manufacturing, assembly and logistics capabilities of the supplier. (Hou et al., 2006) proposes an evaluation index system including satisfaction, flexibility, risk and confidence index for the supplier selection in new product development. A system is needed to decide the time and extent of supplier involvement. Table 3 presents sub-indices for this evaluation system. Most of the items in this table are explicitly mentioned in this literature survey at several places. If a supplier ranks high in these dimensions, the supplier can be selected to contribute early in NPD process and it can be responsible for more critical and complex tasks. The supplier gain also credits for the future projects.

The second domain is about coordination of project tasks between buyer and supplier, interaction and inter-organizational exchange of project members from buyer and supplier side. In NPD projects, the collaboration quality of the members from both sides is more important for the project success than giving more tasks to the supplier. Therefore, the main focus should be the relationship between members.

### **Building a Buyer-Supplier Project Team**

In a buyer-supplier project team, members of two different organizations work cooperatively to achieve common goals. Size and composition of the team are critical factors for the NPD (Wagner & Hoegl, 2006). The size increases with the complexity, since complex designs require more people with different competencies. Some of the members build

Tab. 3: Supplier selection and evaluation indices for involving suppliers

<b>Satisfaction Index</b>	Product quality (certification, quality feedback speed)
	Product cost (development cost; raw materials cost and raw materials source)
	Technical capability (process capability; production capacity; new technologies adaptability)
	System support (organization, training and process feasibility)
<b>Flexibility Index</b>	Product standardization
	Quantity feasibility
	Developing capability (R&D budget and expense, new technologies adoption ratio, innovation capability)
	Product modularization
	Speed of information interchange
	Management level (level of IT and software tools usage, Product Data Management normality degree)
<b>Risk Index</b>	Consistency (commercial /business culture, technical tools, enterprise/organization architecture, development strategy)
	Collaborative experience
	Technical risk (technical specialization and technical change ratio)
	Enterprise power (corporate scale, trading position, financial status, market competition power)
	Development perspective (capacity planning, sustained improving capacity, market share)
<b>Confidence Index</b>	Business credit standing (contractual damage ration, completion ration, customer compliant ratio)
	After service feasibility and capability
	Depth of information sharing
	Security classification of information

Source: Hou et al. (2006)

the interface between buyer and supplier, and the number of interfaces among engineers depends on the number of team members. Smaller teams have more direct and efficient intra-team communication, greater effort of all team members and better usage of team members' potential.

The composition of a successful project team has several requirements. The communication capability of the team members is the most desired feature while composing the team (Wagner & Hoegl, 2006). Open, accurate, spontaneous and on-time communication is critical for the project scheduling, since it reduces time losses and overlaps between tasks. On the other hand, the problems can be quickly communicated to other side and the

solutions can be found easily. For successful product development, McIvor et al. (2006) suggest that team include interfaces, who encourage external team communication, and powerful project and senior managers, who communicate externally. Such teams are busy with task-oriented external communication.

The team should possess the necessary technical competences. Besides this, the personal characteristics and culture of team members should fit to each other by being compatible or complementary. A high motivation, project commitment and interpersonal trust are necessary. Mutual support and participative decision making should be established. And other aspects affecting the success of team structure are the capabilities of project leader,

team-work and interdisciplinary work abilities and also language skills for international groups.

## 2. The Semiconductor Industry

Semiconductors are technology enablers of many daily-used products – automobiles, televisions, cell phones, computers – and of an enormous variety of appliances in medical and agriculture areas, for instance. Besides, the rapid rate of innovation in the semiconductor industry facilitates the information technology revolution that affects many sectors. It has become the vital core of an entire ecosystem that drives innovation and growth in all sectors of the economy (SIA, 2006).

Global semiconductor industry spreads to USA, Europe, Japan, China, India, Korea and Taiwan. Although the United States is still the world leader in semiconductor technology, their position is not secure. China has become the world's largest market for semiconductors, reflecting a dramatic shift in electronics equipment manufacturing to the Asia-Pacific region in general and China in particular. And China has decided supplying most of its domestic needs for semiconductors from domestic production. In China, India, Eastern Europe, Russia and a host of other countries not traditionally associated with promoting free enterprise, governments are offering incentives to companies that will invest in manufacturing and R&D facilities (SIA, 2006).

The players in this industry vary from research and development companies or organizations to semiconductor manufacturers owning the fabrication facilities. Some of them have all capabilities: research, design, development and manufacturing of semiconductors. The major players in the field of semiconductors are, according to semiconductor industry (2007-2010) market research (RNCOS, 2007), Intel®, Samsung®, Hynix®, Micron Technology®, Toshiba®, TSMC Group®, Powerchip®, AMD®, STMicroelectronics®, Infineon Technologies®, Texas Instruments® and NEC Corporation®. There are always new entrants, since it is a growing market.

Semiconductor industry operates in an environment of tough global competition. The semiconductor market shows continuous growth but in a cyclical pattern, that always forces companies to offer products at lower prices. Companies try to gain a place in the

global market and fight against the growing costs; they develop strategies to improve time-to-market cycle of a new product and to respond rapidly to the global market (Lou et al., 2010). These strategies can consist in the reduction of the number of suppliers and building stronger and long-lasting relationships, and early involvement of suppliers. (Keller & Pauly, 2009) state that in this sector, partnering relationships with suppliers bring quality improvements beside the improvements at cost and delivery time. The manufacturers in semiconductor industry build agreements with competitors, create joint venture companies in other countries, and establish global partnerships for developing new products. All these efforts aimed on increasing capacity and global market share, reduce the costs and share risks.

Some manufacturers provide manufacturing services to other companies that do not want to make investments and take risks for building and maintaining their own foundries (SIA, 2011), allowing them to concentrate on product design and development. Foundry suppliers are specializing in manufacturing processes to control manufacturing costs and to improve productivity.

## 3. The Case Study

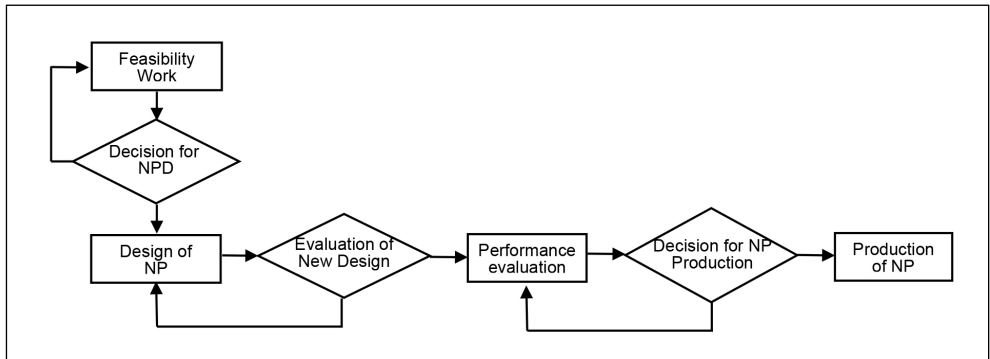
The study presents the joint NPD activities of a semiconductor supplier, its customers, competitors and suppliers. The company will be referred as "the Company" for confidentiality.

### 3.1 Company Profile

The Company develops and delivers semiconductor solutions for the microelectronics applications. It follows an aggressive growth strategy, investing heavily in R&D, establishing strategic alliances with blue-chip customers, other semiconductor manufacturers, suppliers and academia, building up an integrated presence in major economic regions, and leading very efficient manufacturing operations. Today, the Company possesses silicon and system expertise, manufacturing strength, distinctive concurrent engineering capability, Intellectual Property (IP) portfolio, industrial and academic partnerships, and a broad product range. Its sales are spread to the industrial sectors such as communications, digital consumer, computer, automotive and industrial.

The Company understands the competitive structure in the semiconductor industry and pays

Fig. 2: NPD flow



Source: own elaboration

high attention to innovation. The semiconductor industry is highly cyclical and has been subject to significant economic downturns at various times. This means performance can vary significantly from one year to the next. The Company is following the trends, tries to forecast the future technologies and to show good performance in this industry.

New product development is mandatory to stay competitive in this rapidly changing environment. The Company NPD flow is shown in Figure 2.

### 3.2 NPD Flow of the Company

New product plans are based on understanding the customer's requirements. The customer communicates its technological roadmap and the Company involves the customer in the NPD process. This involvement can start from the concept stage, project planning or design stage of the customer product. The customers' needs are translated into technical requirements as product specifications, process operations and manufacturing process controls. The Company understands the importance of concurrent engineering by stating that manufacturing and reliability must be considered at the design level in order to manufacture reliable products meeting customers' expectations.

The Company defines the NPD flow as consisting from four steps: feasibility assessment, NP design, performance evaluation and NP (New Product) production. This procedure governs the entire life cycle of a product from

new product proposal to its manufacturing and introduction to market. Each new product begins with a feasibility work to detail business and technical aspects, to see the potential of the product and to decide the allocation of the design resources. The feasibility results are reviewed by a board of people from several departments in the Company. The review and detailing can be done several times. When the feasibility report is approved, the NP design starts.

The designers work according to the clearly defined design rules and describe the functionality of Integrated Circuit (IC) using special design tools; it is reviewed periodically, and new customer requirements can be added. The process technologies are considered in the design. Then, the physical IC structure is defined and wafer evaluation brings more manufacturing considerations to design. The design results in working samples of the product. After the tests of the first working samples, the design is ready for performance evaluation step, where it is tested for characterization and reliability. The performance evaluation step involves a considerable investment; therefore approval of new design should be done carefully.

The working samples may be given to customers for application study; this action is a part of supplier involvement in NPD process at customer side. In the performance evaluation step, new product is qualified through characterization and reliability tests. If the result reports are approved, the new product is ready to be manufactured.

### 3.3 The Scope of the Relationships with Suppliers

The Company keeps relationships mainly with three types of suppliers: equipment suppliers, raw material suppliers and external subcontractors:

- Equipment suppliers: The limits of the technology in semiconductor manufacturing processes highly depend on the quality and technology of equipment. Semiconductor producers should follow and use the latest process technologies to produce smaller chips and consequently remain competitive. The Company establishes strategic alliances with equipment- and CAD-development suppliers to cooperate closely and to follow advances immediately.
- Raw materials: these include silicon wafers, lead frames, moulding compounds, ceramic packages, and very high-purity chemicals and gases. As the Company depends on a limited number of suppliers for several materials, they have strong partnerships for on-time and quality deliveries.
- Subcontractors: The Company outsources wafer manufacturing, assembly and testing of finished products and some other services. Depending on the market conditions and its available capacity, these subcontractors play a significant role in optimizing cost and focusing on critical proprietary processes.

The Company develops equipment- and CAD-development alliances with major suppliers to sustain competitiveness of process technology. It has vendor certification and Ship-To-Stock programs to assure the quality of purchased materials. The Company preferably chooses subcontractors to manufacture assembly and test the products in the regional areas where the customers are residing. There are also intellectual property (IP) suppliers that deliver sub-systems.

The NPD and delivering these semiconductor solutions are building the core business of the Company. Although it is highly affected by the supplier's technological capabilities, the relationship types stated above suggest that there is not much supplier involvement during the design and development of a new product. Mainly manufacturing processes are affected by the suppliers. However, the Company applies concurrent engineering, and technology used in manufacturing processes brings design rules during the NPD design phase.

Material suppliers are selected according to specific business, quality and service criteria. Business agreement starts with selected strategic suppliers by going through negotiations of price, delivery and payment terms. Then, the quality management process conducts audit controls, qualification follow-up, qualification list coordination, certification program, performance measurement coordination, setting long-term targets. The approval of supplier includes completion of a questionnaire based on international standards and an assessment of the adequacy of the suppliers' organization in achieving total customer satisfaction. At material qualification, after successful business discussions and audit results, the material is analyzed, and then submitted to qualification tests. All supplier performance is followed at plant level in terms of quality, delivery and service, a supplier's report card is created and all the results are consolidated at corporate level. In continuous improvement process, all strategic suppliers with significant business are requested to enter into a continuous improvement program with the Company.

The Company sees that the consistent supply and continuous improvement is mandatory for its continuous improvement and fulfilment of its commitments to customers. It established staff functions to ensure supplier quality, control and compliance, purchasing administration, and supplier innovation. The supplier quality department has grouped suppliers into categories, such as 'high-risk' or 'strategic.' Suppliers in each group must perform according to a specific dashboard of indicators. All key suppliers must be 100% in line with industry standards, from finance and quality to environment and social.

The Company avoids over-dependence on single suppliers. It combines more volume at global and regional levels, increasing the purchasing volume for a smaller number of service and material suppliers. While aggregating groups of suppliers, it assigns special responsibilities to the largest among them. One of the main things the Company considers is communicating with its major suppliers to ensure they felt comfortable with both the short-term needs of its cost-reduction strategy and with the medium- and long-term benefits of working with the Company. This also includes working with smaller local suppliers to explore how they could grow by working with the Company.

### 3.4 Other Relationships of the Company

The Company has a worldwide network of strategic alliances, including product development with key customers, technology development with customers and other semiconductor manufacturers. These industrial partnerships are complemented by a wide range of research programs conducted with leading universities and research institutes around the world. The Company is able to offer leading-edge solutions to customers in all segments of the electronics industry by complementing its portfolio of proprietary technologies and core competencies with the expertise of strategic partners.

Joint activities with other semiconductor manufacturers are typical relationships established with competitors. These are referred as joint semiconductor R&D activities, and they are mainly focusing on *wafer* testing, packaging and developing process technologies for *wafer fabs* that require a great amount of investment. The manufacturing capability is also complemented by the subcontractors, those provide manufacturing, assembly and testing facilities. The Company cooperates with competitors also to create a common standard for a new technology.

Joint NPD activities are performed through strategic alliances with customers. The Company gets involved in the technological roadmap of the customer and fulfills the requirements of the customer. The Company does a large amount of R&D with customers. The design is partially done by the customer and partially by the Company.

Customer quality support system provides an environment that takes customers' suggestions for product improvements and analyzes them. Failure analyses of a product and reliability data is given to the customers. The design specifications, agreements or special requirements are properly coordinated between the Company and customers. Contract reviews are made to follow customers' expectations. The sales personnel, including marketing support, coordinate customer communication links with manufacturing, product groups, quality, and other company functions. The customers perform independent quality audits units of the Company.

The Company management systems assures compliance with customers'

expectations in relation to environmental, health and safety, and wider corporate responsibility issues. The customers are concerned about the management of social, ethical, and environmental risks in their supply chain and they increasingly expect the Company to monitor their suppliers' performance through self-assessment and audit.

### 3.5 Case Study Outcomes

The Company is a semiconductor supplier that designs, develops and manufactures semiconductor systems and competes in a rapidly changing environment. Therefore, the Company runs many NPD processes in parallel and makes large investments in R&D and manufacturing processes to keep the pace with technology. The manufacturing technologies that the suppliers of equipment and Computer Aided Design (CAD) systems develop have great impact on semiconductor NPD flow. Each manufacturing process change brings change in the existing products (smaller or low-power microchips), new design rules at design phase of NPD, new characterization and reliability tests at development phase. The change in manufacturing is needed to stay competitive. Therefore, manufacturing considerations are part of NPD process in the Company and all participants have contributions in different scopes.

The products are the results of high-technology know-how of the Company and its collaborative work with customers, competitors and suppliers; each partner in the joint activities has an important impact on the success of the Company. The NPD in the Company does require not only the supplier involvement, but also the involvement of customers, competitors, suppliers, universities and research institutes to cope with technological changes, costs and risks. There is a balanced relationship with each contributor during the Company's NPD process. Figure 3 shows the relationship links.

Relationships with customers effecting NPD process includes sharing technology roadmap and market analysis data, joint design and development activities and customer quality audits. There are suppliers, competitors, universities and research institutes on the other side of the chain.

Suppliers deliver IPs in complex sub-systems; improve manufacturing process technologies through strategic alliances for equipment and

CAD-development. The Company makes quality audits and introduces social and environmental norms to the suppliers. It also communicates its cost strategies with the suppliers. And it helps them grow and reach industry standards.

The Company establishes and follows joint research programs with universities and research institutes. The outcomes are contributing to the development of new technologies.

The joint activities made with competitors to develop new technology standards and manufacturing process technologies are also highly affecting NPD process in the company.

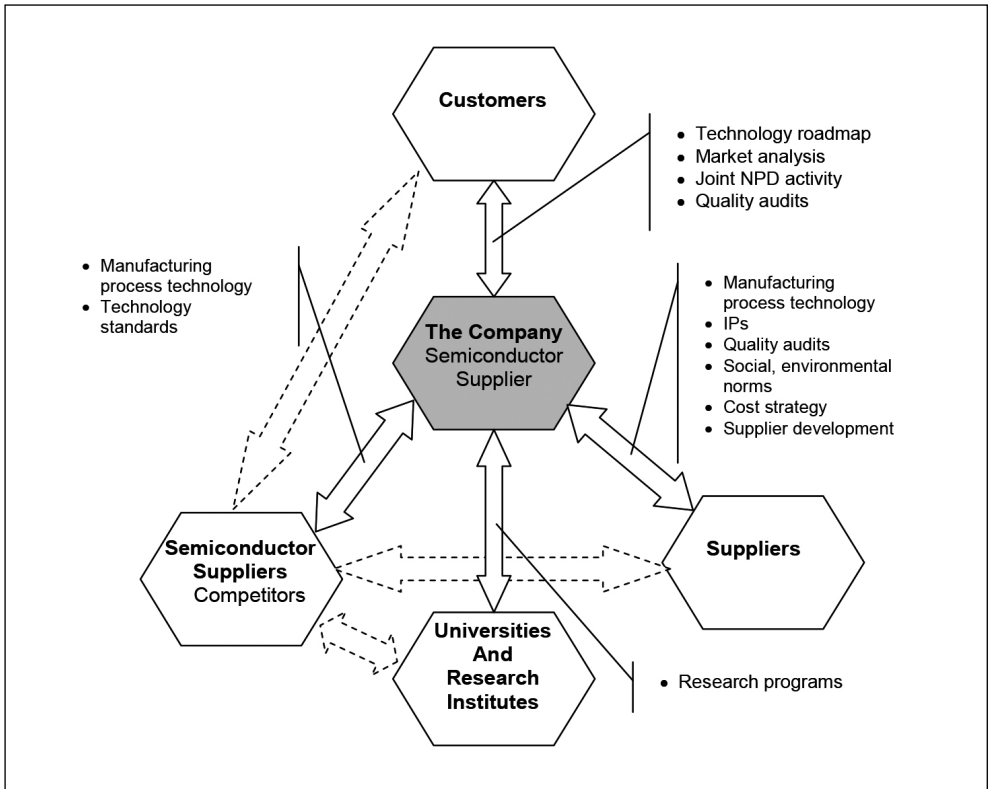
Implicitly, there exist the same kind of joint activities between the competitors and the customers, suppliers and universities those the Company is working with.

**4. Discussion of Findings**

The Company follows a strategy that relies on the introduction of new products and new technologies, where innovation plays an important role. The structure of the industry, where the technological changes are happening frequently, is also forcing it to innovate to stay competitive. The Company conducts co-operative and collaborative actions with customers, suppliers, competitors and research organizations, those mentioned as network of actors in the literature.

In the literature, supplier involvement in NPD is mainly focused at buyer side. The buyer establishes an environment where the supplier participates on the different stages of the buyer's NPD process. Our case study presents the NPD flow of a supplier that enables joint

**Fig. 3: Balanced relationship link in the NPD process of the Company**



Source: own elaboration

activities with several types of participants: customers, suppliers, research groups and competitors. Fast moving market, the need for high-technology know-how at IC design and semiconductor manufacturing, the large R&D expenses, expensive semiconductor process technologies, pressure for lower costs forces the supplier Company to have joint activities. These activities can take place during the definition of new products or technologies, the consideration of quality and cost aspects or during the development of new process technologies.

The literature mentions two project categories: know-how projects and capacity projects. Both categories can be seen in the case study. Joint product development with customers is a part of know-how projects where innovative solutions are produced. Research performed together with universities, joint R&D activities for process technologies with other semiconductor manufacturers are capacity projects where extra R&D resource is gained and investment costs are reduced.

The rate of joint activities is high and this indicates that the culture of the Company has grown towards co-operation. However, it does not want to depend on single supplier. The company works with a group of suppliers in order to respond quickly the customer requests. It can create competition between them and this can be a barrier as mentioned in the literature. Beside this, it may suggest lack of trust. Reducing the number of suppliers has been mentioned as a strategy in the semiconductor industry, but this is not valid for the Company's case.

Communication links are emphasized in the literature. Balanced relationship link in NPD process of the Company brings the necessity of powerful communication links. Shared technology forecasts and market analysis with customers, shared quality norms and cost strategy with suppliers are examples for shared data. The sales and marketing people are interfaces coordinating communication links between customer and manufacturing, product groups, quality, and other company functions.

The Company assigns special responsibilities to most of the suppliers. The shared responsibility is a key feature of cooperative relationship as mentioned in the nature of buyer-supplier relationship.

Supplier development mentioned in the literature is enabled in the Company by helping

the suppliers achieve quality, social and environmental norms.

The semiconductor industry aspects – rapid technological changes, need for innovation, global competition, need for reducing cost and time-to-market cycle, partnerships to increase capacity and market share, to reduce the costs and to share risks – exist in the Company's environment.

## Conclusions

The global competition requires that companies rapidly adapt themselves to technological changes, develop new products, reduce the cost, shorten the time to market, and increase the quality. The improvement of existing product and services is not enough to sustain competitiveness today. NPD process becomes a focus point when projects are complex, and the cost, time and quality considerations are determinant. In NPD processes, the companies tend to establish partnerships with other organizations to increase their R&D resources and capabilities; companies focus on the specialization in their core businesses and complement the missing competencies in synergy with other companies.

The paper focuses mainly on the supplier involvement in NPD. The case study from semiconductor industry shows that a more complex relationship structure is affecting the NPD process for high-technology products. Many NPD processes are frequently being established in the semiconductor industry, because projects are complex, require special skills and time-to-market is very short. In this environment, there is a networking approach and only supplier involvement is not satisfactory. The customers, suppliers, competitors, universities and research institutes are expected to work collaboratively to reach the common goals, and to answer to the market needs and trends. Each partner is contributing according to its specialized area and capability. Partners share R&D resources, technology roadmap data, quality, social and environmental norms and cost strategies to reach the consumers' expectations.

Joint activities between the different participants depend on trust and reliability, openness, support, flexibility and commitment as it has been suggested only for the suppliers in the literature. They are established according the level of complementary skills and

technological know-how to reach the innovative solutions. Another aspect is to be close to the regional costumers or to be able to enter regional markets.

Further research can be conducted to see if the networking approach during NPD process is valid in other semiconductor companies and in different sectors, to understand the contribution of different participants in different industry sectors and the different relationships with participants.

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## Abstract

**SUPPLIER INVOLVEMENT IN NEW PRODUCT DEVELOPMENT: A CASE STUDY FROM THE SEMICONDUCTOR INDUSTRY****Özalp Vayvay, Maria Manuela Cruz-Cunha**

*The global competition requires that the companies adapt themselves to technological changes rapidly, develop new products, reduce the cost, shorten the time to market, and increase the quality. In this context, supplier involvement in New Product Development (NPD) is determinant for a company to respond to the requirements of the increasingly dynamic markets. The main purpose of the paper is to demonstrate the importance of supplier involvement in NPD, buyer-supplier relationships and their effects on buyer's NPD process, highlighting the benefits of supplier involvement, the barriers, the strategic aspects and industry aspects. These issues are addressed with a case study from the semiconductor industry. Besides helping to understand NPD in the semiconductor industry, the contribution and findings of this work are clear: the results achieved confirm the findings of studies referred in the literature review, and confirm that the semiconductor industry sector requires a closer and more complex relationship structure with suppliers, given the specificities and challenges of the sector, such as rapid technological changes, permanent innovation, global competition, reduction of cost and time-to-market cycle, increased capacity, among other. The main contribution of the paper to the scientific literature and to managers is the better understanding of the buyer-supplier relationships in NPD in the semiconductor industry.*

**Key Words:** *New product development, supplier involvement, semiconductor industry, buyer-supplier relationship.*

**JEL Classification:** L21, L23, L25, M11.

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# DIAGNOSTICS OF MANAGEMENT CULTURE IN ORDER TO IMPLEMENT THE CONCEPT OF A SOCIALLY RESPONSIBLE COMPANY: THE CASE OF A CONCERN

*Jolita Vveinhardt, Regina Andriukaitiene*

## Introduction

The benefit of the practical implementation of the company social responsibility (hereinafter – CSR) is unquestionable when society's expectations are considered; however, the boundary between this benefit and the costs of the organization to implement socially responsible behaviour is relatively hard to draw. Although the debate about CSR profitability often emphasized aspect of marketing according to Erhemjamts et al. (2013), controversial issues remain; nevertheless researches show that socially responsible activity is positively associated with investment and organizational strategies; also indirect CSR effect on the company activity results is highlighted – through the organization's reputation and customer satisfaction (Galbreath & Shum, 2012). A pragmatic approach is relevant to organizations in deciding whether to implement the principles of social responsibility in their activities, but the moral values of CSR are no less important for social cohesion in the society and sustainable economic development.

The principle of social responsibility of business organizations reasoned by H. R. Bowen (1953) has remained unchanged so far, despite the frequent criticism and frequent doubts in practice about the benefits for the organization itself (Costas & Kärreman, 2013). CSR is defined as a social obligation to carry out the policy in making decisions and acting in accordance with the accepted values of society (Maignan & Ferrell, 2004; Thomas & Nowak, 2006). Business cherished values and ethics realized in organizational culture are cornerstones of CSR principles (Garavan et al., 2010; Ardichvili, 2013; Pérez & del Bosque, 2013) relating to the organization and its management culture.

Particularly abundant amount of the scientific works on issues of social responsibility content

indicate the timeliness and the importance of this topic. However, the real preparation of organizations to work according to all requirements formulated for corporate social responsibility still raises doubts and induces the analysis of the level of management culture development as an integral part of corporate social responsibility. However, it remains as the unfilled gap in researches that analyse the impact of the management culture upon corporate social responsibility of organizations.

Management culture reflects the level of organization's management system development. It determines how innovations will be introduced to the management of an organization and whether they will be implemented on the whole. Ethics and legislation compliance indicates the level of personal culture and awareness, organic self-awareness organic in the social system. Culture coincides with managerial staff functions and more specifically – the quality of their implementation. Managerial culture is more accepted both by the organization's staff and by clients whose organization-related evaluations distinguishes organizations from each other.

Insufficient knowledge of the links of management culture and CSR may adversely affect the process, during which CSR is being introduced in companies. The problem of the research is posed by the question: what is the attitude of an internal stakeholder – employees – to the management culture aiming at CSR and how can management culture influence CSR?

There are some limitations of this research. In this research, when analyzing coherences of management culture and social responsibility, it is focused on the relationship with employees, their reactions to the organizational system as an interested party. The relationship with the stakeholders outside the organization and

environmental, philanthropic, etc. activities were not the purpose of this research.

The object of this research is management culture level in order to implement the conception of a socially responsible company.

The aim of the research is to determine the level of management culture in order to implement the conception of a socially responsible company in the case of manufacturing group.

There were used following research methods: the scientific literature analysis and synthesis, a questionnaire survey.

## 1. Theoretical Review

In order to highlight the impact of management culture on CSR, firstly it is necessary to define the content of the management, its components. Therefore, in this part we will discuss the concept of the management culture, its components (categories) and CSR in the context of the internal stakeholder of the organization – the employees, taking into account the goal of the research.

Management culture is an integral part of organization culture. However, in the studies of organizations and their culture sufficient attention is not always paid to the management culture as one of the conditions for change. Management culture is usually addressed by analysing staff work organization, management processes optimization, working conditions formation, organizational design, etc. questions (Zakarevičius, 2004; Vveinhardt, 2011; etc.). There were four components of management culture distinguished, including managerial staff culture, management processes, culture of management organization processes, the culture of the working conditions and culture of documentation system organization. All of these components are closely related to each other.

Management culture components, such as managerial staff culture, were investigated by Furnham and Stringfield (1993), Hales and Mustapha (2000), Subramaniam and Ashkanasy (2001), Raz and Fadlon (2006), Lopez (2006), Bartollas et al. (2007), Pino et al. (2008), Ford and Collison (2011) and others. To sum up the authors' insights, managerial staff culture includes general managerial staff culture, knowledge of management science, staff personal and professional characteristics, leadership style, the ability to manage. All of this has an influence on the quality of the

management processes and on the way the management process will be organized.

Processes of management organization were analysed by Mendonca and Kanungo (1990), Pye (1993; 2005), Graetz and Smith (2009), Keevers and Treleaven (2011), Parker and Rees (2013) and others. The organization culture of management processes consists of: rational organization of managerial work, optimal regulation of management processes, modern computerization of management processes, reception of visitors, conduction of meetings, culture of telephone conversations and other factors reflecting other kinds of culture.

Working conditions are discussed in the articles by Blekesaune and Solem (2005), Antonoli et al. (2009), Cremers (2010), Jeong (2012), Parker et al. (2013) and others. The authors distinguish the criteria which are identified as the working conditions of the management culture. Thus, management culture of working conditions consists of work environment (covering the following criteria as workplace interiors, lighting quality, temperature, and cleanness), employment organization, work and rest mode, relaxation options, work safety, socio-psychological microclimate.

Documents of the organization, their management are an integral part of organization of the management processes and ensuring favourable working conditions. Documentation systems are analysed by Briggs and Pate (1996), Jenkins and Erdman (1998), Kalinowski-Jagau (1998) and others. Corporate social responsibility subjects are generally described by Chaudhry and Krishnan (2007), Antal and Sobczak, (2007), Montiel (2008), Aguinis and Glavas, (2012), Blackman et al. (2012) and others. Summarising the insights of various authors it is possible to distinguish the components of the documentation system. Documentation systems' culture includes the following components: document-processing culture, document retrieval and use system, application of modern information technologies, archival documents' storage system.

Various researches focus more on the studies of CSR and corporate culture, changing behaviour, (e.g. Garavan et al., 2010; Ardichvili, 2013). That is, the effect of changing the organization and employees' behaviour is emphasized. However, in the scientific

literature still there is the gap in analysis of the management culture and social responsibility coherences. That is, distinguishing the management culture. However, there was found that there exists the positive direct connection link between management culture and social responsibility – the raised management culture level enables organizations to enhance social responsibility of the organization (Andriukaitiene, 2013). Therefore, there is a need to analyse the changes of behaviour fostering the links of CSR and management culture in greater detail.

CSR is defined as a social obligation to carry out the decision-making policy and to act in accordance with the accepted values of society (Maignan & Ferrell, 2004; Thomas & Nowak, 2006). CSR involves many aspects. According to the definition formulated by WBCSD (1998), CSR is the commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society. The renewed definition by the European Commission (2011) notes that when implementing social responsibility companies need processes, integrating social, environmental, ethical, human rights issues and the issues of consumption in the company activity, and a key strategy is close cooperation with stakeholders. Values fostered by business and ethics realized in organizational culture are the cornerstone CSR principles (Garavan et al., 2010; Ardichvili, 2013; Pérez & del Bosque, 2013). The relationship with internal stakeholders, employees, is revealed through management and management culture. The analysis of scientific experience in relation to social responsibility components shows that social behaviour of organization is analyzed in various aspects. According to Costas and Kärreman (2013), CSR typically stands for corporate responses to ethical, environmental and social issues. Whilst extant research has predominately focused on CSR in relation to external stakeholders and taking a macro-institutional and/or functionalist perspective. Quite great attention is paid to the investigations of employee's social behaviour. Firstly, the situation of the employees in the organization and consistency within the organization is one of the CSR goals. Secondly, the implementation of CSR principles largely depends on the approval

of the staff and the involvement in the processes, therefore, job satisfaction and commitment to the organization are particularly important factors, which depend on the management culture. The issues on employee's intention to leave the job, career change and professional burnout are detected in the following works by the scientists: Li et al. (2010), Young and Corsun (2010), Kuusio et al. (2013), Vveinhardt and Streimikiene (2015), Vveinhardt et al. (forthcoming) and others. The components as uncertainty at work, lack of information, the employee's physical well-being, psychological state are often combined in the analysis of the organization climate, socio-moral, ethical climate, organizational commitment (Kuenzi & Schminke, 2009; Verdorfer et al., 2013; Wang & Hsieh, 2013; and others.). Uncertainty at work is analysed in the works of these authors: Choo et al. (2006), Roth (2009), Kallehauge (2010), lack of information work is analysed by Kelly and Shin (2009), Flett (2011) and others. Physical and psychological well-being is discussed in the works of the following scientists: M. Brown et al. (2009), Juniper et al. (2012), Kelloway et al. (2013) and others. Bolis et al. (2013) researched ergonomics contribution regarding work in companies in the context of sustainability policies and CSR and noted that sustainable work is believed to be one which improves the organization's performance and fosters professional development as well as workers' health. The social responsibility criticism is formed in the questionnaire used in the study based on Idemudia (2011). Nepotism, favouritism, protectionism is analysed by Wong and Kleiner (1994), Vinton (1998), Abdalla et al. (1998), Padgett and Morris (2005), Arasli and Tumer (2008), Scoppa (2009), Vveinhardt (2013).

Thus, the review of scientific research shows close coherences of management culture and social responsibility concepts that are provided in Table 1. Four categories (dimensions) of the management culture are distinguished in the Table theoretically substantiating the connection with CSR.

The role of the management culture of the organization in the implementation of CSR is generalised and the linkages are demonstrated here. As it has already been mentioned, the dimensions (categories) of management culture are associated with the principled CSR values. For example, the culture of managerial staff

Tab. 1: Coherences of management culture and social responsibility

Management culture dimensions	From management culture towards CSR	Relationship with social responsibility
Managerial staff culture	Competence, ethics, values	Managerial staff values and competences in organizing corporate processes are significant both in evaluating organization's possibilities to develop socially responsible policies and decision-making.
Management organization processes of the organization	Skills of managerial staff to implement new ideas	Reflects socially responsible actions and ensures the quality of the processes' coordination.
Working conditions	The state of the management culture and CSR on the level of relationships within the organization	Employees – one of the interested parties, representing organization's policy in the professional and personal relationships with external stakeholders.
Documentation system	Organizational conditions to implement CSR	Database and functional use of the information on CSR policy and control as well as accountability implementation.

Source: own

is the factor that accumulates and represents CSR values. The perception of company's social responsibility is closely related to the development of management culture (Geva, 2008; Bagdoniene & Paulaviciene, 2010); it is the organization's strategy and performance management tool and must be applied not only in business but also in any organization (Giziene et al., 2011). In other words, the organization's ability to implement corporate social responsibility values depends on management culture level.

## 2. Research Methodology

After the assessment of the lack of the research of this character, the new, original instrument developed by the authors of the article was used to conduct the research. Having performed the analysis of scientific literature, the research instrument was developed by the way of concepts' operationalization. While developing the instrument, two provisions were considered in advance. First, universal categories – management culture and social responsibility – were identified, without

distinction of organizations according to sectors and / or economic activity classification, size, etc. It means that the work with people is viewed in accordance with the humanistic perspective. Second, the defined provision indicates that the object of the research is the management culture, and in case of this research the part of social responsibility becomes the context.

After setting the culture level using the research instrument, it is pursued to diagnose the organization's readiness to become socially responsible. In the questionnaire the part of management culture consists of four categories: managerial staff culture; culture of management processes' organization; management culture of working conditions; documentation system culture. In the questionnaire the part of social responsibility consists of two categories: social behaviour of the organization; employee's social behaviour.

Table 2 presents the first and second stages of the instrument formation, during which the categories were assigned to the parts of management culture and social responsibility (Stage 1), subcategories (Stage 2), statements (Stage 3) are provided.

**Tab. 2: The structure of the questionnaire: parts, categories and subcategories**

Parts	Categories	Subcategories	Number of statements
Management culture	Managerial staff culture	General level of managerial staff culture	7
		Level of management science knowledge	5
		Employees' personal and subject characteristics, leadership style	7
		Level of the ability to manage (managerial art) level	9
	Culture of management processes organization	Optimal management of the regulatory processes	7
		Managerial work rational organization	5
		Level of modern management processes' computerization	5
		Customers adoption, meeting conduction, telephone conversations culture	7
	Management culture of working conditions	Working environment level (interior, lighting, temperature, cleanliness, etc.)	9
		Workplace organization level	6
		Labour and rest mode, relaxation possibilities	6
		Work safety, socio-psychological microclimate	6
	Documentation system culture	Document-processing culture	6
		Optimal document search and delivery system	5
		Rational use of modern information technologies	8
		Rational archival storage system	6
Social responsibility	Organizations social behaviour	Responsibility in the market (2 subcategories)*	11
		Environmental responsibility	7
		Responsibility in relations with employees	7
		Responsibility in relations with society	6
	Employee social behaviour	Intentions to leave the job	6
		Uncertainty and lack of information at work	6
		Physical and psychological well-being of employees	5
		My comments about the organization	5
		Corruption, nepotism, favouritism	10
		Social responsibility criticism: staff attitude	10
<b>In total</b>	<b>6</b>	<b>26</b>	<b>177</b>

\* Services and their quality; consumer information, health and safety.

Source: own

In this part of the instrument management culture subcategories comprise 104 statements. Social responsibility subcategory includes 73 statements. As it is seen in Table 2, the number of statements in subcategories is spread quite evenly. The average of management culture part statements in the subcategory – 26 (minimum number of statements is 24, the maximum number of statements – 28 statements). Two categories comprising the part of social responsibility cover 31 and 42 statements. When analyzing the categories and subcategories in respect of the volume of parts, their disparity is based on that social responsibility part inevitably had to include two major categories of social behaviour: the employee and the organization. The minimum number of the statements in the subcategory is 5. Throughout the questionnaire there are six 5-step test length subcategories. The maximum number of statements in the subcategory is 9-11. There are five subcategories of such length in the questionnaire. SPSS 21 software package was used to calculate the data.

### 3. Organization of the Research

Questionnaire survey was carried out in 2013 using the questionnaire 'Determination of management culture level for the implementation of the conception of socially responsible companies'. The reliability of the questionnaire was tested in the pilot research with a smaller sample (Andriukaitiene, 2013). Both the pilot research (Cronbach's alpha coefficient of subcategories of the part of the management culture of the questionnaire ranges from 0.75 (the lowest) to 0.9 (the highest), Cronbach's alpha of subcategories of the part of social responsibility of the questionnaire ranges from 0.92 to 0.95) and the research of this case (Cronbach's alpha coefficient of subcategories of the part of the management culture of the questionnaire ranges from 0.66 to 0.86, Cronbach's alpha of subcategories of the part of social responsibility – from 0.62 to 0.86. As one can see, in the case of different samples the values of the coefficient vary slightly) have high psychometric characteristics.

In order to perform the research one of the concerns that registered its activity in Lithuania and declared the aim to become socially responsible, the main activity of which is manufacturing services, was chosen. However, the concern is on the initial stage of

the implementation of CSR, when the analysis of the present situation is carried out. The concern was established in 1998; hence its lifetime for this day is 15 years. During the period of the research 885 employees worked in the concern, 806 respondents, i.e. 91 percent of the concern employees participated in the survey and that permits to assert that sample is representative and reflects the population. The concern wished to remain anonymous, so this article does not mention its name.

### 4. Results of the Research

The respondents were categorized according to: the divisions of companies' group, currently held positions, work experience, age, gender, and education. All results of demographic characteristics of the employees are presented in Table 3.

From the results provided in Table 3 it is seen that the production divisions are represented by 92.06 percent of the employees. In respect of the positions certain distribution is evident; thus it is natural that the largest share of production divisions are occupied by the ordinary workers (80.27%). Thus by indicating their positions 19.73% of the respondents identified that take certain level of managerial positions, but in tagging the division it is clear that some managers indicated the administration, others – production. Consequently in this case at first glance it may seem that there is a discrepancy between the first (division) and the second (position) position, but this is not so. The analysis of the respondents' work experience revealed the tendency that the most abundant number of the employees works up to 5 years (i.e. up to 1 year – 41.3%, from 1 to 5 years – 40.45%) in the concern. The percentage of the long-working employees is not big; in general it compiles 18.25%. However, the characteristic of work experience compared with the characteristic of employees' age shows that there is no direct coherence between them – independently of the age group, the number of the respondents identified in all age groups is more or less equal. Thus it cannot be assumed that the employees working for the shorter period are just after graduation, young people. The distribution of the respondents by gender shows the clear dominance of the feminine gender (67.37%), which shows that the female workforce is more acceptable in the concern production processes. The analysis of education of the employees shows that 25.43%

**Tab. 3: The results of demographic characteristics of the employees**

Characteristics		Frequency	%
Division	Administration	64	7.94
	Production	742	92.06
	<b>In total</b>	<b>806</b>	<b>100.00</b>
Position	Ordinary employee	647	80.27
	Administrative employee	112	13.90
	Lowest level manager	26	3.23
	Middle level manager	16	1.98
	Top-level manager	5	0.62
	<b>In total</b>	<b>806</b>	<b>100.00</b>
Seniority	Up to 1 year	333	41.30
	2-5 years	326	40.45
	6-10 years	124	15.40
	11-15 years	23	2.85
	<b>In total</b>	<b>806</b>	<b>100.00</b>
Age	18-23	142	17.62
	24-29	176	21.84
	30-39	190	23.57
	40-49	194	24.07
	50 – to retirement age	103	12.78
	The retirement age	1	0.12
	<b>In total</b>	<b>806</b>	<b>100.00</b>
Gender	Man	263	32.63
	Woman	543	67.37
	<b>In total</b>	<b>806</b>	<b>100.00</b>
Education of the employees	University education	114	14.14
	Higher non-university	91	11.29
	College	134	16.62
	Professional	209	25.93
	Secondary	232	28.80
	Primary	26	3.22
	<b>In total</b>	<b>806</b>	<b>100.00</b>

Source: own

of them have higher education. Compared with the positions it is obvious that not all managing persons have higher education (as it was mentioned above there are 19.73% of the managing persons); therefore it is possible to affirm that the managers working in the lowest production divisions' levels might have college

education (as well as a number of the ordinary workers).

Table 4 presents the results that were tested by the Student's criterion (t-test). The minus sign at z-estimate indicator notes the negative situation because all questionnaire statements were coded positively.

**Tab. 4: Management culture and social responsibility in respect of the concern divisions**

Subscales	Administration (N = 64)	Production (N = 742)	t-test screening results	
			t	p
Managerial staff culture	0.12	-0.19	2.382	<b>0.017*</b>
Culture of management processes' organization	-0.14	0.06	-2.296	<b>0.022*</b>
Management culture of working conditions	0.61	-0.17	6.334	<b>0.000**</b>
Documentation system culture	0.27	-0.23	4.539	<b>0.000**</b>
Organization social behaviour	0.46	-0.03	3.955	<b>0.000**</b>
Employee's social behaviour	0.78	0.06	5.730	<b>0.000**</b>

\* Statistical significance level  $\alpha = 0.05$ ; \*\* statistical significance level  $\alpha = 0.01$

Source: own

**Tab. 5: Management culture and social responsibility in relation to the concern staff**

Subscales	Ordinary employee (N = 647)	Administration employee (N = 112)	Lowest level manager (N = 26)	Middle level manager (N = 16)	The highest level manager (N = 5)	ANOVA screening results	
						F	p
Managerial staff culture	-0.23	0.06	-0.05	0.18	2.14	9.803	<b>0.000**</b>
Culture of management processes' organization	0.05	-0.01	0.19	-0.02	0.78	1.992	0.094
Management culture of working conditions	-0.22	0.32	0.10	0.64	1.73	15.866	<b>0.000**</b>
Documentation system culture	-0.30	0.16	0.03	0.66	1.77	20.106	<b>0.000**</b>
Organization social behaviour	-0.06	0.26	-0.03	0.57	2.21	11.342	<b>0.000**</b>
Employee's social behaviour	-0.01	0.60	0.25	0.91	2.18	19.382	<b>0.000**</b>

\* statistical significance level  $\alpha = 0.05$ ; \*\* statistical significance level  $\alpha = 0.01$

Source: own

The aspects of management culture and social responsibility vary depending on what organization's subdivision the respondents work in. It was tested by the Student's criterion (t-test). It is important that when analyzing the management culture and social responsibility in respect of all divisions of the concern

the statistically significant differences were determined in absolutely all subscales. The results show that there is a significant difference in grouping the respondents into two largest categories – administration and production staff. The production staff, unlike executives, has a different and unfavourable attitude

towards the cultural elements representing the management staff and the demonstrated values of social responsibility. This shows that the actions of the managing personnel are disapproved, or they can be treated not as expected. In this situation one cannot expect an efficient interaction of managing personnel and the employees. The more so as the unevenness of evaluations of culture of organisation of management processes are particularly highlighted. The differences conformable to the current positions held are presented in Table 5.

In many cases the aspects of management culture and social responsibility are different depending on the positions held by the employees. The higher the position is, the more favourable the evaluation is. This again confirms the fact that has been described above that there is a huge gap between the managers and the staff. Maybe the management doesn't assess the level of its management culture and the real situation of the CSR values within

organization adequately. Ordinary employees evaluated management culture worst in accordance with almost all the components, and they exceptionally critically evaluated the components of social responsibility. The tests were carried out by using the univariate dispersive analysis One-way ANOVA. According to Tukey HSD test, the statistically significant differences were identified between the z-estimates of the top-level managers and the staff of other positions. The statistically significant differences were not identified on the analysed issue only in the subscale of the culture of management processes organization. It is obvious that the assessments of organization's managerial staff policy development are not adequate to the subordinates' reactions. The middle link staff – is not the exception. The data presented in Tables 6, 7 and 8 provide significant observations to managerial system by exploring the reasons for the gap.

**Tab. 6: Management culture and social responsibility in relation to the work experience of the concern employees**

Subscales	Up to 1 year (N = 333)	2-5 years (N = 326)	6-10 years (N = 124)	11-15 years (N = 21)	More than 16 years (N = 2)	ANOVA screening results	
						F	p
Managerial staff culture	-0.13	-0.19	-0.30	0.28	1.42	3.085	<b>0.016*</b>
Culture of management processes' organization	0.05	0.07	-0.04	0.08	0.74	1.139	0.337
Management culture of working conditions	-0.21	-0.08	-0.03	0.50	0.93	3.828	<b>0.004**</b>
Documentation system culture	-0.29	-0.15	-0.13	0.18	0.62	2.919	<b>0.021*</b>
Organization social behaviour	-0.04	0.05	-0.08	0.63	0.93	3.299	<b>0.011*</b>
Employee's social behaviour	0.06	0.14	0.09	0.56	1.26	2.115	0.077

\* statistical significance level  $\alpha = 0.05$ ; \*\* statistical significance level  $\alpha = 0.01$

Source: own

In most cases the aspects of management culture and social responsibility assessment vary depending on work experience in the workplace. The tests were carried out by using the univariate dispersive analysis One-way ANOVA. According to Tukey HSD test, the statistically significant differences were identified between the z-estimates of the employees with the largest work experience (more than

16 years) and the employees with less work experience. However, it should be noted that this organization has only two employees with most solid work experience. The length of service of more than a half of the employees in the organisation is up to five years. Given that the organization has been working for more than ten years, this shows a significant staff turnover, that can be influenced by both

**Tab. 7: Management culture and social responsibility in relation to the age of the concern staff**

Subscales	18-23 years (N = 142)	24-29 years (N = 176)	30-39 years (N = 190)	40-49 years (N = 194)	50 y.-to retirement age (N = 104)	ANOVA screening results	
						F	p
Managerial staff culture	-0.31	-0.15	-0.09	-0.11	-0.22	1.265	0.282
Culture of management processes' organization	0.01	-0.05	0.05	0.12	0.13	1.995	0.093
Management culture of working conditions	-0.41	-0.19	-0.01	0.01	0.06	5.812	<b>0.000**</b>
Documentation system culture	-0.40	-0.13	-0.20	-0.11	-0.16	2.920	<b>0.020*</b>
Organization social behaviour	-0.24	-0.05	0.09	0.11	0.11	3.651	<b>0.006**</b>
Employee's social behaviour	-0.19	0.15	0.28	0.19	0.04	5.367	<b>0.000**</b>

\* statistical significance level  $\alpha = 0.05$ ; \*\* statistical significance level  $\alpha = 0.01$

Source: own

the level of the management culture and social behaviour of the organization. The management culture and social responsibility in relation to the work experience of the concern staff reveal the statistically significant differences in the larger part of the subscales, i.e. the significant differences were not identified only in two subscales (culture of management processes' organization and employee's social behaviour).

Judging by the number of respondents, the composition of the staff of the concern by age allows expecting that the majority have gained professional and life experience, therefore, their evaluations are reasonable. The fact that no statistically significant differences have been found in the categories of managerial staff culture and the culture of organization of management processes should be noted. In all cases the aspects of management culture and social responsibility differ depending on staff age. The characteristics of management working conditions, documentation system culture, social behaviour of the organization and employee were distinguished. The tests were carried out by using the univariate dispersive analysis One-way ANOVA. According to Tukey HSD test, the statistically significant differences were identified between the z-estimates of the youngest employees (18-23 years old) and middle-aged employees. The negative ratio of

managerial actions' efficiency with certain age groups was revealed.

Since this is a manufacturing organization, primary, secondary and vocational education predominates. This had a significant impact on the provided evaluations of components of management culture and social responsibility. The aspects of management culture and social responsibility differ depending on staff education. According to Tukey HSD test, the statistically significant differences were identified among the z-estimates of the groups (with higher, college and professional as well as secondary/primary education). The tests were carried out by using the univariate dispersive analysis One-way ANOVA. It shows the influence of education on the acceptance of managerial actions and the changes in managerial culture. In addition, it is the differences in education can become one of the problem of the gap between different groups of staff and internal communication when feedback is ensured insufficiently.

In some cases the aspects of management culture and social responsibility differ depending on staff gender. It was tested by the Student's criterion (t-test). As Table 9 shows, the most statistically significant differences were identified in the following subscales: management culture of working conditions, documentation system culture, and employee's social behaviour.

**Tab. 8: Management culture and social responsibility in relation to education of the concern staff**

Subscales	Higher (N = 205)	College (N = 134)	Professional (N = 209)	Secondary / primary (N = 258)	ANOVA screening results	
					F	p
Managerial staff culture	0.07	-0.09	-0.28	-0.30	6.949	<b>0.0001**</b>
Culture of management processes' organization	0.05	0.15	0.11	-0.06	3.904	<b>0.009**</b>
Management culture of working conditions	0.21	-0.11	-0.11	-0.35	13.192	<b>0.000**</b>
Documentation system culture	0.06	-0.06	-0.25	-0.41	13.968	<b>0.000**</b>
Organization social behaviour	0.21	0.10	0.00	-0.19	7.298	<b>0.000**</b>
Employee's social behaviour	0.51	0.24	-0.01	-0.16	21.424	<b>0.000**</b>

\* statistical significance level  $\alpha = 0.05$ ; \*\* statistical significance level  $\alpha = 0.01$

Source: own

**Tab. 9: Management culture and social responsibility in relation to the concern staff gender**

Subscales	Man (N = 263)	Woman (N = 543)	t-test screening results	
			t	p
Managerial staff culture	-0.09	-0.20	1.559	0.119
Culture of management processes' organization	0.07	0.04	0.659	0.510
Management culture of working conditions	0.00	-0.16	2.080	<b>0.038*</b>
Documentation system culture	-0.07	-0.25	2.774	<b>0.006**</b>
Organization's social behaviour	0.09	-0.03	1.646	0.100
Employee's social behaviour	0.27	0.04	3.185	<b>0.002**</b>

\* statistical significance level  $\alpha = 0.05$ ; \*\* statistical significance level  $\alpha = 0.01$

Source: own

No statistically significant differences have been found in the categories of management culture, culture of organization of management processes, social behaviour of the organization. The evaluations on the gender remain the subject of discussion because women more often tend to react to the situation and interpret it more openly than men in sociological researches (Zukauskas & Vveinhardt, 2009). However, the estimates of components of managerial staff culture, culture of organization of management processes and social behaviour of the organization are distinguished both when measured by gender, and according to other parameters. To sum up briefly, we can state that the concern is not mature for

efficient implementation of CSR ideas and the weakly-developed culture of management and the ability to properly organize processes can be considered as the cause. The level of the management culture also influences quite critical evaluations of the components representing CSR.

### Conclusions

The state of the management culture of the organization and preparedness of the organization to become a socially responsible organization (to implement CSR principles) are two complex variables that are dependent on each other. The concept of management culture is developed and the relationship

between the management culture and CSR is analysed in the study. According to the authors of the article, before the implementation of CSR in the activities of the company, first it is necessary to assess the state of the management culture, which gives primary information to CSR implementation strategy, taking into account the situation of the specific organization. The organizations that have a high level of management culture are ready to become socially responsible. The employee reaction to the culture of the organization can be considered as a kind of litmus.

When the employees estimate social responsibility activities negatively and the administration positively the following assumptions are possible: the social responsibility program is implemented formally, there are no feedback mechanisms. Hence, there is no effective internal auditing system of social responsibility, which should be ensured by management culture. It is diagnosed that social responsibility does not become an inseparable part of organizational culture. It highlights the coherences of management culture and social responsibility. As the systematic approach, which would embrace the practice of management culture and social responsibility, the danger for the quality of realized managerial actions emerges. The employees' reaction to the managerial culture is an important signal that induces the changes in the implementation of the social responsibility program to primarily initiate in managerial staff level. In addition, in implementing the social responsibility policy it is necessary to take into account the socio-demographic and human resources as well as psychological climate that can improve the interaction between the managerial staff and subordinates.

If organizations are not ready to become socially responsible or social responsibility is not axiologically accepted, they can only imitate socially responsible activities, but it will not become an organic part of the management culture. In this case, there should be a natural shortage of consistency in actions and suggestive power in respect of both employees and the society (customers, partners, communities). This kind of imitation can enhance the employees' dissatisfaction and internal conflict. So the internal consistency of the organization, as one of the key values of the CSR may remain unachieved. Future studies

should continue to develop the methodologies of the management culture, social behaviour of the company and social behaviour of employees.

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## Abstract

**DIAGNOSTICS OF MANAGEMENT CULTURE IN ORDER TO IMPLEMENT THE CONCEPT OF A SOCIALLY RESPONSIBLE COMPANY: THE CASE OF A CONCERN****Jolita Vveinhardt, Regina Andriukaitiene**

*While implementing corporate social responsibility (CSR) in practice, it is necessary to evaluate the management culture of the organization, which is the instrument and the indicator of the initial position of implementation the CSR. The article substantiates the level of the management culture and corporate social responsibility problems explored in the works of authors. The relatively great lack of scientific literature on the topic of management culture, therefore, this article presents the authors analysing the components of management culture. Theoretical and empirical research involves relatively different contexts of corporate social responsibility topics from managerial transformations to corporate social responsibility approach in the aspect of national traditions and international influences. The aim of this article is to determine the level of management culture in order to implement the conception of a socially responsible company in the case of manufacturing companies' group. So in order to implement the set aim the survey was carried out in 2013. The authors' formed the questionnaire 'Determination of management culture level for the implementation of the conception of a socially responsible company' and used it for the survey. The empirical study was carried out in one of the Eastern Europe manufacturing concerns registered in Lithuania. The concern wished to remain anonymous; and 885 employees worked in it during the investigation period, i.e. 91 percent of all employees. When presenting the results, the demographic characteristics of the respondents are detailed according to: company's group divisions, currently occupied positions, work experience, age, gender, education. The results of the empirical research show that management culture is related to the level of social responsibility perception within the organization. The reaction of the organization employees towards the management culture shows the directions of its changes.*

**Key Words:** Management culture, social responsibility, corporate social responsibility.

**JEL Classification:** M120, M140.

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# THE IMPACT OF SOCIAL EXPENDITURE ON PUBLIC DEBT IN THE CZECH REPUBLIC AND SLOVAKIA

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## Introduction

Fiscal policy setting regarding a long-term sustainability of public finance represents a serious problem not only in the EU member countries. The severity of the problem has been magnified by the debt and economic crisis within the previous years. The problem mentioned is associated with the development of private and public consumption, changes in investment, development of financial markets and the negative impact of demographic development in Europe as well. Moreover, it is obvious that pensions will continue to increase in the EU member countries. This trend is confirmed by the previous development since 2004 and the forecasts of empirical studies, e.g. Ellison (2012), EACG (2012), EC (2012a), EC (2012b). The aim of the European leaders should be reflected in finding a quick, sustainable solution to the overall situation that would be beneficial for the common market and the individual markets too. The sustainable solution does not necessarily mean zero level of public debt or adherence to the golden rule each financial year. As mentioned in the study of Cecchetti, Mohanty and Zampolli (2011), although debt at moderate levels improves welfare and enhances growth, high levels can be damaging. However, the problem is society and its habits. People, governments, firms are used to have access to finance. Indeed, such countries without finance and debt become poor and stay poor. In the case they have a possibility of borrowing and saving the money, individuals are able to consume even without current income. Considering a debt, businesses can invest, even though their sales would otherwise not allow it. Therefore, when they are able to borrow, fiscal authorities may play their role in stabilising the macroeconomy. However, history has taught us that borrowing may result in vulnerabilities. Particularly, when

debt ratios rise beyond a certain level, financial crises become both more likely and more severe (Reinhart & Rogoff, 2009).

In our investigations, we focused primarily on the public sector. We did not take into account the behavior of households and firms, but we focused only on government behaviour. Especially, we examine the influence of public expenditure on public debt using a data set on the level of public expenditure in the Czech Republic and Slovakia from 1993 to 2015. For that reason, the basic hypotheses are formulated as follows:

*H<sub>0</sub>: Public expenditure is more significantly correlated with the changes in public debt than other analysed variables.*

*H<sub>1</sub>: Public expenditure is less significantly correlated with the changes in public debt than other analysed variables.*

It should be noted that one of the problems associated with the growth of public expenditure is the growth of social expenditure. For that reason, such a system of an economy should meet the criteria for the EU optimal functioning regardless the impact of public expenditure sensitive to the population aging. Therefore, the particular importance should be oriented to a regular monitoring of this expenditure in the long term mainly due to persistent increases in spending on pensions. Based on the conclusions of various empirical studies (Jaime-Castillo, Marques-Perales, & Alvarez-Galvez, 2016; Soltes & Gavurova, 2014) and the reasons above, we decided to test the hypothesis on social expenditure being more significantly correlated with the changes in public debt in selected countries than the other variables.

The hypotheses are formulated as follows:

*H<sub>0</sub>: Social expenditure is more significantly correlated with the changes in public debt than other analysed variables.*

*H<sub>1</sub>: Social expenditure is less significantly correlated with the changes in public debt than other analysed variables.*

In order to test the hypothesis, we apply several regression linear models. This approach would enable us to identify the relationship between the changes in a variable and the changes in public debt. The aim is to test the assumption that public expenditure represents a statistically serious problem related to the public debt development in the Czech Republic and Slovakia as well in the long term. Particularly, we focus on the category of social expenditure as this category is closely related to the sustainability issues of the pension system in countries.

The remainder of the paper is organised as follows. Section 1 discusses the main relations between debt and expenditure as well as the main determinants of social expenditure and public expenditure. Section 2 discusses our model and data sets. Section 3 contains our main empirical results. Section 4 discusses the results in the context of population development in Slovakia and the Czech Republic. Consequently, Section 6 concludes.

## 1. Literature Review

Economic theory says that economic policy instruments are used to achieve sustainable economic growth in the long term. Forecast of the future economic development would be prepared much easier if economic growth was constant. However, the reality does not correspond to the theory. Achieving sustainable economic growth is closely linked to the long-term sustainability of public finances in an economy (Gavurová, 2012). Sustainability of public finances in the context of public debt and deepening the indebtedness of all market actors can be viewed from many angles. As Mirdala (2014) mentioned, significant reduction in primary budget deficit (aiming to primary surplus during a reasonable period) is the only way to reduce a negative impact of sovereign debt on economic growth.

Absorbing conclusion about the relationship between debt, investment, and productivity growth can be found in the study of Salotti and Trecrocia (2016). The authors proved that high debt levels are indeed associated with significant and sizeable declines in both private expenditure on investment and productivity growth. Particularly, they estimated the

elasticity of investment to the debt/GDP level to be up to 0.10 for levels of debt equal to the advanced countries' sample average of 54% (therefore, accordingly higher when the debt/GDP ratio assumes higher values, as in most developed countries nowadays), while a 30% difference in the debt/GDP levels can explain about 0.30/0.35% lower annual productivity growth. According to their words, both effects are not only highly statistically significant but also economically important. Also, Neaime (2015) clarified the sustainability of public finances through the analysis of government budgets and public debt levels.

The main emphasis is on the expenditure side of public finance. Public expenditure has gained further importance in the context of recent social developments in Europe. In particular, expenditure directed to social sphere is under the scrutiny of society. Negative demographic trends coupled with a strong wave of immigrants arriving in Europe raises questions about the sustainability of public finances combined with growing indebtedness of economies and other consequences of the economic crisis. Chang et al. (2016) argue that a higher social expenditure is usually connected with a higher government debt as higher debts reduce social expenditure. However, a speculation that higher government debt may contribute to higher social expenditure is reasonable as fiscal deficits are typical for a recession, which commonly creates greater demand for social expenditure. The authors analyse 13 OECD countries, and their conclusions suggest that higher social expenditure increases government debt. However, the shocks from government debts to social expenditure are uncertain. The authors discovered that higher government debt does reduce social expenditure. However, it may be connected to higher social expenditure. Also, the study of Yu, Fana and Magalhaes (2015) deals with the question of the public expenditure increases in the social sphere. The authors conducted the analysis on a sample of 147 countries during the period from 1980 to 2010. Total public expenditure increased significantly in selected countries as a whole. Particularly, developed countries had accounted for the majority of the absolute size of expenditure. However, some regions in developing countries, especially in Asia, had experienced a rapid expansion mainly due to strong economic growth. Also, both developing

and developed countries had shown significant growth of social protection expenditure even though the growth in developed countries was much more pronounced. The level and the composition of total public expenditure in the social sector and social protection diverged across the regions over the period of 1980-2010. The particular importance of the impact of expenditure in the social area is the subject of many discussions. This area of interest has been mainly analysed in the context of population aging and long-term sustainability of public finance in Europe. However, the strong migration spread in Europe within last year has led to the consideration of public expenditure in the social area as the one of the leading criteria for considering the application for asylum of new immigrants. It is expected that this trend would continue for several years. As a result, it would create new pressure on public expenditure, especially in the social sphere. Jaime-Castillo, Marques-Perales, & Alvarez-Galvez (2016) argue that the effect of socioeconomic status on attitudes toward immigration is larger in countries characterised by high social expenditure. However, the authors add that there is much variation between analysed countries. They state that there is the problem of the long-term sustainability of public finances in the context of the sustainability of the social system, respectively the issue of setting up and maintain the country's pension system in case of entering an increasing number of people. Many EU countries, especially in the eastern part of the Europe, have struggled with a high share of expenditure on pensions. Despite the effort of mitigating the impact of the expenditure to total public expenditure, there are still many countries exceeding the "marginal" value. The previous is also supported by the study of the World Bank (WB, 2012). This development is characteristic for all EU countries without exception. Countries such as Slovakia and the Czech Republic due to their size and age structure of the population are among the riskiest countries of the EU in this area (Modrakova, Hetes, & Soltes 2013). Rievajová and Chinoracká (2013) argue that expenditure on pensions would continue to increase in both countries, i.e. in Slovakia and in the Czech Republic too. Therefore, it is necessary to take account this unfavourable demographic development related to the sustainability of the current pension systems and their

correct setting. The previous considers next generations as we do not want to increase public debt related to pensions. Moreover, the authors argue that despite several ongoing demographic processes with time shifting towards the most advanced economies, the situation starts to be similar in Slovakia. Growing post-productive population means that it is inevitable to consider its increasing impact on social processes and its needs and interests. These ideas are supported in the Europe 2020, i.e. Europe's growth strategy, as the main aim of the long-term sustainability of public debt and the security of reliable and adequate pension systems was defined. The pension systems above would enable people to maintain their standard of living after the retirement. Nowadays, it is really difficult to find an optimal design of the pension system in the European countries that would guarantee a decent standard of living after the retirement and be sustainable in the long-term too. Also, it is important to realise that the examination of the demographic composition of the population is represented by the complex and long-term process. Today's generation of young people in the case of insufficient representation would cause the problems due to a lack of productive population in the long term. Therefore, the indicators of pre-productive population, post-productive population, and others, were introduced to solve the demographic problems above. The indicators are the subject of many empirical studies, e.g. the studies from the Czech Republic by Pavlík et al. (2002) or Vohralíková and Rabušic (2004). The study of Vohralíková and Rabušic (2004) introduced the Index of the economic burden that represents a number of people aged to 19 and a number of pensioners per 100 people in the productive age (20-64 years). Although the indicator declined due to decreased number of children between 2000 and 2010 from 59.3 to 54.6, the burden of the productive population would begin to grow. Particularly, trends in the main age groups are in favour of the previous prediction. Also, the Index of the economic burden should be almost doubled in 2055 compared to the current value. As a result, from the economic point of view, the crucial would not be only the increase in the index value but also the change in the structure of dependent people as a significantly higher share in the indicator would be represented by post-productive population. Regarding the

previous, social expenditure per person in the post-productive age would be higher than for children under 15.

In addition, there are various empirical studies in Slovakia too. For instance, the INFOSTAT (2002) in the document of "Prognóza vývoja obyvateľstva SR do roku 2050" introduces in addition to various demographic indicators the calculation of the population development in SR till 2050 as well.

## 2. Methodology and Data

Generally, theory uses for the analysis of the impact of one or multiple variables on an observed phenomenon dynamic and stochastic regression models as well. The aim of our model is to test the hypothesis that public expenditure has a more significant influence on public debt than other selected variables. Regarding our analysis, we created a model with seven macroeconomic variables for both countries the Czech Republic and Slovakia during the period 1993-2015 on a yearly basis. Although the analysed period represents 22 years, we are aware that the analysis is based on short time series. However, it is impossible to conduct the analysis on a yearly basis using a longer period as the Czech Republic and Slovakia were once part of the one state before 1993. Statistical and econometric computations were performed in EViews statistical software. All tests conducted are based on the level of significance  $\alpha = 0.05$ . For our analysis, we draw the data from datasets of Eurostat, AMECO, OECD, national statistical offices websites and national central banks of the Czech Republic and Slovakia. The article contains only some of the calculations; more detailed results can be requested by authors.

While choosing variables in the model, we relied on the analysis of Peková (2008) and Medved' (2005), who considered variables significantly affecting a debt such as the size of the public budget deficit, mainly government budget, inflation, the rate of economic growth, FDI and interest rate. The relationship between the debt and the interest rate is also analysed by Ardagna et al. (2007). Discussion on the relationship between debt, interest rates and economic output can be found in Baxter and King (1993). The relationship between debt and deficit can also be found in Elmendorf and Mankiw (1999); Auerbach and Gale (2009).

The response variable in our model is public debt (Debt), and explanatory variables are as follows:

- Total public expenditure – sum of all public expenditure (TExp, Million Euro);
- Gross Domestic Product (GDP, Million Euro);
- Inflation (P, %);
- Interest rate – base interest rate PRIBOR/BRIBOR/EURIBOR (IR, %);
- Deficit (Def, Million Euro);
- Foreign direct investment (FDI, Million Euro).

In the first step, we applied the Augmented Dickey-Fuller test (ADF) for testing unit root, i.e. a stationarity test. Based on the results of ADF test, we can confirm that all data are stationary on the level of the first differences (see Tab. 1). Regarding the Czech Republic, data of interest rate was non-stationary, i.e., we could not reject the  $H_0$  hypothesis ( $H_0$ : The variable has a unit root), and thus we excluded the variable. In the case of Slovakia, all variables were stationary, and thus they remained in the model. Next computations are based on the first difference of the variables.

We created a model with all selected variables. In order to estimate all beta parameters in selected equations, we employ the Ordinary Least Square (OLS) method. In addition, we conduct the hypotheses testing for parameters of the linear model along with the test of statistical significance for the parameters mentioned. Subsequently, T-statistics values and p-values were assessed. We set a confidence interval for beta parameters with the given number of degrees of freedom. Also, we test the model as a whole.

Both models were gradually tested for normal distribution of residuals, heteroscedasticity, autocorrelation, multicollinearity and a model specification was conducted as well (Bartóková & Ďurčová, 2015). Regarding testing for normal distribution of residuals, the Jarque-Bera test was applied. According to the test, if a level of significance is less than probability value, we cannot reject the  $H_0$  hypothesis and thus variable follows a normal distribution. For that reason, we suggest that all variables tested follow a normal distribution based on the Jarque-Bera test. Subsequently, the Breusch-Pagan test was employed for testing the presence of heteroscedasticity. T-statistic was higher

Tab. 1: The results for Augmented Dickey-Fuller test

the Czech Republic					
Augmented Dickey-Fuller test					
Factor	t-stat (prob.)	Factor	t-stat (prob.)	Factor	t-stat (prob.)
Critical value	-3.012363 (0.05)	dGDP	-4.234303 (0.0038)	dPublic Expenditures	-3.285059 (0.0289)
dDebt	-3.787330 (0.01)	dFDI	-5.112394 (0.0005)	dInterest Rate	-2.793392 (0.0779)
dDeficit	-5.284124 (0.0004)	dInflation	-6.666086 (0.0000)		
Slovakia					
Augmented Dickey-Fuller test					
Factor	t-stat (prob.)	Factor	t-stat (prob.)	Factor	t-stat (prob.)
Critical value	-3.012363 (0.05)	dGDP	-3.106423 (0.0415)	dPublic Expenditures	-3.025891 (0.0447)
dDebt	-3.042857 (0.0407)	dFDI	-3.246557 (0.0313)	dInterest Rate	-3.670232 (0.0140)
dDeficit	-4.836843 (0.0010)	dInflation	-4.749682 (0.0013)		

Source: own calculations, results were calculated in program Eviews

than a level of significance in both countries, and thus, the  $H_0$  hypothesis could not be rejected. Therefore, we argue that there is no heteroscedasticity. A presence of autocorrelation was based on the findings of Durbin-Watson test. We argue that there is no autocorrelation as our assumption is based on the movement of statistic value around two, respectively in the interval 1.5 to 2.5. Moreover, multicollinearity was examined by introducing the variance inflation factor (vif). Based on the vif test we argue that there is multicollinearity in some variables as the statistic value is greater than five in both models. The Ramsey reset test was used to assess the model specification. According to the results of Ramsey rest test, the model needed to be adjusted for removing some variables. Therefore, the variables of inflation and deficit in the case of the Czech Republic were excluded from the model. Similarly, the variables of inflation, interest rate, and FDI were excluded in the case of Slovakia.

Following the results before, new models for Czech Republic and Slovakia were derived as follows:

$$Debt_{SR}(y) = -661.969 + 3.747891 * dExp - 0.844727 * dGDP + 3.233244 * dDef \quad (1)$$

$$Debt_{CR}(y) = -1286.339 + 0.849618 * dExp + 0.682717 * dFDI - 0.406103 * dGDP \quad (2)$$

Subsequently, new models were analysed by performing all five basic tests mentioned above. The model satisfied the requirements of basic tests in both countries, and thus, we argue that the model and variables are statistically significant. (Tab. 2 shows the values of t-statistic and p-value for statistically significant variables). Through the created linear regression functions we can explain the variability of the variable public debt at 93.9% for Slovakia and at 98.2% for the Czech Republic.

Regarding the Slovak Republic, there is a strong direct linear correlation between public debt and public expenditure. The weaker correlation is associated with the debt and deficit and the weakest with GDP. Public expenditure is the most significant variable among the considered variables. In the case of the Czech Republic, the situation is the same, i.e. the most significant variable is public expenditure concerning statistical significance.

**Tab. 2: The value of t-statistic and p-value for statistically significant variables**

the Czech Republic					
Factor	t-stat (prob.)	Factor	t-stat (prob.)	Factor	t-stat (prob.)
dSocial Expenditure	4.942977 (0.0017)	dFDI	3.674775 (0.0001)	dGDP	-3.711625 (0.0034)
Slovak Republic					
Factor	t-stat (prob.)	Factor	t-stat (prob.)	Factor	t-stat (prob.)
dPublic Expenditure	6.266792 (0.0000)	dDef	-4.065973 (0.0007)	dGDP	-3.711625 (0.0016)

Source: own calculations, results were calculated in program Eviews

### 3. Model Description and Results

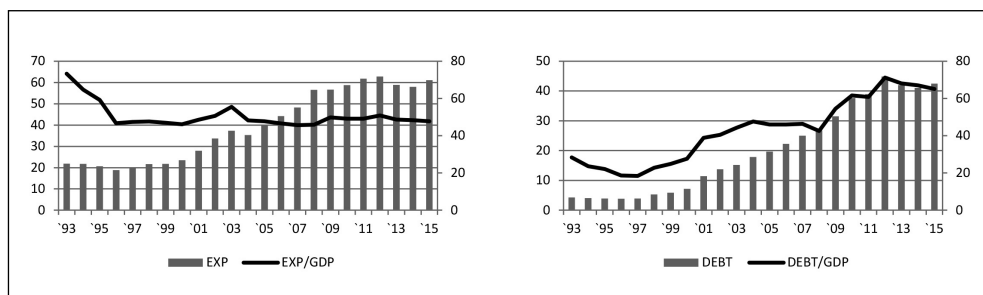
#### 3.1 The Czech Republic

We use predominantly economic factors for testing the hypothesis, and thus, we examine the hypothesis that public expenditure has an impact on public debt in the Czech Republic. Also, we assume that the changes in total public expenditure, deficit, inflation, interest rate, FDI, and GDP would be statistically significant. The previous assumption was confirmed by testing the initial econometric model just for five variables (the model with six variables – see Methodology). Therefore, all three variables, i.e. total public expenditure, GDP, and FDI are statistically significant variables in connection with the change of public debt in the Czech Republic.

Particularly, we observe a rapidly increasing trend in the development of GDP mainly during the period 2000-2008. Indeed, the increasing

trend is a direct result of several factors. One of the factors is an attempt to join the EU (the period 2002-2004) as a prudent fiscal and monetary policy enabled to improve the economic performance and increase the output to the level of potential output. On the other hand, rapid growth in GDP resulted in a long-term increase in public expenditure, especially in the period after joining the EU (Mura et al., 2014). The emergence of the economic crisis in 2008 contributed to a more significant decrease in GDP. However, public expenditure remained approximately at the same level (Fig. 1). The decline in GDP was stopped due to the introduced restrictive measures and thus the indicator experienced a slight increase comparing to the slower increase in public expenditure. Despite the increasing trend in GDP till 2011, the GDP rate has experienced slight decrease until now. Compared to GDP,

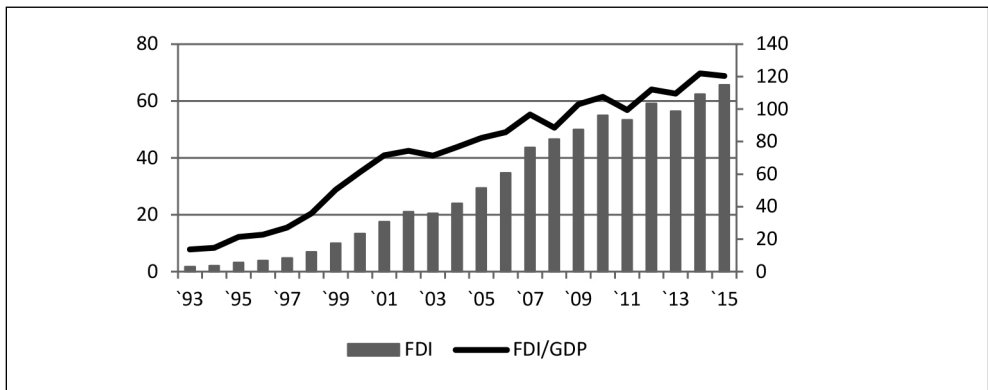
**Fig. 1: Public Expenditure and Debt – volume and ratio to GDP in period 1993-2015, the Czech Republic**



Note: left axis is %, right axis is billion Euro

Source: own calculation based on data from Eurostat, AMECO

**Fig. 2: FDI – volume and ratio to GDP in period 1993-2015, the Czech Republic**



Note: left axis is %, right axis is billion Euro

Source: own calculation based on data from Eurostat, AMECO

public expenditure has remained at the same level. Although the total growth of total expenditure was not significant, it moved in a regular way. The total value of public expenditure has increased three times during the analysed period (since 1999).

The FDI increased throughout the reporting period in volume and as a proportion of GDP too. The ratio to GDP increased to seven times during 22 years. The fastest growth in FDI was shown in years 2004-2008, i.e. the period of economic growth of the country (Fig. 2).

The result of the basic empirical model confirms our initial hypothesis. For that reason, we focus on the most significant variable and examine the composition of total public expenditure. Our findings suggest that total public expenditure represents a sum of the values in ten categories of public expenditure into different areas of an economy. As a result, the biggest part of total value is represented by one category of expenditure, social expenditure

(SocExp), that appear to have a 30% share of total public expenditure. Based on the previous fact, we re-examined the hypothesis. The result of the model is described as follows:

$$dDebt_{CR}(y_{CR}) = 5891.529.11 + 2.937082 * dSocExp - 0.431412 * dGDP + 0.692786 dPZI \quad (3)$$

Finally, our hypothesis is confirmed. Social expenditure represents the most significant variable as it has the strongest correlation with the change of public debt. Strikingly, a change in a unit of social expenditure would result in about 3-times stronger change in public debt.

### 3.2 Slovakia

Similarly, we use the same economic factors as above for testing the hypothesis. We assume that the similarity of countries would reflect in that case too. However, the results of the

**Tab. 3: The value of t-statistic and p-value for statistically significant variables – model with social expenditure**

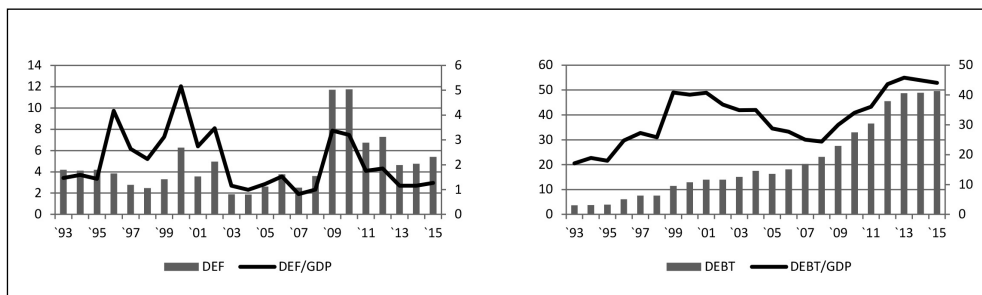
The Czech Republic					
Factor	t-stat (prob.)	Factor	t-stat (prob.)	Factor	t-stat (prob.)
dSocial Expenditure	4.080517 (0.0007)	dFDI	2.852500 (0.0106)	dGDP	2.209965 (0.0403)

Source: own calculation, results were calculated in program EViews

test confirm that the variables of the deficit, public expenditure, and GDP are significant for the model. Therefore, changes in public expenditure or deficit as well result in an approximately equally change in public debt. The coefficients of these variables are roughly

equal, i.e., the coefficient for public expenditure is 3.747 and for deficit represents the value of 3.233. The change in GDP in comparison to the previous change results in a much smaller effect that is expressed by the coefficient equal to -0.844.

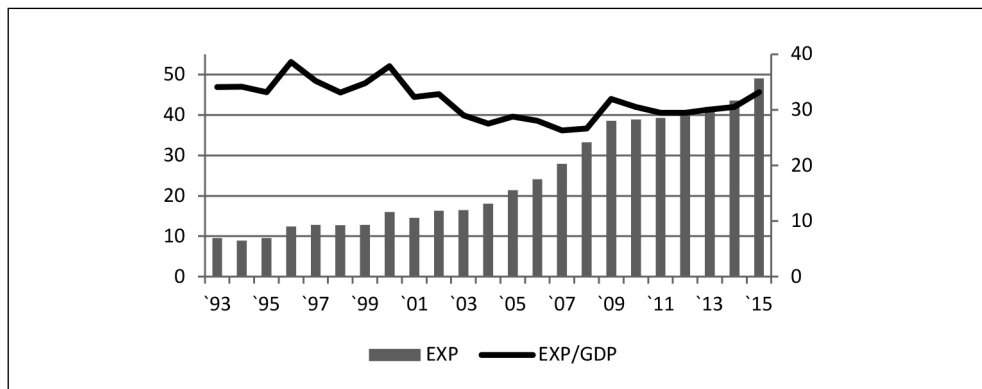
**Fig. 3: Deficit and Debt – volume and ratio to GDP in period 1993-2015, Slovakia**



Note: left axis is %, right axis is billion Euro

Source: own calculation based on data from Eurostat, AMECO

**Fig. 4: Public Expenditure – volume and ratio to GDP in period 1993-2015, Slovakia**



Note: left axis is %, right axis is billion Euro

Source: own calculation based on data from Eurostat, AMECO

The development of the variables of public debt, deficit, and public expenditure show common features. Fig. 3 indicates that the government tried to mitigate the level of deficit to GDP predominantly in the period 2004-2007, i.e. the period of economic growth. However, we can distinguish two periods that

are characterised by an increasing deficit. The previous corresponds to the period of consolidation between the years 1998-2001 and the period of the crisis in 2008-2010. Furthermore, the development of public debt to GDP followed the development of deficit to GDP mainly in the period of consolidation

(1996-2000) and the crisis period while the ratio of public debt to GDP increased. Also, we can observe the development of public debt to GDP in the period of economic growth, i.e. the period 2004-2007 where the GDP growth was faster than the growth of public debt. Also, the positive fact is that the ratio of deficit to GDP in 2015 is on the lower level than in 1993. Consequently, the ratio of public debt to GDP has increased from 20% of GDP in 1993 to 55% of GDP in 2015. The public expenditure has shown an increase during the analysed period as well.

Fig. 4 shows that the value has reached on average 42% of GDP. Moreover, the economic performance of Slovakia has not required any additional excessive public expenditure in the pre-crisis period. Generally, we have observed the improvement in the economic performance since the joining the EU and the introduction of structural reforms. Moreover, structural reforms accompanied by restrictive fiscal policy and early attempts at adopting the euro as a domestic currency resulted in 10.4% growth of GDP in 2007. Also, a deficit in public finance has experienced a positive development as mentioned above. Particularly, increased revenues due to a new tax reform have enabled to finance increased public expenditure (Andrejovská & Mihoková, 2015).

The breakthrough was the year 2008 as Slovakia battled against the economic crisis. Subsequently, GDP and deficit had a positive development as the variables approached the pre-crisis values within the following five years. However, GDP returned to slow growth after a slight increase in 2009 and 2010. The major problem remained a continual increase in public expenditure. Although its growth rate was not so fast as in the period between 2004-2010, it has been gradually approached it.

The result of the basic empirical model confirms our initial hypothesis, similarly as in the case of the Czech Republic. We follow the same approach as above and examine the composition of total public expenditure. Following our results, we select the category with the highest ratio to total public expenditure. The final sum of the variable above represents 16% of total public expenditure. Strikingly, social expenditure in the Czech Republic represents approximately 30% of total public expenditure. Our procedure was similar to the one of the Czech Republic, i.e. we applied new category into the model. Moreover, we used

the test of stability, and there we discovered a problem. There was no reason to reject the null hypothesis about the unit root ( $t$ -statistics = -2.05897, critical value = -3.012363). For that reason, we excluded this factor from the model. Subsequently, it was not possible to verify the null hypothesis.

#### 4. Discussion of Results

Despite the fact that we were unable to confirm the hypothesis concerning social expenditure in the case of Slovakia, we decided to compare the results from the considered field of study for both countries.

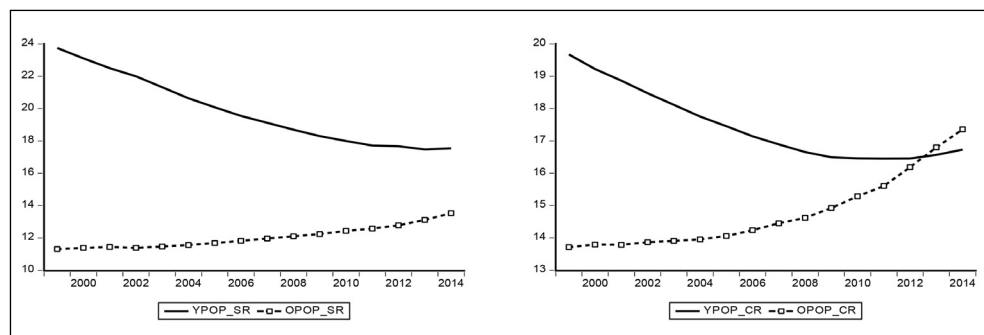
The results point out to the fact that the most significant component of social expenditure in both analysed countries is the old age expenditure (the represented share in the case of Slovakia is 47% and in the Czech Republic 59% of social expenditure). Also, the other important components are sickness and disability (44% in Slovakia and 22% in the Czech Republic of social expenditure). The methodology of Eurostat in the case of old age expenditure includes mainly old age pensions in an economy and the provision of goods and services to the elderly as well. Similarly, the variables of sickness and disability include paid sick leave, medical care and the provision of pharmaceutical products, disability pensions and the provision of goods and services to the disabled. (EUROSTAT, 2016a) Regarding the previous findings, it is crucial to solving the issue of public finance setting and its further sustainability. The solutions should be based on the correct perception in the case of population aging in Europe. Growing number of the post-productive population will lead to an increase in two variables mentioned and thus to a further increase due to their impact on public debt. However, the positive development of the pre-productive age and the post-productive age population to the pre-productive population could help the situation.

The Fig. 5 (left) shows the current situation in Slovakia. We argue that the share of the young population (the population aged 0-16) in the total population has been permanently decreased during the examined period. This fact is also mentioned in the document INFOSTAT (2002) as a decrease in population growth will be the main feature of demographic development in Slovakia in the following 50 years. The intensity of the process above will

directly depend on the assumptions of future trends in fertility and migration. Moreover, it will be indirectly dependent on demographic, social, political, economic, cultural and other factors. (INFOSTAT, 2002) In comparison with Slovakia, the Czech Republic has experienced a significant decrease in the analysed indicator (Fig. 5 – right). The previous corresponds to the conclusions about the negative development in the demographic curve regarding all EU countries (see EC (2012b)). Based on the

analysed data, the movement of the category considered to positive directions has been changed slightly since 2012. However, the previous is in contrast with the prognoses of the Czech statistical office (CZSO, 2012) regarding the further development. According to the CZSO (2012), younger age groups grow relatively slower than the total population predominantly due to the decline in fertility (as a result of economic, health or social problems).

**Fig. 5: The Development of Population Ratios in Period 1999-2014, (%)**



Note: YPOP – a ratio of the population aged less than 16 to the total population (%), OPOP – a ratio of the population aged 65 and over to the total population (%)

Source: own calculations, Eurostat

Strikingly, the post-productive population has experienced quite a different development during the analysed period (Fig. 5). The share of the post-productive population in the total population have permanently increased in both countries since 1999. Slovakia has experienced the slow increase in the value of the indicator while the Czech Republic have shown a significant permanent growth rate since 2005. In fact, the share of the post-productive population in the total population overrun the share of the young population in the total population in 2012. The previous development is expected to happen in the following ten years in the case of Slovakia. A similar expression can be found in Cecchetti, Mohanty and Zampolli (2011), who state: *Unfortunately, the unprecedented acceleration of population aging that many industrial countries now face may make this task even more difficult. First, aging drives government revenue expenditure up and down, worsening debt directly. But, as*

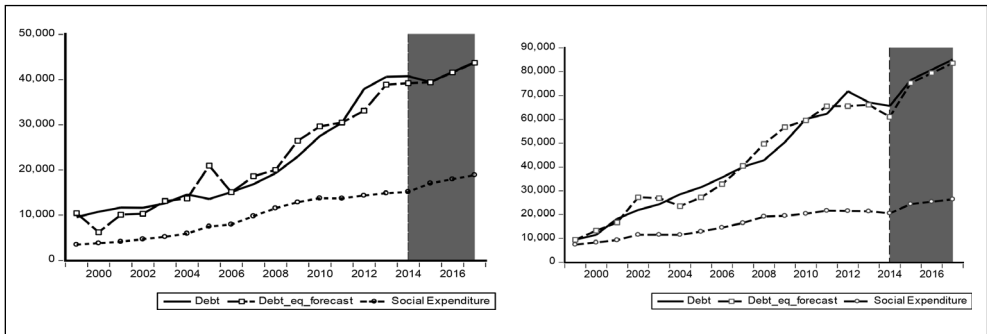
*our results in the previous section suggest, there is an additional effect: Rising dependency ratios put further downward pressure on the trend growth, over and above the negative effects of debt.* According to INFOSTAT (2002) the population aging in Slovakia is going to accelerate in the next decades. This is an irreversible process that could only be mitigated. The CZSO (2012) and INFOSTAT (2002) agree that the reason for a significant increase in a share of the post-productive population is the improvement in the mortality ratios, especially in the old age population. The estimations of the CZSO (2012) are based on the hypothesis that a number of people over 80 is going to increase 4 times in the following five years. The previous fact corresponds to the post-productive population aging. Moreover, the CZSO (2012) stresses another important economic issue as the increase in the population over 80 is going to lead simultaneously to the increase in the health care and social expenditure for this

population (CZSO, 2012). Goliaš (2010) tried to analyse the possible solutions to this problem too.

Also, the current level of health care is one of the main factors of the development considered. Particularly, the progress in health care during the previous decades have even enabled to prolong the life of the people that would not survive without medicine. According the study of European Commission "Public Finance Sustainability", the higher expectations are not considered to be the only problem. Indeed, the period of receiving the pensions that takes into account life expectancy is supposed to be a serious economic issue. In order to find a suitable solution, we would have to set a mechanism for calculating a retirement age. According to the forecasts found in the study of Rievajová and Chinoracká (2013), the public expenditure on pensions is going to increase by 5.2% in Slovakia and by 2.7% in the case of the Czech Republic in the following 50 years.

Furthermore, the indicator "S2" is in favour of linking the demographic development with the fiscal position of a country. The indicator provides quantification of the current structural primary balance (% of GDP) in the way that the current value of future structural primary balances would cover public debt level. (EC, 2012b) Based on the indicator, the change in the Czech Republic corresponds to 5.5% of GDP and in Slovakia 6.9%. This indicates that the population aging is not the only problem in the area of public finance but even the total value of public expenditure and the fiscal policy setting in a country too. For that reason, we present our short-term estimation of public debt development based on our econometric model. The estimation is affected by social expenditure development and GDP in the case of the Czech Republic and the estimated deficit development in the case of Slovakia besides mentioned too (Fig. 6).

**Fig. 6: The Forecast of the Future Debt and Public Expenditure Development (period 2015-2017, Million Euro)**



Note: left SR, right CR

Source: own calculations, Eurostat

Following the development shown in the figures, we assume that the debt is going to increase in both countries. Also, we argue that an increase in social expenditure has the potential to be a significant factor regarding an increase in debt. Although we cannot prove the previous based on our results (and also it was not the aim of our paper), we assume that it is necessary to find the complex solution for stabilisation policy, not only for one part of it. The previous is supported by the studies mentioned above. Moreover, the previous

raises the question how much attention has been paid to the analysis of the fiscal policy setting and the provision and administration of social expenditure as the part significantly contributing to higher public debt.

### Conclusions

The topic of the massive international indebtedness is a subject of many academic discussions in the recent period. Our study has followed and analysed the approach that public expenditure, especially social expenditure is

considered to be a factor with significant power to contribute to increased indebtedness. The primary hypothesis that the variable of public expenditure is more significantly correlated with the changes in public debt than other analysed variable was confirmed. Moreover, the result was the same in both analysed countries. On the other hand, our second hypothesis that the variable of social expenditure is more significantly correlated with the changes in public debt than other analysed variables was confirmed only for the Czech Republic. The character of the values did not allow us to find the answer. Following our results, we argue that social expenditure can be considered as the potential variable having the negative impact on debt, i.e. it contributes to higher debts in the Czech Republic. The category of pensions and health care expenditure is considered to be the one of the most problematic areas of interest (widely associated with increasing life expectancy). As a result, the pressure for a further increase in public expenditure, especially social expenditure is created as it requires the health care financing mentioned with longer periods of pensions. Therefore, the intensity of the expenditure above will gradually raise the debt level (*ceteris paribus*). Avoiding or postponing the solutions of this problem would harm efficiency of the economic policy setting and would lead to long-term instability in an economy. In this context, the paradox is created that is difficult to deal with it. The question of further medical progress is in contrast to the question of financing the population aging (pensions, health care). In particular, when the success in the medicinal field leads to the pressure on public expenditure regarding the long-term sustainability and effectiveness, we face a dilemma as the question of ethics, morality and humanity is against the economic functioning of the society as a whole.

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## **THE IMPACT OF SOCIAL EXPENDITURE ON PUBLIC DEBT IN THE CZECH REPUBLIC AND SLOVAKIA**

**Manuela Raisová, Ludmila Pavliková, Jozefína Semančíková**

*Europe is facing the problem of growing consumption and increasing volume of public expenditure too for years. Financing of public expenditure (as a sum of short-term, medium or long term projects) is a complicated issue. Regarding the financial perspective, the primary result is the creation of budget deficits. Countries are currently not able to deal with them, and thus this problem leads to the creation of new deficits. Therefore, an economy creates public debt – through the accumulation of deficits. The aim of our paper is to examine the effect of social expenditure on public debt. We have focused on the examination of only two countries – the Czech Republic and Slovakia. Our findings confirm that social expenditure represents a significant proportion of public expenditure. Moreover, public expenditure and social expenditure as well have increased in volume in the previous years. Governments use them to fulfil their social role in the economy. From this perspective, financing of social expenditure also contributes to the deficit, and in the long term to the creation of public debt. For that reason, another objective of our paper is to verify the effect of social expenditure on public debt. We examine the primary hypothesis on the significant correlation between public expenditure and public debt. As a result, we created an econometric model to test our hypothesis that the variable of public expenditure is more significantly correlated with public debt than other selected economic variables. Moreover, we modified the model, and we tested the hypothesis that social expenditure is more significantly correlated with public debt than other selected economic variables. We found that hypothesis concerning public expenditure had been confirmed for both countries. Hypothesis about social expenditure was confirmed for the Czech Republic. However, in the case of Slovakia, this hypothesis could not be verified.*

**Key Words:** Public debt, population ageing, social expenditure, Slovakia, the Czech Republic.

**JEL Classification:** H51, H55, H62, H63, H68.

**DOI:** 10.15240/tul/001/2016-3-011

# RESEARCH ON THE DEMAND FOR PARKING LOTS OF SHOPPING CENTRES

*Vytautas Palevičius, Marija Burinskienė, Valentinas Podvezko, Gražvydas Mykolas Paliulis, Edita Šarkienė, Jonas Šaparauskas*

## Introduction

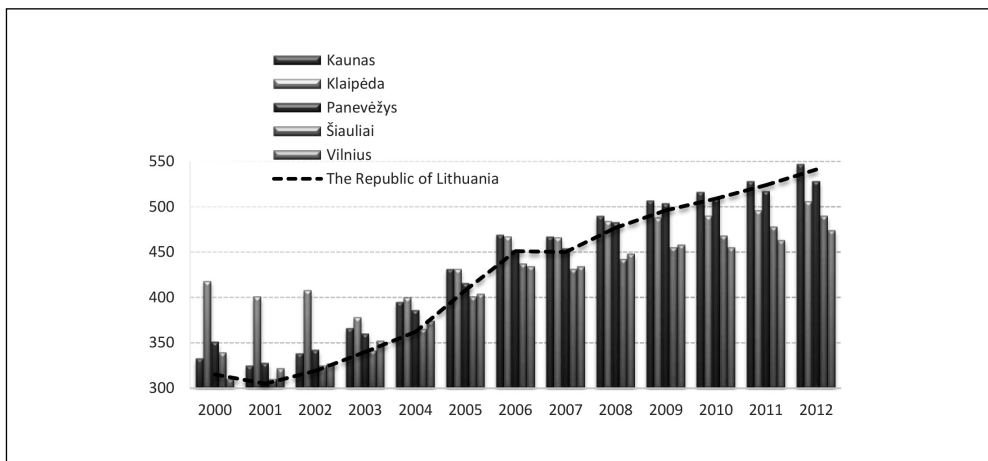
A high level of car ownership in large cities of Lithuania caused a great shortage of parking spaces in multi-storey housing areas. The car ownership level in Klaipėda is 506 cars/1,000 inhabitants, in Kaunas – 547, in Šiauliai – 490, in Panevėžys – 528 and in Vilnius – 474 (see Fig. 1). More and more residential districts face a problem of the abundance of cars standing right beside residential houses. This is dangerous from the road safety point of view as they block the driveways, sidewalks and green spaces, and considerably worsens the quality of life for local residents. One of the ways to reduce the demand for parking lots in urbanized areas is to use the parking lots of adjacent shopping centres.

Construction of the shopping centres was encouraged by the growth of economy in the

cities of Lithuania over the recent decades. In 1995, the first shopping centres were opened in large Lithuanian cities the majority of which were built in peripheral zones of the city. This ensured good accessibility, variety of goods and services, free parking of cars. The development of shopping centres in a periphery satisfied the needs of investors – to acquire cheaper land, uncomplicated design and construction, quick payback of investments. A transport infrastructure was erected – streets and pedestrian paths were built (Burinskiene & Munch, 2003).

The largest construction of shopping centres in Vilnius took place in 2000-2010 when their number increased three times. Based on data of 2014, the total area of shopping centres in Vilnius amounted to more than 400 thousand square meters. Based on the Lithuanian

**Fig. 1:** Dynamics in the level of car ownership in the largest cities of Lithuania



Source: Department of Statistics Lithuania

Construction Technical Regulation (STR) the shopping centre shall ensure the minimum number of parking spaces, 20 m<sup>2</sup> area of the shopping shall be accommodated with 1 parking space (Zagorskas & Palevičius, 2011).

Unlike the laws in many other countries, the laws of Lithuania allow to build shopping centres of various size in residential districts. At night, parking lots near those shopping centres are almost empty, whereas, the residents of adjacent multi-storey houses lack parking spaces near their houses. Our aim is to develop an evaluation system of shopping centre parking lots, which would enable to solve problems related to the lack of parking spaces near multi-storey houses.

Intensive use of the parking lots of shopping centres will allow reducing the number of parking spaces in the urbanized areas, to release the multi-storey residential areas from the chaotically parked cars and to create favourable and safe conditions for pedestrians, public transport and service vehicles.

## 1. Literature Review

The literature review of the shopping centre parking's lots is divided into two groups. In the first group the scientific work is overviewed and in the second group – pilot projects.

### 1.1 The Scientific Works

The scientists from Netherlands made the research – Is parking supply related to the turnover of shopping areas? (Mingardo & Van Meerkerk, 2012). For the research purposes they selected 80 parking lots of shopping centres and determined that the size of parking lot has no effect on the turnover of the shopping centre. However, the most important factors are quantity and quality of the shops, visitor-friendliness, location and accessibility.

The Scottish scientist, analysing the relative importance of nine agglomeration format characteristics on the attractiveness of shopping malls and shopping streets, found out that retail tenant mix and atmosphere has the highest relative importance. He concluded also that parking does not seem “to provide potential to change the attractiveness of the investigated agglomeration factors” (Teller, 2008).

The Australian scientist raised five hypotheses: 1) Consumers will rate parking and access convenience as an important determinant of where they choose to shop;

2) Consumers will rate parking and access as important irrespective of age, income or gender; 3) Consumers will perceive malls as offering better access and parking convenience than strips; 4) Parking and access convenience will influence retail centre preference; 5) Parking and access convenience will influence consumers most frequented retail format. The author concluded, that the findings indicate that urban planners must give careful consideration to the negative consequences that may stem from strategies designed to deter car-based shopping (Reimers, 2013).

### 1.2 Pilot Projects

In the works of foreign scientists a differentiation of the demand for parking lots of shopping centres has not been widely studied (Czerwinski, 2013). More widely studied are the demand and possibilities for the construction of multi-storey garages at large shopping centres (Pech et al., 2009), the use of the parking lots of shopping centres for Park&Ride system, implementation of Carfree Cities concept, and the like (Hole, 2004).

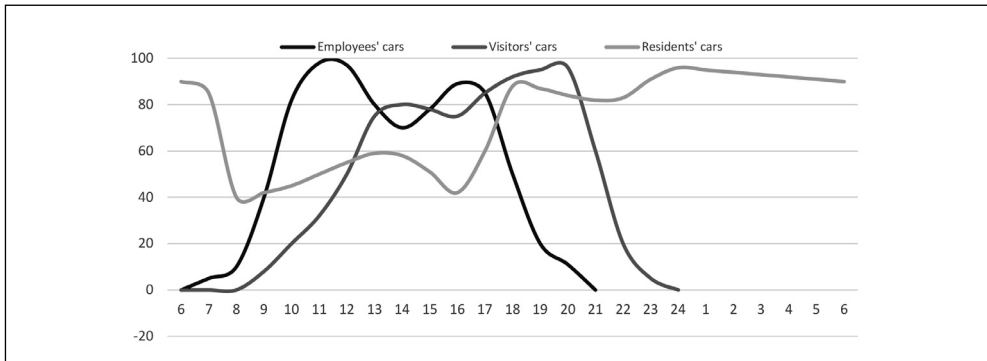
Many authors from EU countries pay their attention to the fact that shopping centres are provided with underground and over-ground garages: Hamburg, Stockholm, Helsinki, Vienna, London, Oxford, Warsaw (Szarata, 2007; Peński & Czechowski 2001), Cracow (Kęsek, 2007) which accommodate 2,000-5,000 cars. Since in foreign countries the shopping centres are built further from residential areas (Kanajan et al., 2005) their parking lots are used only by the shopping centre visitors of (see Fig. 2).

When solving car parking problems in urbanized areas the multi-storey underground garages are built, a top priority is given to the development of public transport as an alternative to passenger car (Wang et al., 2004).

In recent decade, in the West European cities the concept of Carfree Cities is popular (Crawford, 2000), based on which the cars are eliminated from the multi-storey residential districts giving priority to public transport and expanding green spaces. Residential districts that are free of parking spaces are erected in Edinburg, Hamburg (Petersen, 2009), Freiburg, Amsterdam, Malmo. The cars are parked on the outside streets of residential districts, in multi-storey garages. At present, it is important to organize a convenient public transport and a network of cycle paths. In recent years, in the cities of United Kingdom, Germany,

Fig. 2:

### Distribution of the loading of multi-functional parking lot with cars during twenty four hours



Source: Kanajan et al. (2005)

Italy, Czech and other countries a system of combined journeys is being implemented by using the compatible passenger car and public transport, including railway, resulting in the implementation of Park&Ride and Park&Rail systems (Majdecka et al., 2012).

Many authors emphasize in their studies that parking problems in the urbanized areas must be solved in a complex way taking into consideration the living quality of residents which is worsened by cars left standing in the prohibited places at the residential houses: in the territories of green spaces, children's playgrounds, etc. (Parteka, 2010).

## 2. Research Methodology

The aim of this work is to ensure the effective twenty-four-hour use of the parking lots of shopping centres, situated in the multi-storey housing areas, for parking of passenger cars. To implement this aim the main criteria are determined influencing the use of the parking lots of shopping centres by the local residents.

The following tasks were raised to reach the aim of work:

- To make a review of foreign scientific literature.
- To carry out investigation of parking regularity in the parking lots of shopping centres adjacent to multi-storey housing areas, taking into consideration the need of local residents to use them at night.
- To assess the results of multi-criteria decision making approach.

The following research methods were used: empirical, expert and multi-criteria: SAW, TOPSIS, PROMETHEE.

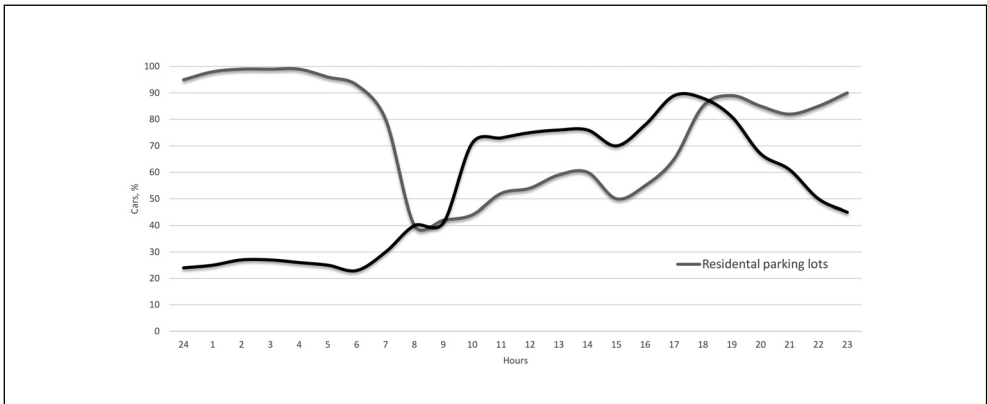
Until now, no detail investigations were carried out at the shopping centres to determine the car parking parameters and characteristics. Today, very often the cars that are not admitted to the parking lots of shopping centres are parked on the streets and adjacent yards of residential houses, and after the shopping centres are closed their parking lots are almost empty throughout the whole night. A complex use of these parking lots and rotation of cars would reduce the number of passenger cars standing on the streets of residential districts (Palevičius et al., 2013).

At present, in Vilnius the number of parking spaces at all shopping centres, including the largest shopping and recreational centres, is more than 20,000 of which only about 5,400 (27%) are occupied with passenger cars at night (see Fig. 3).

Observations of the parking of cars were carried out in the parking lots of 49 Vilnius City shopping centres and within a 300 metre radius of shopping centres (see Fig. 4).

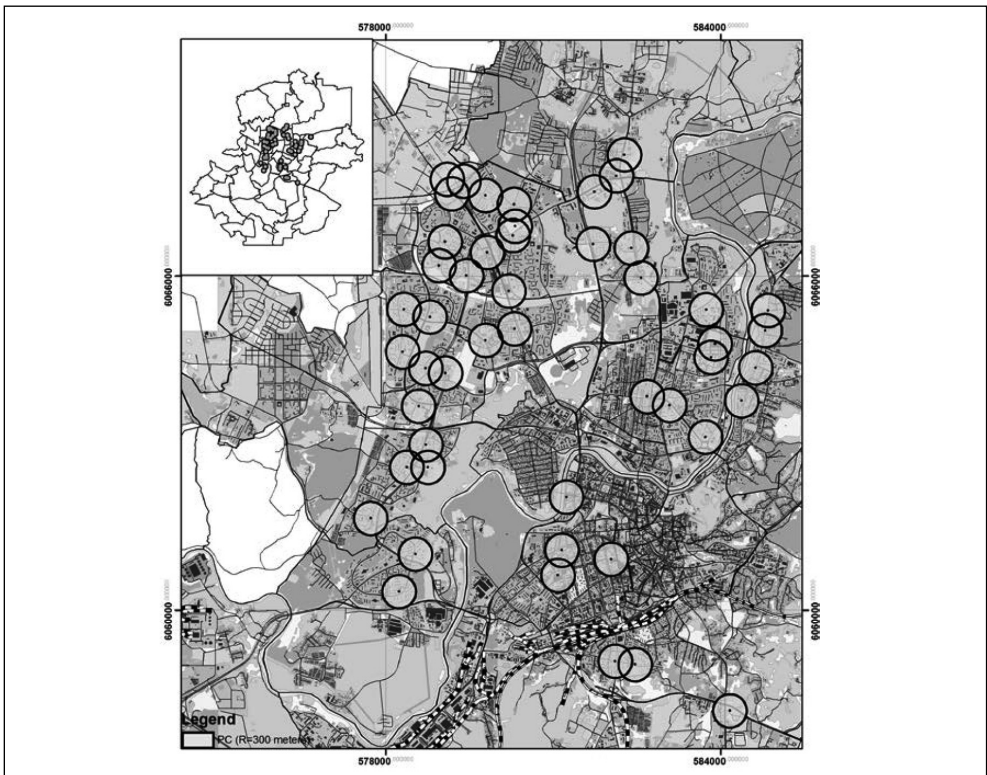
The research was carried out in September – October 2013 using the observation method. The research of parking spaces has its own specific features, therefore observations were carried out during working days, except Fridays and weekends. During the observation it was determined: a design capacity of parking lots of shopping centres, the occupancy of the lot,

**Fig. 3:** Distribution of the loading of parking lots of shopping centres and multi-storey houses with cars during twenty four hours



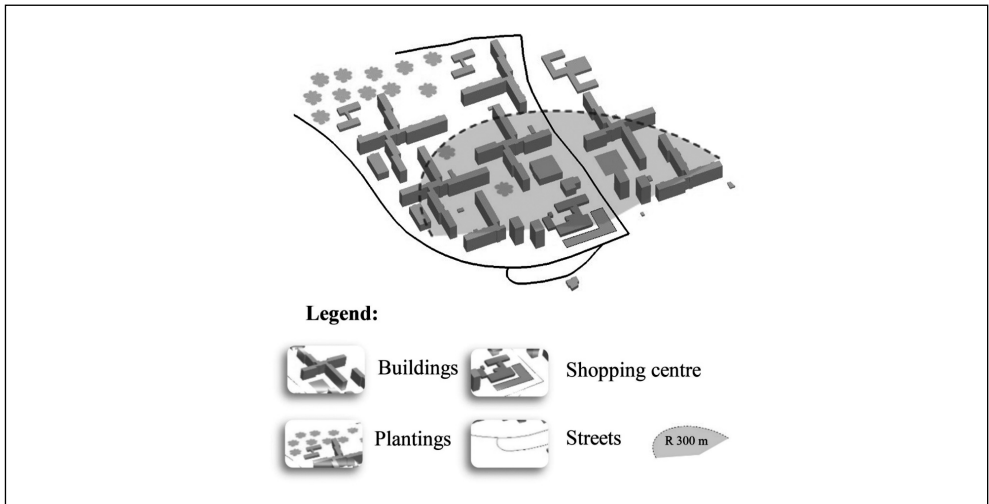
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**Fig. 4:** Vilnius City scheme



Source: own

Fig. 5: A scheme of study area



Source: own

the number of residents and flats, the value of flats, the number of working population, the demand for parking spaces (the research on the occupancy of parking spaces was carried out at night from 10.00 p.m. to 2.00 a.m.), etc. Additionally, the main criteria were selected in order to determine the interaction of the parking lots of shopping centres with the neighbouring area (R 300 m). An example of research scheme is given in Figure 5.

During preliminary analysis in a visual way and based on the marking of parking spaces the real number of parking spaces was determined in the parking lots of shopping centres as well as their design capacity. In the absence of marking the exact number of parking spaces was determined with the help of GIS technologies (Jakimavičius & Burinskienė, 2010).

From 10.00 p.m. to 2.00 a.m. at night in a sequence order in all study objects the number of free parking spaces was recorded.

The value of occupancy or loading of the lot was determined by the following formula:

$$p_{st} = a - l + n, \quad (1)$$

The occupancy coefficient of the parking lot in the certain time intervals is used to show the ratio between the number of cars parked in

the parking lot in the certain moment and the existing number of parking spaces.

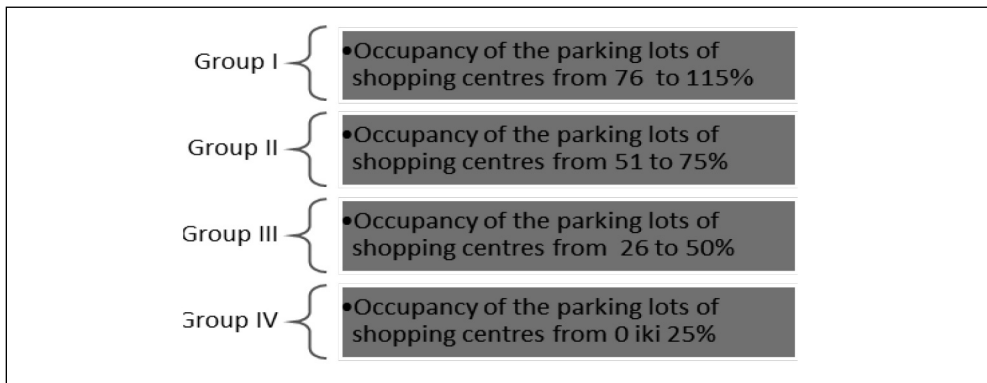
$$k = \frac{P_{st}}{a}, \quad (2)$$

For the rational functioning of a parking lot this value would not exceed 0.8. When the occupancy is more than 0.8 – the functioning of a parking lot is aggravated, the problems of road safety appear; when the value exceeds 1.00 – the parking process in many cases becomes uncontrolled. Also, a percentage expression of the occupancy value can be used.

The parking lots of shopping centres, that are qualified as high attraction objects, allow the residents of multi-storey houses to use them at night for their own needs, e.g., for a long-term or short-term storage of cars. The detail investigations showed that the occupancy of the study parking lots at night varies from 1 to 115%. It is obvious that the occupancy coefficients for the parking lots of shopping centres are different, therefore, the authors divided the study parking lots into four groups (see Fig. 6).

The group I covers eight parking lots of shopping centres, the group II – 8, the group III – 13 and the group IV – 20. Depending on the

Fig. 6: Percentage occupancy of the parking lots of shopping centres by groups



Source: own

housing development of the urbanized areas the demand for the parking lots of shopping centres in the cities are different. Frequently, the total area is not as important as the nature of functioning of certain places which is described by the turnover of one car parking space. Therefore, it is important to confirm or deny a hypothesis that a systematic development of the parking lots of shopping centres will allow to solve parking problems in the urbanized areas. This investigation is related to the belief that it will give positive results. The main indices are selected which allow assessing the situation in the study micro-environment and determining the relation of the existing parking lots of shopping centres to the environment of the district. In this work 7 criteria were selected:

- Intensity of housing development (K1) – a ratio between the sum of the total area of over ground premises of all buildings and the total area of land plot, expressed in percent (%).
- Width of the carriageway of streets situated at the shopping centres (K2). At the parking lots of shopping centres, which were divided by arterial streets and the streets of lower categories, a width of the carriageway was measured (in meters).
- Number of flats (K3) was determined based on the information given by the Statistics Lithuania, expressed in a number of flats.
- Value of flats (K4) was calculated based on data provided by the company Codeln, UAB.
- Direct visibility of the parking lot from the surrounding flats (K5) was calculated with the help of GIS, expressed in percent.
- Working population (K6) was determined based on the information given by the Statistics Lithuania, expressed in units.
- The demand for parking spaces (K7) was calculated according to the minimum requirements to the erection of parking spaces at multi-storey houses; based on the Construction Technical Regulation STR 2.06.04:2014 Streets and Roads of Local Significance. General Requirements.

All those criteria were determined and calculated within a 300 metre radius of the parking lot of shopping centres.

The group I involves eight parking lots of shopping centres the occupancy of which at night varies from 83 to 115% (Tab. 1).

The group II covers eight parking lots of shopping centres the occupancy of which at night varies from 54 to 67% (Tab. 2).

The group III involves thirteen parking lots of shopping centres the occupancy of which at night varies from 27 to 48% (Tab. 3).

The Group IV covers twenty parking lots of shopping centres the occupancy of which at night varies from 1 to 23 % (Tab. 4).

For further calculations the Multiple-Criteria Decision Making techniques (MCDM) were used.

**Tab. 1: The values of the criteria of occupancy potential for the parking lots of shopping centres in group I**

No.	$K_{1, \%}$	$K_{2, m}$	$K_{3, vnt.}$	$K_{4, Lt/m^2}$	$K_{5, \%}$	$K_{6, vnt.}$	$K_{7, \%}$
1	1.36	34	2,480	2,670	17	2,350	239
2	0.95	70	1,610	3,448	11	1,880	505
3	0.79	6	1,430	2,670	17	1,350	241
4	1.48	24	2,480	2,734	14	3,150	259
5	1.08	14	1,720	2,705	18	2,470	542
6	0.42	13	720	3,402	9	960	492
7	1.03	14	2,220	3,489	10	1,780	373
8	1.01	20	1,700	2,730	19	2240	256

Source: own

**Tab. 2: The values of the criteria of occupancy potential for the parking lots of shopping centres in group II**

No.	$K_{1, \%}$	$K_{2, m}$	$K_{3, vnt.}$	$K_{4, Lt/m^2}$	$K_{5, \%}$	$K_{6, vnt.}$	$K_{7, \%}$
1	0.92	14	1,610	2,635	17	1,580	369
2	1.03	13	1,640	2,757	9	2,310	255
3	0.53	40	950	2,738	6	1,250	467
4	0.63	14	1,320	3,448	3	1,060	390
5	0.96	34	1,760	2,659	11	1,750	455
6	0.13	7	20	2,635	0	140	221
7	0.33	30	590	4,151	40	690	463
8	0.73	33	1,290	3,837	0	1,710	221

Source: own

**Tab. 3: The values of the criteria of occupancy potential for the parking lots of shopping centres in group III**

No.	$K_{1, \%}$	$K_{2, m}$	$K_{3, vnt.}$	$K_{4, Lt/m^2}$	$K_{5, \%}$	$K_{6, vnt.}$	$K_{7, \%}$
1	0.43	8	680	2,949	5	970	260
2	0.35	10	520	3,267	30	830	282
3	0.76	6	1,290	3,463	0	1,770	234
4	0.70	0	1,390	3,474	8	1,220	417
5	0.77	35	1,330	2,696	9	1,510	249
6	1.04	7	1,880	2,710	15	1,890	169
7	0.55	27	1,020	3,779	11	1,140	446
8	0.35	14	730	3,345	0	630	390
9	0.64	15	1,150	2,614	19	1,070	352
10	0.45	7	770	2,659	11	920	491
11	0.28	27	480	2,730	22	570	187
12	0.71	21	1,410	3,345	8	1,170	414
13	0.82	66	1,530	2,670	31	1,400	233

Source: own

**Tab. 4:** The values of the criteria of occupancy potential for the parking lots of shopping centres in group IV

No.	$K_{1, \%}$	$K_{2, m}$	$K_{3, \text{vnt.}}$	$K_{4, \text{Lt/m}^2}$	$K_{5, \%}$	$K_{6, \text{vnt.}}$	$K_{7, \%}$
1	0.17	0	310	3,345	25	400	458
2	0.95	48	1,590	2,721	0	2,050	258
3	0.72	16	1,170	3,219	14	1,530	526
4	0.49	23	870	3,631	12	1,030	475
5	0.21	40	410	3,527	25	470	432
6	0.33	50	590	2,735	8	630	170
7	0.89	15	1,580	2,690	20	1,800	238
8	0.27	9	450	2,782	8	650	243
9	0.61	21	1,170	3,345	14	1,450	105
10	0.44	22	700	3,097	18	920	540
11	0.29	39	580	3,345	50	590	419
12	0.67	20	1,140	4,212	3	1,530	496
13	0.04	42	70	1,666	0	90	543
14	0.34	42	570	3,413	9	810	516
15	0.17	52	180	4,190	0	280	847
16	1.04	18	2,000	3,307	14	1,900	433
17	0.13	0	220	3,135	0	280	493
18	0.34	22	540	3,283	23	780	541
19	0.53	11	840	2,962	8	1,320	260
20	0.28	18	540	2,670	0	480	222

Source: own

### 3. The Use of Multiple-Criteria Methods

The multiple-criteria problems are solved by various mathematical methods. The multiple-criteria problems have from several to several tens of criteria and when making the decision all of them must be considered. To assess the criteria of occupancy potential of the parking lots of shopping centres three multiple-criteria methods were used: SAW, TOPSIS and PROMETHEE. Each method uses different ideas of data normalization and transformation.

#### 3.1 Determination of the Significance of Criteria

Having made an empirical research of 49 shopping centre parking lots the list of decisive criteria was made having the effect on the occupation of the parking lots of shopping centres. The list of criteria was made in a way

of expert evaluation, i.e. 4 groups of scientists selected 7 main criteria, which were later presented to the experts. For expert evaluation the expert questioning was carried out where 8 experts took part, 4 of them are the specialists in transport sector, 3 specialists of territorial planning and 1 architect. The respondents work in both public and private sector. The average working experience of the respondents is more than 15 years.

The experts made a ranking of criteria by the preference order in respect of their significance to the research object. The most significant criterion was given the highest value equal to one, the next criterion (according to its effect on the research object) got the value 2, and so on; the least significant index got the value  $m$ , where  $m$  – the number of criteria used. Ranking makes it possible for the experts to distinguish the most significant and insignificant criteria and to assess the significance of

Tab. 5: The results of expert ranking  $e_{ik}$ 

$m$	Experts								$e_i$	$V$
	$r_1$	$r_2$	$r_3$	$r_4$	$r_5$	$r_6$	$r_7$	$r_8$		
1	2	2	6	4	4	3	3	6	30	3-4
2	5	6	7	5	6	6	7	4	46	6
3	3	4	3	7	2	4	2	5	30	3-4
4	7	7	5	6	7	7	6	3	48	7
5	6	3	4	3	5	2	5	7	35	5
6	4	5	2	2	3	5	4	2	27	2
7	1	1	1	1	1	1	1	1	8	1

Source: own

criteria. Using methods of mathematical statistics the consistency of expert judgements is determined. The results of expert ranking are given in Table 5.

On a basis of the results of criteria ranking it is verified if the expert judgements are consistent. The level of consistency is defined by the concordance coefficient of M. Kendall (Kendall, 1970; Podvezko, 2007; Podvezko & Sivilevicius, 2013).

If expert estimates (data of Tab. 5) are marked as  $e_{ik}$ , the sum of ranks of each index

as  $e_i = \sum_{k=1}^r e_{ik}$ , their average as  $\bar{e} = \frac{\sum_{i=1}^m e_i}{m}$

( $i = 1, 2, \dots, m$ ;  $k = 1, 2, \dots, r$ ; where  $m$  – the number of criteria used,  $r$  – the number of experts), the concordance coefficient  $W$  is calculated by the formula (Kendall, 1970):

$$W = \frac{12S}{r^2 m(m^2 - 1)}, \quad (3)$$

The sum of squares of deviation from the total average of values  $S$  is defined by the formula:

$$S = \sum_{i=1}^m (e_i - \bar{e})^2, \quad (4)$$

The level of consistency of expert estimates is defined not by the concordance coefficient  $W$  itself but by the related criterion  $\chi^2$  calculated by the formula (Kendall, 1970):

$$\chi^2 = Wr(m-1) = \frac{12S}{rm(m+1)}, \quad (5)$$

It has been proven (Kendall, 1970) that if calculated by the formula (5) the value of  $\chi^2$  is higher than the critical  $\chi^2_{kr}$  taken from the distribution table of  $\chi^2$  with  $\nu = m - 1$  degree of freedom and the selected significance level  $\alpha$  close to zero, a statistical hypothesis on the consistency of expert estimates is assumed.

Based on table 5 the calculated concordance coefficient  $W = 0.597$ . Based on formula (5) the calculated  $\chi^2 = 28.66$  value exceeds the critical value  $\chi^2_{kr} = 12.59$  with the significance level  $\alpha = 0.05$  and the freedom degree  $\nu = 7 - 1 = 6$ . This shows that the expert estimates are consistent.

In the second stage the experts directly assessed (in percent) the significance of each

criterion  $c_{ik}$  ( $\sum_{i=1}^m c_{ik} = 100$ ;  $k = 1, 2, \dots, r$ ).

The estimates make it possible to calculate the weights of criteria  $\omega_i$  as the average of all estimates by the formula:

$$\omega_i = \sum_{k=1}^r c_{ik} / (100r), \quad (i=1, 2, \dots, m), \quad (6)$$

The expert estimates of criteria significance and criteria weights are given in Table 7.

When estimating criteria significance the criteria comparison matrix was developed using AHP (Analytic Hierarchy Process) method (Saaty, 2005; Saaty, 1980; Podvezko, 2009; Kutut et al., 2014), (Tab. 6).

Tab. 6: The criteria comparison matrix of all experts using AHP method

	1	2	3	4	5	6	7
1	1	3	1/3	4	2	1/3	1/4
2	1/3	1	1/6	1	1/2	1/3	1/7
3	3	6	1	5	4	2	1/2
4	1/4	1	1/5	1	1/2	1/4	1/6
5	1/2	2	1/4	2	1	1/2	1/5
6	3	5	1/2	4	2	1	1/3
7	4	7	2	6	5	3	1

Source: own

Tab. 7: The direct expert estimates of criteria significance and criteria weights

<i>m</i>	Experts								Sum of estimates	Weights	Position
	<i>r</i> <sub>1</sub>	<i>r</i> <sub>2</sub>	<i>r</i> <sub>3</sub>	<i>r</i> <sub>4</sub>	<i>r</i> <sub>5</sub>	<i>r</i> <sub>6</sub>	<i>r</i> <sub>7</sub>	<i>r</i> <sub>8</sub>			
1	21	24	10	15	5	15	15	5	110	0.1375	4
2	11	5	6	13	1	8	5	10	59	0.0738	6-7
3	18	15	20	10	20	12	20	10	125	0.1562	2
4	4	4	12	12	2	5	5	15	59	0.0738	6-7
5	7	16	12	15	2	20	10	5	87	0.1088	5
6	14	10	20	15	20	10	15	20	124	0.1550	3
7	25	26	20	20	50	30	30	35	236	0.2950	1

Source: own

The consistency index of the expert pairwise comparison C.I. = 0.036, the consistency ratio C.R. = 0.027 < 0.1, i.e. the estimates are consistent.

To reduce the impact of randomness on the determination of weights the same experts once again filled in the criteria comparison matrix by AHP method. The weights, calculated by two AHP methods, are given in Tab. 8 and Fig 7. They also give weights of direct estimates and the mean of weights.

### 3.2 Evaluation of the Occupancy Potential for the Parking Lots

When analyzing the occupancy potential for the parking lots the world-widely used SAW, TOPSIS and PROMETHEE methods were applied reflecting the main ideas of these methods. A bibliography of only two methods – PROMETHEE and TOPSIS is made of several hundred publications each, the methods were

used in many various fields – from logistics to health protection (Behzadian et al., 2010; Behzadian et al., 2012; Mardani et al., 2015a; Mardani et al., 2015b). The simplest SAW (Simple Additive Weighting) method (Hwang & Yoon, 1981; Podvezko, 2011; Tupenaite et al., 2010; Bagocius et al., 2014) reflects the idea of qualitative MCDM methods – integration of the values of indices and their weights into one quantity – criterion of the method. In this case, the sum of the weighted normalized values of all criteria is calculated for each *j*-th parking lot. The criterion of the method *S<sub>j</sub>* is calculated by the formula:

$$S_j = \sum_{i=1}^m \omega_i \tilde{r}_{ij}, \quad (7)$$

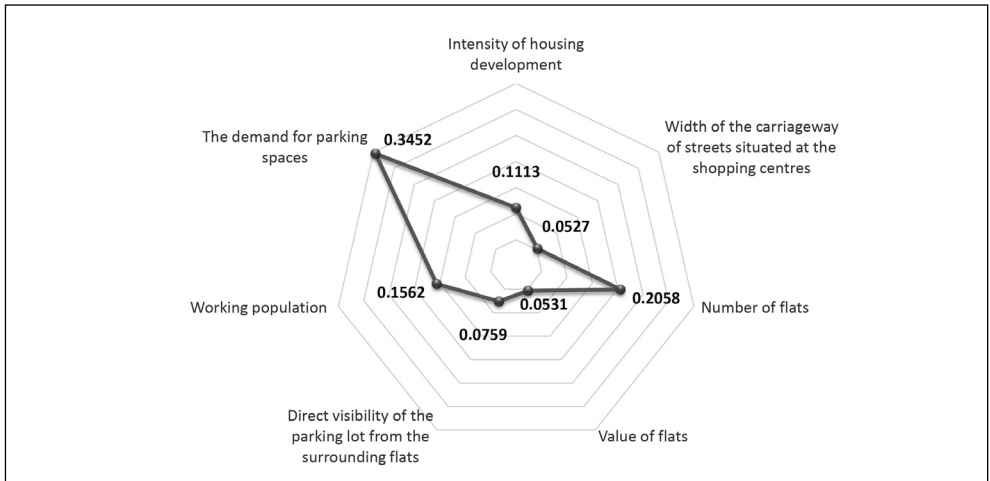
where  $\omega_i$  is weight of the *i*-th criterion,  $\tilde{r}_{ij}$  is the normalized value of *i*-th criterion for *j*-th parking lot.

Tab. 8: Criteria weights calculated by different methods

	1	2	3	4	5	6	7
AHP (1)	0.1020	0.0402	0.2414	0.0395	0.0674	0.1543	0.3553
AHP (2)	0.0944	0.0440	0.2200	0.0457	0.0512	0.1594	0.3853
Direct	0.1375	0.0738	0.1563	0.0738	0.1088	0.1550	0.2950
The mean of weights	0.1113	0.0527	0.2058	0.0531	0.0759	0.1562	0.3452
Location	4	7	2	6	5	3	1

Source: own

Fig. 7: The average of criteria significance of the parking lots of shopping centres



Source: own

The SAW method was used the “classical” normalization where the normalized values  $\tilde{r}_{ij}$  are calculated by the formula:

$$\tilde{r}_{ij} = \frac{r_{ij}}{\sum_{j=1}^n r_{ij}}, \quad (8)$$

where  $r_{ij}$  is the value of  $i$ -th criterion for  $j$ -th parking lot taken from the table of expert estimates.

The main principle of TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) method is that from compared alternatives the chosen one will have the shortest distance from the best solutions and the largest distance from the worst solutions (Hwang & Yoon, 1981; Opricovic & Tzeng, 2004; Ginevicius et al., 2012).

The TOPSIS method uses vector normalisation:

$$\tilde{r}_{ij} = \frac{r_{ij}}{\sqrt{\sum_{j=1}^n r_{ij}^2}} \quad i = 1, \dots, m; \quad j = 1, \dots, n. \quad (9)$$

The best solution (alternative)  $V^*$  and the worst solution  $V^-$  are calculated by the formulas:

$$V^* = \{V_1^*, V_2^*, \dots, V_m^*\} = \{(\max_j \omega_i r_{ij} / i \in I_1), (\min_j \omega_i \tilde{r}_{ij} / i \in I_2)\}, \quad (10)$$

$$V^- = \{V_1^-, V_2^-, \dots, V_m^-\} = \{(\min_j \omega_i r_{ij} / i \in I_1), (\max_j \omega_i \tilde{r}_{ij} / i \in I_2)\}, \quad (11)$$

where  $I_1$  – a set of numbers of maximizing

criteria,  $I_2$  – a set of numbers of minimizing criteria,  $\omega_i$  is the weight of  $i$ -th criterion ( $\sum_{i=1}^m \omega_i = 1$ ).

The total distance of each compared alternative to the best solutions  $D_j^*$  and to the worst solutions  $D_j^-$  is calculated by the formulas:

$$D_j^* = \sqrt{\sum_{i=1}^m (\omega_i \tilde{r}_{ij} - V_i^*)^2}, \quad (12)$$

$$D_j^- = \sqrt{\sum_{i=1}^m (\omega_i \tilde{r}_{ij} - V_i^-)^2}, \quad (13)$$

The criterion of the TOPSIS method  $C_j^*$  is calculated by the formula:

$$C_j^* = \frac{D_j^-}{D_j^* + D_j^-} \quad (j=1, \dots, n) \quad (0 \leq C_j^* \leq 1), \quad (14)$$

PROMETHEE (Preference Ranking Organisation Method for Enrichment Evaluation) method (Brans & Mareschal, 2005; Podvezko & Podvezko, 2010a; Podvezko & Podvezko, 2010b) instead of normalized values uses the values of so-called preference function  $p(d)$  where the argument  $d$  is the difference between the index values of two compared alternatives, i.e. distance between them. This function depends on two parameters – the indifference limit  $q$  and the preference limit  $s$ .

PROMETHEE methods compare all the  $A_j$  and  $A_k$  alternatives by calculating the outranking relation  $\pi(A_j, A_k)$ .

The outranking relation  $\pi(A_j, A_k)$  is calculated by the formula:

$$\pi(A_j, A_k) = \sum_{i=1}^m \omega_i p_t(d_i(A_j, A_k)), \quad (15)$$

where  $\omega_i$  is the weight (significance) of  $i$ -th criterion  $R_i$ ;  $d_i(A_j, A_k) = r_{ij} - r_{ik}$  – the difference between the values  $r_{ij}$  and  $r_{ik}$  of  $i$ -th criterion  $R_i$  of alternatives  $A_j$  and  $A_k$ ;  $p_t(d) = p_t(d_i(A_j, A_k))$  –  $t$ -th preference function selected for  $i$ -th criterion.

PROMETHEE methods assess the sums of all “outcoming” relations for each  $j$ -th alternative:

$$F_j^+ = \sum_{k=1}^n \pi(A_j, A_k), \quad (16)$$

and the sums of all “incoming” relations:

$$F_j^- = \sum_{k=1}^n \pi(A_k, A_j), \quad (j = 1, 2, \dots, n), \quad (17)$$

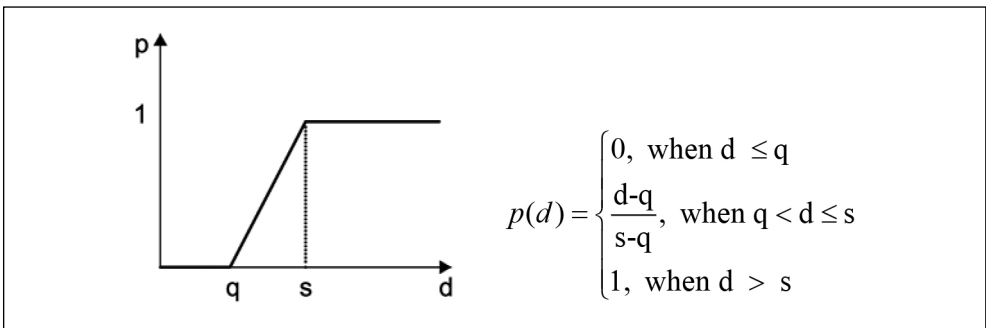
The method PROMETHEE II calculates differences  $F_j = F_j^+ - F_j^-$  between the relations of  $F_j^+$  and  $F_j^-$  and ranks the alternatives in a descending order of the differences between their values  $F_j$ .

From the preference functions  $p(d)$ , most frequently used in practice, in this research the authors chose the so-called V-shape function best suitable to all criteria (Fig. 8).

The study parking lots were divided by their occupancy into four groups. Tables 1-4 give the values of all criteria.

The values of evaluation criteria obtained for all parking lots in each group using the

Fig. 8: V-shape with indifference preference function



Source: Brans & Mareschal, 2005

Tab. 9:

**Results of the evaluation of parking lots of group I by SAW, TOPSIS and PROMETHEE methods**

No. of the parking lot of shopping centre	Method								Sum of positions	Position
	SAW		TOPSIS		PROMETHEE					
	$S_j$	Position	$C_j^*$	Position	$F_j^+$	$F_j^-$	$F_j$	Position		
1	0.1270	4	0.4014	5	1.170	1.479	-0.309	4	13	4
2	0.1467	2	0.6356	2	2.346	0.875	1.471	2	6	2
3	0.0983	8	0.2699	8	0.480	2.176	-1.696	8	24	8
4	0.1309	3	0.4398	4	1.362	1.541	-0.179	3	10	3
5	0.1540	1	0.7322	1	2.610	0.396	2.214	1	3	1
6	0.1066	7	0.4608	3	1.748	2.266	-0.518	6	16	5
7	0.1166	6	0.3911	6-7	1.198	1.548	-0.350	5	17.5	6
8	0.1202	5	0.3911	6-7	0.951	1.583	-0.632	7	18.5	7

Source: own

Tab. 10:

**Results of the evaluation of parking lots of group II by SAW, TOPSIS and PROMETHEE methods**

No. of the parking lot of shopping centre	Method								Sum of positions	Position
	SAW		TOPSIS		PROMETHEE					
	$S_j$	Position	$C_j^*$	Position	$F_j^+$	$F_j^-$	$F_j$	Position		
1	0.1493	3	0.5063	2	1.988	0.963	1.035	3	8	3
2	0.1303	4	0.4065	4	1.508	1.911	-0.402	6	14	4-5
3	0.1262	5	0.3886	5	1.848	1.118	0.730	4	14	4-5
4	0.1058	6	0.3003	6	1.256	1.376	-0.120	5	17	6
5	0.1560	2	0.4834	3	2.572	0.456	2.115	1	6	2
6	0.0418	8	0	8	0	4.309	-4.309	8	24	8
7	0.1939	1	0.7262	1	3.316	1.271	2.045	2	4	1
8	0.0963	7	0.2709	7	1.169	2.265	-1.094	7	21	7

Source: own

SAW, TOPSIS and PROMETHEE methods, the corresponding positions, the sum of positions and the summary of evaluation (ranking) are given Tables 9-12.

Calculations, made by the above multiple-criteria methods, show that the best evaluation results in group I of parking lots are represented by the parking lot of the shopping centre No. 5 (Tab. 9). This is determined by the intensity of housing development (1.08), large number of flats (1,720), 2,470 working population and its location within a 300 metre radius of the shopping centre (Tab. 1). The lot is situated within 18% visibility zone from the neighbouring

residential houses, provided with convenient entrance and with fast accessibility from the parking lot to the houses.

The most unfavourable situation is represented by the parking lots of the shopping centres No. 7 and 8 (Tab. 9). This is explained by the lower demand for parking spaces, less flats and less residents (Tab. 1). In the parking lots of shopping centres with the occupancy of 51 to 75% (group II) the best evaluation results were showed by the parking lots at the shopping centres No. 5 and 7 (Tab. 10). This area has a high intensity of housing development – 0.96-1.03, respectively, the number of flats

**Tab. 11: Results of the evaluation of parking lots of group III by SAW, TOPSIS and PROMETHEE methods**

No. of the parking lot of shopping centre	Method								Sum of positions	Position
	SAW		TOPSIS		PROMETHEE					
	$S_j$	Position	$C_j^+$	Position	$F_j^+$	$F_j^-$	$F_j$	Position		
1	0.0539	13	0.2198	13	0.252	3.455	-3.203	13	39	13
2	0.0841	4	0.5624	2	2.495	2.555	-0.060	8	14	4-5
3	0.0614	11	0.2795	12	1.973	3.192	-1.219	10	33	11
4	0.0790	8	0.4632	7	2.893	1.440	1.453	4	19	7
5	0.0761	9	0.3616	10	1.895	2.430	-0.534	9	28	9
6	0.0805	6	0.4172	8	3.211	3.164	0.047	7	21	8
7	0.0872	2	0.5276	4	3.534	1.213	2.231	1	7	2
8	0.0563	12	0.3306	11	1.657	3.375	-1.718	11	34	12
9	0.0853	3	0.5440	3	2.456	1.516	0.940	5	11	3
10	0.0799	7	0.5258	5	3.036	2.154	0.882	6	18	6
11	0.0652	10	0.4098	9	1.725	4.366	-2.641	12	31	10
12	0.0828	5	0.4719	6	2.884	1.233	1.651	3	14	4-5
13	0.1085	1	0.6165	1	3.941	1.859	2.082	2	4	1

Source: own

– 1,640-1,760, respectively and the number of working residents – 1,750-2,310, respectively. Visibility from the residential houses to the parking lots comes to 9-11% (Tab. 2).

A low occupancy (26-50%) and inefficient use of the parking lots of group III is determined by the adjacent streets (of categories A, B and C) of high traffic volume, inconvenient accessibility, a low visibility of parking lots from the residential houses. In this group the relatively best evaluation results were obtained for the parking lots of the shopping centres No. 7 and 13 (Tab. 11). The intensity of housing development is 0.35-0.43, respectively, the number of flats – 680-730, respectively, the number of working population is 630-970, respectively (Tab. 3).

In group IV of the parking lots with the lowest occupancy (up to 25%) the evaluation results are similar to those of group III, however, the parking lots of those shopping centres are distinguished by especially large number of parking spaces (400-500), a complicated accessibility, paid parking at night (Tab. 12). A low occupancy of parking lots in winter is determined by a small number of flats (580), a small number of working population (590), a low intensity of housing development (0.29) and the streets of high traffic volume (Tab. 4).

### 3.3 The Effective Use and Development of the Parking Lots of Shopping Centres

The use of multiple-criteria methods SAW, TOPSIS and PROMETHEE showed that the occupancy of the parking lots of shopping centres in urbanized areas is mostly influenced by the demand for parking spaces, intensity of housing development, the number of flats and working population, accessibility of parking lots and their direct visibility from residential houses. The implemented complex analysis enabled to identify four groups of shopping centres by the occupancy of their parking lots.

The main criteria were determined based on which the development of shopping centres in the urbanized areas shall be planned at the streets of certain categories taking into consideration the urban transport system.

The group I represents not large shopping centres (Fig. 9) having up to 100 parking spaces. Those shopping centres are located in residential districts, within the territory of multi-storey houses, where the prevailing intensity of housing development is higher than 1.00. In the adjacent area, at a 300 m radius from the shopping centre parking lot the demand for parking spaces

**Tab. 12: Results of the evaluation of parking lots of group IV by SAW, TOPSIS and PROMETHEE methods**

No. of the parking lot of shopping centre	Method								Sum of positions	Position
	SAW		TOPSIS		PROMETHEE					
	$S_j$	Position	$C_j^+$	Position	$F_j^+$	$F_j^-$	$F_j$	Position		
1	0.0501	13	0.4336	7	2.381	2.942	-0.561	13	33	12
2	0.0532	10	0.3352	13	4.340	3.277	1.062	9	32	11
3	0.0645	3	0.4674	3	4.046	1.018	3.029	4	10	3
4	0.0539	9	0.3904	10	2.525	1.420	1.035	10	29	9-10
5	0.0548	8	0.4329	8	2.724	2.285	0.438	12	28	8
6	0.0334	16	0.1849	19	0.934	4.821	-3.887	18	53	18
7	0.0624	4	0.4060	9	4.000	2.893	1.107	8	21	7
8	0.0312	17	0.1908	18	0.370	4.554	-4.184	19	54	19
9	0.0456	14	0.2868	17	2.264	4.584	-2.320	15	46	14-15
10	0.0587	6	0.4605	6	2.965	1.459	1.506	6	18	5-6
11	0.0770	1	0.6036	1	5.048	1.930	3.118	3	5	1
12	0.0551	7	0.3865	17	3.845	1.451	2.394	5	29	9-10
13	0.0305	18	0.3189	14	2.122	4.840	-2.718	16	48	16
14	0.0502	12	0.3783	12	2.453	1.767	0.686	11	35	13
15	0.0507	11	0.4625	5	6.431	3.113	3.318	2	18	5-6
16	0.0708	2	0.4637	4	5.214	1.067	4.147	1	7	2
17	0.0290	20	0.2908	15	1.335	4.055	-2.719	17	52	17
18	0.0601	5	0.4894	2	3.146	1.644	1.502	7	14	4
19	0.0424	15	0.2712	17	1.487	3.418	-1.930	14	46	14-15
20	0.0236	19	0.1338	20	0.249	5.272	-5.023	20	59	20

Source: own

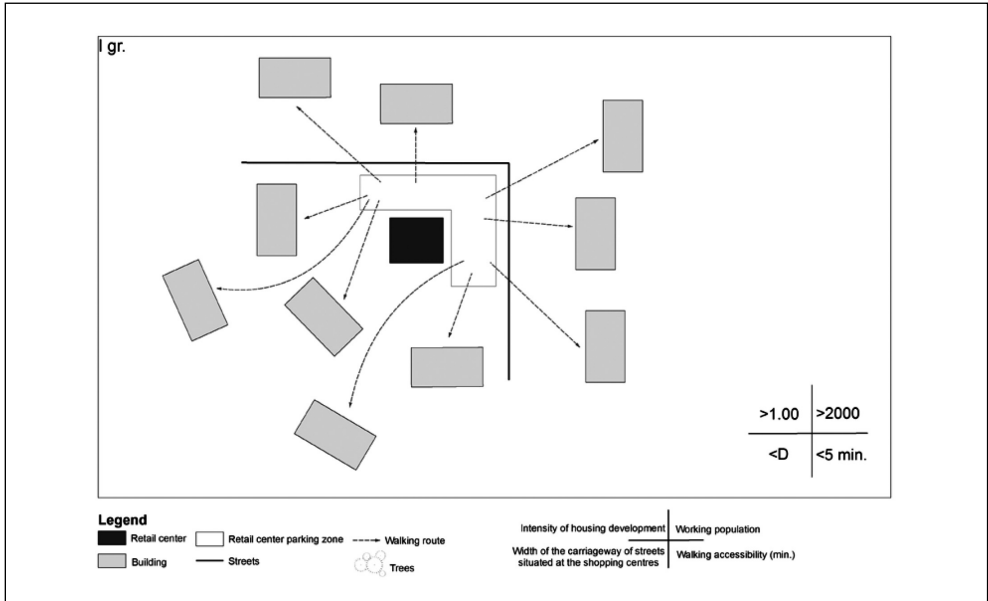
reaches on average 363%, the average of working population living within the adjacent area – 2,022, the average number of flats – 1,795. The research has determined that accessibility of the parking lot of shopping centre from the residential house on foot varies from 3 min to 5 min.

In order to reduce journey time, to reach optimization of engineering infrastructure and territorial development, those shopping centres shall be built in the territories of multi-storey houses. However, they must satisfy the main three limit values of criteria set by the experts (Tab. 13): intensity of housing development – higher than 1.00, the number of working residents – more than 2,000 and the number of flats – more than 1,800. Accessibility of the parking lot from the residential houses on foot shall not exceed 5 min and they cannot be separated by the street not larger than of category D (Fig. 9).

It was determined by research and substantiated by practical calculations that those shopping centres allow to reduce the number of parking spaces by 5.6% per one flat. For example, having built 100 parking lots this will help to save 0.2 ha of the total area of the territory and 0.43 thousand EUR.

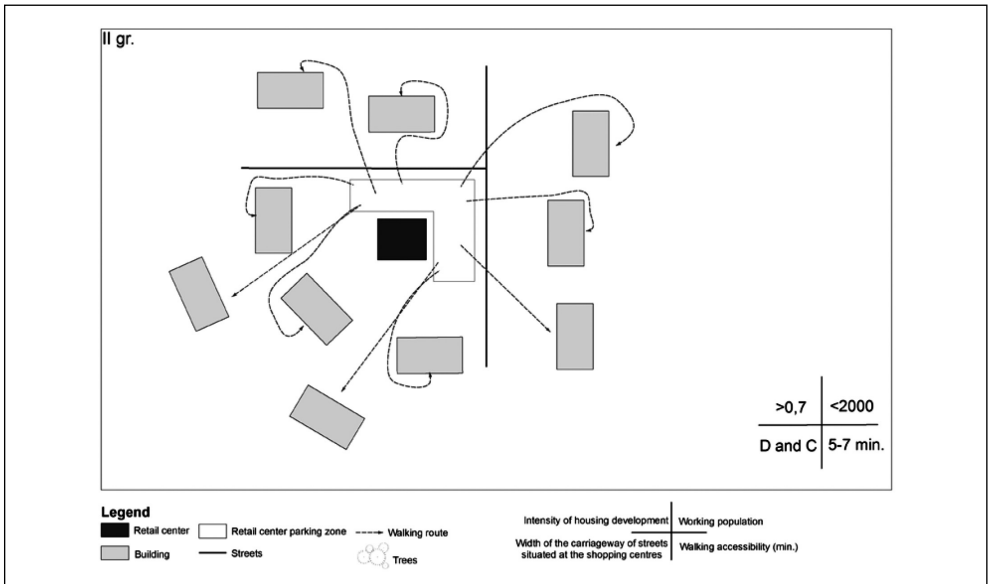
The group II (Fig. 10) represents shopping centres having from 100 to 150 parking spaces. In the adjacent area of shopping centres the demand for parking spaces reaches on average 374%, intensity of housing development – from 0.7 to 1.00, the average of working population living within the adjacent area – 1,610, the average number of flats – 1,428. The research has determined that accessibility of the parking lot of shopping centre from the residential house on foot varies from 5 min to 7 minutes (Fig. 10).

Fig. 9: The scheme of a parking lot of the shopping centres of group I



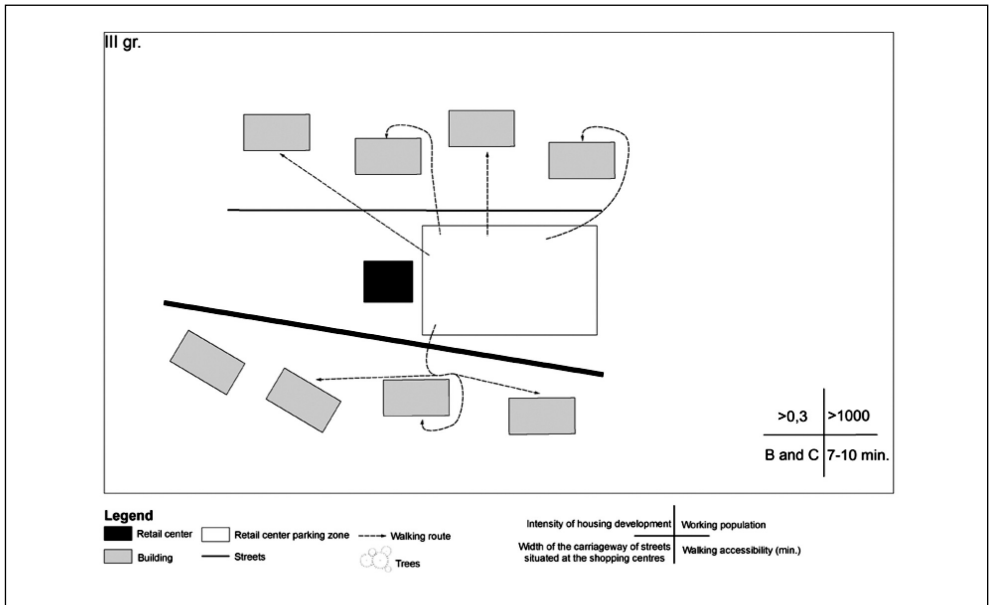
Source: own

Fig. 10: The scheme of a parking lot of the shopping centres of group II



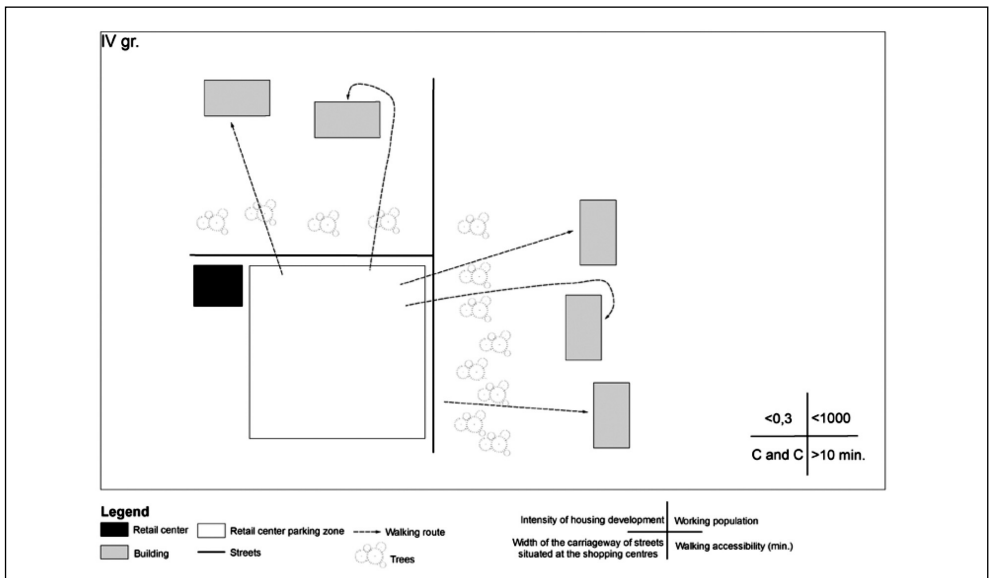
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**Fig. 11:** The scheme of a parking lot of the shopping centres of group III



Source: own

**Fig. 12:** The scheme of a parking lot of the shopping centres of group IV



Source: own

The parking lots occupy the total area of 2,000 m<sup>2</sup> – 3,000 m<sup>2</sup>, thus, it is necessary to find a ratio between the compact sustainable development, the shape of residential district and distribution of structural elements within the territory. Calculations have determined that at the given limit values (Tab. 13) those shopping centre parking lots allow to reduce the number of parking spaces by 5% per one flat.

The shopping centres of group III are located at the main urban transport corridors (the streets of category B or C), therefore, research on their accessibility on foot showed that it will take the resident, having left his car in the parking of the shopping centre, from 7 to 10 minutes to come home. The parking lots occupy the total area of 3,000 m<sup>2</sup> – 4,000 m<sup>2</sup>, thus, due to their size they are not recommended in the residential areas of multi-storey houses. Accessibility of those shopping centres on foot is poor, usually they are separated by fast-speed streets, therefore, the drivers waste time to cross the street. Due to the above mentioned circumstances, it is recommended to build this type of shopping centres in the territory of mixed housing development since there is a good accessibility by car, a large variety of goods and services, free parking. Those parking lots are suggested to be used for Park&Ride system. In a daytime the parking lots will be used by people working in this area and the drivers travelling to the city centre.

Group IV represents the largest shopping centres having more than 200 parking spaces and occupying the total area of more than 4,000 m<sup>2</sup>. In the adjacent area of shopping centres the demand for parking spaces reaches on average 411%, intensity of housing development – up to 0.3, the average of working population living within the adjacent area – 950, the average number of flats – 776.

Those shopping centres are characterized by the functions of business, entertainment and specific services oriented towards rich and middle-class people. Their location demonstrates their exclusiveness: large parking lots (Fig. 12), concentration of 2-4 traffic lanes and generated flows, high level of public transport development, etc. Though multi-storey houses or their groups get into the analysed 300 m radius, only few residents use those parking lots. Research on their accessibility on foot showed that it will take the resident, having left his car in the parking of the shopping centre, at least 10 minutes to come home. Those shopping centres are recommended to be built in sub-urban areas and to adapt them to the systems of combined journeys, for example, Park&Ride or Bikes&Ride.

For the newly planned shopping centres and their parking lots the limit values were determined (Tab. 13). They were determined based on the analysis that was made using multi-criteria evaluation methods. Development of the parking lots of shopping centre is regulated by four potential ways to reduce the demand for parking spaces.  $PC_p$  – the total area of the shopping centre (m<sup>2</sup>),  $PC_v$  – number of parking spaces at the shopping centre,  $UI$  – intensity of housing development,  $DG_s$  – number of working residents,  $B_s$  – number of flats,  $PC_k$  – occupancy coefficient for the parking lot based on the research findings,  $PC_r$  – the suggested percentage of reducing the number of parking spaces per one flat.

## Conclusions

It was determined that the occupancy index of the shopping centre parking lots from 10 p.m. to 2 a.m. varies from 1% to 100%, and the average total occupancy index is 27%. This means, that when planning the shopping centre parking lots

Tab. 13: The 4th shopping centres limit value

PC <sub>p</sub> , m <sup>2</sup>	PC <sub>v</sub>	Limit value			PC <sub>k</sub>	PC <sub>r</sub> , %
		UI	DG <sub>s</sub>	B <sub>s</sub>		
~2,000	~100	>1.00	>2,000	>1,800	1.00	5.6
2,001-3,000	101-150	0.7-1.00	1,500-1,999	1,300-1,799	0.60	5.0
3,001-4,000	151-200	0.3-0.7	1,200-1,499	1,000-1,299	0.40	–
>4,001	>201	<0.3	1,000-1,199	800-999	0.12	–

Source: own

in the residential districts of multi-storey houses the existing housing development is not taken into consideration and no efforts are made to rationally use land plots for parking of cars. Therefore, the entirety of criteria of shopping centre parking lots was formed, which allowed to determine factors enabling to increase the occupancy index.

In order to improve parking conditions in the residential districts the list of 7 criteria was made. With the help of multi-criteria evaluation methods the significance and priority order of separate criteria were identified. The largest influence for the occupancy of shopping centres is made by the demand for parking spaces (0.3452), the number of flats (0.2058) and the number of working residents in the residential district (0.1562).

Having divided the shopping centre parking lots into 4 groups based on the occupancy index of parking lots and having made the multi-criteria evaluation analysis, the limit values for all the groups were obtained. The best results were obtained for the shopping centre parking lots of group I having up to 100 parking spaces allowing to more rationally use land plots for the parking of cars. However, in order to reach this, the obtained limit values must be as follows: intensity of housing development – at least 1.00, the number of working residents – at least 2,000, the number of flats – at least 1,800. Calculations showed that the occupancy coefficient of parking lots can be increased to 1.00. The second position is taken by the shopping centre parking lots of group II. When planning the shopping centres of this group in the residential districts of multi-storey houses a rational ratio shall be found between the shape of housing and the distribution of the structural elements of the parking lot of shopping centre within the territory.

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**RESEARCH ON THE DEMAND FOR PARKING LOTS OF SHOPPING CENTRES****Vytautas Palevičius, Marija Burinskienė, Valentinas Podvezko, Gražvydas Mykolas Paliulis, Edita Šarkienė, Jonas Šaparauskas**

*Over the last decade, in the cities of Lithuania the number of shopping centres has been increasingly growing, they were provided with large parking lots. The development of shopping centres has formed a new structural and very concentrated urban element the result of activity of which has not been widely studied from the transportation point of view. When implementing a sustainable urban development the authors of the article aimed at ensuring the effective use of the parking lots of shopping centres during twenty four hours. For this purpose, an empirical research was carried out which resulted in a comprehensive analysis of the parking lots of 49 shopping centres in Vilnius City. The research used observation method to determine a design capacity of the parking lots of shopping centres, their occupancy, to additionally define the number of residents living in the closest proximity to the parking lot, the number of flats, the value of flats, the number of working population, the demand for parking spaces, occupancy of the parking lots with cars, etc. The expert method was used to select the main criteria characterizing interaction of the parking lots of shopping centres with the multi-storey housing area. With the help of expert questionnaire the weights and significances of criteria were determined. Using the multiple-criteria methods a priority use of the parking lots of shopping centres for parking of passenger cars was calculated and assessed. The article gives development priorities and outlines the strategy of implementing the given recommendations. This is one of the first attempts to use the parking lots of shopping centres to park passenger cars at night. If the suggested system is put into practice it would help to reduce up to 20% the demand for parking spaces in the urbanized multi-storey housing areas.*

**Key Words:** *Parking lots, shopping center, transport planning, expert, AHP, MCDM.*

**JEL Classification:** C300, R520.

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# ATTRIBUTES CONTRIBUTING TO PERCEIVED CUSTOMER VALUE IN THE CZECH CLOTHING ON-LINE SHOPPING

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## Introduction

Over the last few years, on-line shopping has become common part of our life. The new millennium has brought intensive growth of electronic entrepreneurship. In comparison to the traditional retailing, on-line shopping provides to the customers more values and benefits associated with time saving, wide product assortment, price and product characteristics comparison that enhance on-line shopping expansion. On-line shopping has a huge potential for the future growth which is accelerated by new technology development, clear legislation as well as the safety aspects of on-line shopping process.

Besides the sales of goods and services, on-line shopping using electronic tools enables also activities such as marketing, promotion, order confirmation, delivery, guarantee and after guarantee services, feedback and warranty claim management. On-line shopping using electronic tools includes all business activities and communication between suppliers and customers, and is considered to be an electronic gate used for reaching customers (Norris, West, & Gaughan, 2001). Further differentiation of on-line shopping into the sub categories such as click-only-marketers or click-and-mortar marketers (Zamazalová, 2009) provides other specifics of on-line shopping such as a possibility to try or test the goods, which encourages some customers in their decisions to shop on-line. This fact partially disproves former statements that on-line shoppers do not have possibility well experience sensory implications during the shopping such as atmosphere, touch, aroma or flavour due to its limitations (Steward & Zhao, 2000). On the other hand, bad experience with on-line shopping gained for example by problems to return goods due to wrong size, pattern or material is responsible for creating

a negative customer approach towards future on-line purchases. There is no doubt that the ease of use on-line shopping order procedure and a possibility to shop "from the table" leads to customer's time saving, convenience and life improvement. The benefits and sacrifices offered by on-line shopping represent important attributes that can have different values and importance for different on-line shoppers. The perceived customer value offered by on-line shopping is a result of the variation between customer benefits and sacrifices that forms customer satisfaction. Each customer evaluates the attributes gained in different phases of the transaction procedure before, during and after shopping subjectively by his or her perception. It is important for companies to explore on-line shopping attributes that are important for their customers, in order to create and deliver the value to them. On-line shopping brings completely new aspects of shopping not only to customers but to companies as well. It enables companies to achieve higher effectiveness and cost reduction in supplier chain and to provide a new kind of added value for the customers. There is no surprise that companies take advantage of this new occasion and pay maximum attention to creation of value attributes that are positively perceived and appreciated by customers (Bucklin, Lattin, Ansari, Gupta, Bell, Coupey et al., 2002).

The paper explores attributes of customer value associated with on-line shopping under the condition of the Czech clothing market. The objective of the paper is to identify the most important attributes of perceived customer and explore trends for customer segmentation in terms of the identified customer value attributes in clothing on-line shopping. There are many criteria that can be applied for customer segmentation (Novotný & Duspiva, 2014). However the research focuses on demographics

such as gender, age and education, and shopping behaviour using the online shopping frequency and the amount of money spent on clothing bought online. In correspondence with the objectives, the following hypotheses were developed to be investigated by the following data:

Hypothesis 1: The perception of customer value attributes when shopping for clothes on-line differ by gender, age and education of on-line customers.

Hypothesis 2: The perception of customer value attributes when shopping for clothes on-line differ by the frequency of on-line shopping and the amount of money spent on clothes shopped on-line.

For the purpose of the study, the research on clothing online shopping was conducted within the Czech Republic in 2014. It was an exploratory research applying a phenomenological approach.

### 1. Customer Value Concept

Customer value concept started to be an important phenomenon within the last decades. This concept encompasses two aspects that define customer value. Customer value can be defined as a value for customers (in literature known as perceived customer value), i.e. what customers gain by purchase or usage of products or services. Perceived customer value is an important factor for acquisition and retaining customers (Khalifa, 2004). Another approach to customer value conception reflects the value of customers to the company (known as customer life-time value), i.e. what customers bring to the company when buying its products. Both conceptual approaches are connected and interrelated. If a company offers a value to customers, they buy products, form positive experience and attitudes and what is more, they recommend products to others. Customers buying company's products bring the value to the company by contributing to its turnover and profit.

The concept of perceived customer value has been originally developed from the service quality concept since the quality is considered to be an important part and a predictor of customer value. As mentioned by Mathwick, Malhotra, and Rigdon (quoted by Lee and Overby, 2004) "*service excellence is the dimension that involves quality judgment for services offered during and after the online*

*shopping*". The other concept closely related to the perceived customer value is customer satisfaction. According to Kotler and Keller (2007) "*the level of satisfaction of a customer's expectations is linked to how the customer perceives and values the purchased product*". Customer value is a basis, a prerequisite for achieving customer satisfaction and customer loyalty. These two concepts are important factors in attracting and retaining customers. Customers who are satisfied will create their positive attitudes towards products, company or a buying process. Positive perceptions of a value delivered to customers thus influences customers' favourable attitudes. For this reason, perceived customer value has become the key concept in marketing strategies and the factor of competitive advantage. Price is considered to be another important aspect of the customer value concept. It is often regarded as the main driver in customers' decision making process, however not the only one. Price and quality, taken in a simplified way, are two significant dimensions representing benefits and sacrifices of perceived customer value, but similarly not the only ones. There are more dimensions such as affective and psychological ones that contribute to customer value and affect customer satisfaction.

The move from traditional 4P marketing mix to 4C marketing mix consisting of customer, cost, communication and convenience has been an important milestone from product oriented to customer oriented marketing models. New environment, knowledge and technologies require more interactive approach to customers, taking politics, public opinion, processes and individual needs into consideration. It is necessary to know the customers' perceptions, meanings, attitudes and preferences in order to succeed in product and service sales. The driving power that determines the value is undoubtedly the customer. Companies, in response to customer's needs and requirements, design value attributes and manage the whole customer value creation process (Vargo & Lusch, 2004). The main objective is to make customers satisfied (Novotný & Duspiva, 2014). For this reason, customer value has to be composed from customer perspective. Customer value thus becomes the key and strategic instrument of the company's competitive advantage (Anderson, Narus, & Van Rossum, 2006).

Perceived customer value as a competitive advantage is closely related to customer shopping decision making process and satisfaction. This means that the customer compares the value attributes offered by the company not only with his or her own attribute importance and preferences, but also with the value attributes of competitors (Dědková & Blažková, 2014). From this point of view, perceived customer value can be quantified as the difference between benefits and costs of a product or service of two (or more) companies providing similar goods (Lošťáková, 2009):

$$(Benefit\ 1 - Cost\ 1) > (Benefit\ 2 - Cost\ 2) \quad (1)$$

The company providing higher customer value usually has a better chance to succeed in the market. It may also happen that some customers do not prefer higher benefits, just the common ones. Then they will probably choose the goods with a lower price. The best alternative for the company is to offer products or services of a bigger variance between benefits and costs. Companies should be interested in searching which attributes influence customer shopping behaviour and why they are important to customers. These attributes are critical for value creation process. Knowing what factors influence and compose customer value from the customer perspective is the main tool for customer satisfaction leading to better company performance results.

There are two concepts in essence used in customer value attribute study. First concept defines the customer's evaluation of attributes associated with benefit and sacrifice. The second multidimensional concept considers the attributes related to rational and economical evaluation on the one hand and emotional individual evaluation on the other hand. These attributes can be grouped into two dimensions: functional and affective ones. The functional dimension is defined by the rational and economic attributes including the quality of the product and service. The affective dimension includes emotional (relating to feelings and internal emotions) and social (related to the social impact of the purchase) aspects of the individuals (Červová, 2013).

Some studies focused on on-line shopping employ two types of value: utilitarian and experiential (Lee & Overby, 2004). Utilitarian value includes saving of time and money,

unexceptionable services and is defined as aggregated group of functional benefits. Experiential value includes aggregated empirical benefits, which on-line shopping provides and enables to the customers (Lee & Overby, 2004). This value corresponds with emotional dimensions (Wikstrom, Carrell, & Henningsson, 2002) and includes hedonic and affective incentives of customer shopping behaviour (Babin & Attaway, 2000). The concept created by Heard (1993) specifies three factors of customer value based on product characteristics, purchase order and goods delivery, and transaction experience. From the customer's point of view, the concept of customer value includes functional, social, emotional, epistemic and situational dimensions (Sheth, Newman, & Gross, 1991).

## 2. On-line Shopping in the Czech Republic

The beginning of commercial use of Internet is associated with the first electronic advertising banner created in 1994 (Langdorf, 2000). At that period, Internet was considered to be mainly a new communication channel used by companies. With a rapid increase of the Internet user base, companies have realized the power of Internet as the biggest information and communication phenomenon. Subsequently they have integrated it as a distribution channel to their sales strategies, as well. The statistics show that the share of on-line connected population has been increasing. Around 40 percent of the world population has an Internet connection these days. In 1994, it was just 0.40 percent. Twenty years later, in 2014, the number of Internet connections has reached the third billion. About 48 percent of all Internet users worldwide live in Asia, 22 percent in North and South America and 19 percent in Europe. China represents 22 percent of the total Internet users in the world. The highest share of population connected to Internet is in the United States, France, UK, Germany, Japan and Canada. More than 80 percent of population in mentioned countries has Internet connection. However, the biggest annual growth of Internet connected population (about 17 percent) is in Uganda, Angola and Zimbabwe (Internet live stats, 2014).

Trends in the Czech Republic are similar to the EU countries. The number of households connected to Internet increased from 19

percent in 2004 compared to 56 percent in 2011 and 67 percent in 2012 (ČSÚ, 2013). It is obvious that firms need to respond to those trends and meet their customers where they are on-line. By now, 94 percent of the Czech Internet users have completed shopping via Internet. Statistics showed that there were more men than women shopping on-line in the period of 2009-2011 (ČSÚ, 2012). However, the differences in on-line shoppers by gender have almost diminished in last years. Women on maternity leave have formed strong on-line shopping group representing 54 percent of the on-line shopping population. They make more on-line purchases than students and retired persons together (ČSÚ, 2013). The Marketing Journal introduced the following figures related to on-line services used by the Czech on-line shoppers in 2012. About 74 percent of Internet users purchased services on-line, 51 percent of them used the price comparative portals, 31 percent used the discount portals and 9 percent did not recognized or did not know which services they had actually used (Michl, 2012). According to the Ecommerce 2013 research, about 90 percent of the Czech internet users shopped on-line at least once a year, 47 percent of them shopped on-line at least once a month. Almost all on-line shoppers (99 percent of them) had a positive experience and were satisfied with their shopping on-line (Marketingové noviny, 2013, September).

The most common goods bought on-line are clothing, shoes, electronic, computers, notebooks, hardware and sport equipment (Marketingové noviny, 2014, October), (Marketingové noviny, 2013, September). Shopping clothing on-line is rapidly growing. Whereas in 2010 clothing was the most frequently bought merchandise online for 36 percent of online shoppers, in 2013 more than 43 percent and a year later 48 percent of online shoppers reported that had bought clothes on-line. On average, people buy clothing on-line about four times a year. Customers appreciate mainly wide assortment, good selection of fashionable brands and price (Marketingové noviny, 2013, March). The amount of money spent on on-line shopping is growing, as well. The turnover of e-shops in the first six months of 2015 reached 35 billion CZK, which was by 20 percent more than in the same period in 2014. This turnover is higher than the annual turnover of e-shops six years ago. In 2014, the annual turnover

of e-shops was 67 billion CZK (Marketingové noviny, 2015, July).

There are about 2,500-3,000 e-shops specialising in clothing assortment in the Czech Republic. Aukro.cz with more than 2.5 million customers and the annual turnover of more than 405 million Czech crowns is probably one of the largest e-shops selling clothing on-line in the Czech Republic. Aukro operates its own outlet offering the brands such as Guess, D&G, Tommy Hilfiger, Ed Hardy and others. More than 77 percent of their customers buy clothing on-line regularly (Marketingové noviny, 2012, February).

### 3. Conceptual Framework of the Study

Customer value concept used in the research was defined and measured in terms of functional and affective dimensions. The functional attributes included aspects of the web site design, assortment, price, goods payment and shipping. The affective attributes concerned the customer's impression of the website, ease of use, communication and trust related aspects. The perception of selected customer value attributes was measured as customer satisfaction, i.e. as a result of a congruence between the perceived and evaluated reality (benefits and sacrifices offered by on-line shopping), and customer expectations. The attributes evaluated the best were those that contributed to customer satisfaction the most and thus represented important attributes of customer value dimensions. Customer satisfaction and loyalty are important factors influencing customer shopping behaviour. Satisfied customer will not only repeat the purchase, but will also spread positive references related to the firm or brand.

### 4. Research Methodology

The objective of the research was to explore customer value perception towards clothing on-line shopping in the Czech Republic and identify trends for market segmentation. For this purpose, an exploratory research using survey as a research strategy was conducted in the period of March-May 2014. Data were collected by electronically-administered questionnaires using social networks, as well.

Respondents were Internet users experienced with on-line shopping. They were men and women of different age and income levels.

Since there was no population framework of population buying clothing on-line in the Czech Republic available, non-probability quota sampling method was used. The sample followed the structure of on-line shopping population identified by previous research (Marketingové noviny, 2013, March), (Marketingové noviny, 2013, May). Clothing is the product category bought online by women the most often (Marketingové noviny, 2013, March). According to NMS Market Research (Marketingové noviny, 2013, March), women represent the largest proportion (57 percent) of all shoppers who bought clothing online. The number of women shopping online increases every year. Since 2007 the proportion of on-line shopping women tripled. The share of Czech women shopping on-line is larger compared to the proportion of women in Slovakia, Hungary, Poland, France or Germany (Marketingové noviny, 2013, May). The structure of on-line shopping population differs by age, education and income, as well. It is known that the number of on-line shopping customers increases with their education and income. In terms of age, the largest proportion (49 percent) of on-line shopping customer is in age of 21-30 years in comparison to the age category of 51-60 years, of which only 14 percent shop on-line. On-line shopping and on-line video have become an important part of daily life for about 40 percent within all economically active women (in group age of 20-60 years) and for almost all women in age up to 35 years (Marketingové noviny, 2013, May).

The sample reflects general characteristics of the Czech online shoppers profile presented by the previous research conducted in the Czech Republic so far, and thus can be considered as representative. The sample included 334 respondents, of which 57 percent were women and 43 percent men. The average age of the respondents was 32.67 years. About 75 percent of the respondents were employed, the rest of the respondents were students. Approximately 34 percent of the respondents completed the secondary level of education and 47 percent of them achieved the university degree.

Descriptive analysis was used to interpret the findings of the research. Means were used to get descriptive information and understand the perception of the selected customer value attributes for respondents when shopping

clothes on-line. Multivariate data analysis, in particular factor analysis was used to identify the main elements of customer value in regards to their importance. A principal components analysis and orthogonal Varimax rotation were used in the analysis to obtain factors that respondents considered to be the attributes of the perceived customer value for shopping clothes on-line. Attributes identified by factor analysis were statistically tested by ANOVA and t-test in order to explore differences in their perception by gender, age and income categories, shopping frequency category and the category of money spent on clothing bought on-line (Kozel et al, 2006, p. 100-102).

## 5. Findings of the Research

On average one respondent made about 7 on-line purchases and spent annually CZK 5,625 on clothes. About 49 percent of respondents made less than 5 purchases, 36 percent made 6-9 purchases a year. Most of them (61 percent) spent on clothes bought on-line CZK 1,000-5,000 a year. About 10 percent of them spent between CZK 10,000 and 20,000. In general, most of respondents (78 percent) were satisfied with their purchases of clothes on-line. Only 12 percent respondents stated that shopping on-line did not meet their expectations.

### 5.1 Customer Value Attributes towards Shopping Clothes On-line

The attributes of customer value used in the study were generated by the focus group interview carried with 12 respondents. In total, 25 attributes considered to be important for on-line shopping were selected for the questionnaire and explored further in the primary research. The attributes were grouped into seven dimensions such as website appearance, technical aspect of website, assortment, price, communication, shipping, and trust. The dimensions included attributes of benefits (e.g. product assortment and selection, shopping convenience, goods return policy and references from other on-line shoppers) and sacrifices (e.g. price, risk related to goods order and payment, anonymity of the seller – no personal contact, complicated claim policy and lack of physical contact in terms of product presentations).

Customer value attributes towards shopping clothes on-line were evaluated by a five-point Likert scale where 1 meant very unsatisfied, 5 very satisfied. The table 1 shows the mean

Tab. 1: Customer value dimension evaluation

Perceived customer value attribute dimensions	Number of attributes	Mean score
Technical aspects of the website	5	3.79
Communication with customers	4	3.70
Shipping	4	3.66
The first impression on website	3	3.65
Assortment	3	3.53
Trust and reputation	4	3.45
Price	2	2.96
<b>Total</b>	<b>25</b>	<b>3.53</b>

Legend: 1... very unsatisfied – 5 very satisfied

Source: own

scores for each customer value dimension measurement.

The findings of the research on customer value attribute evaluation in clothing on-line shopping have shown that all dimensions of customer value were evaluated well. Respondents expressed rather good satisfaction with all dimensions of the customer value. The best evaluated attributes were associated with the technical aspects of the web site (3.79), communication with customers (3.70), shipping (3.66), the web site appearance and the impression the web site makes on respondents (3.65). Attributes related to a product assortment and selection, trust and reputation, and price received lower mean scores. Respondents were slightly less satisfied with those attributes.

## 5.2 The Main Customer Value Dimensions Identified by the Research

To summarise the findings presented above and reduce them into a smaller number of factors in order to identify the underlying dimensions in customer value, factor analysis was used. Six factors with eigen values larger than or equal to one explaining almost 64 percent of the total variance in the data were extracted in terms of customer value components. The results of principal component analysis are presented in the table 2 below.

Orthogonal Varimax rotation assuming that resulting factors are uncorrelated was used to identify factors that could represent the main attribute dimensions of customer value for

shopping clothes on-line. The factor analysis was conducted on twenty five variables. The variables with factor loadings lower than 0.5 showing relatively low correlations of the variables with the factors were excluded and the analysis was repeated again. Finally, there were six factors including 17 variables (KMO = 0.748,  $p = 0.000$ ) gained by the factor analysis. The contribution of each variable to the identified six factors of customer value in terms of benefits and sacrifices was specified by the correlations of the variables with the factors. The factors were named and described according to the highest (rotated) factor loadings that showed relatively high correlations of the variables with the factors. The table 3 displays coefficients (loadings) that relate variables to the six rotated factors.

The first extracted factor explaining 14 percent of the total variance of perceived customer value includes four variables that are associated with the **website design and appearance**. It concerns the functional aspects of the website such as web design and affective aspects related to the website impression, i.e. how easy or difficult as well as pleasant/unpleasant is to browse the web site to find a product or to use the website, at all. Another important aspect of this factor is **communication** with customers and fast response to the customer's order. Customers wish to be informed on their orders processing and shipping.

Another important factor for shopping clothes on-line is **shipping** – general shipping terms, the need for fast and flexible shipping

**Tab. 2: Results of Principal Component Analysis (Rotation sums of squared loadings)**

Component	Eigenvalue	Percentage of variance	Cumulative percentage
1	4.084	14.054	14.054
2	1.697	12.121	26.175
3	1.563	10.423	36.599
4	1.322	10.117	46.716
5	1.105	8.907	55.622
6	1.035	7.940	63.562

Source: own

**Tab. 3: Varimax Rotated Component Matrix**

Attributes	Factor					
	Web site	Shipping	Annoyance	Assurance	Product presentation	Trust
Web impression	0.778					
Web design	0.680					
Fast response	0.647					
E-shop communication	0.608					
Payment conditions		0.751				
Flexible shipping		0.678				
Fast shipping		0.631				
Shipping conditions		0.586				
Goods return and money-back policy			0.811			
Difficult to use			0.669			
Transaction security				0.823		
Customer care (service)				0.745		
Information reliability				0.609		
Pictures of products					0.851	
Product description					0.733	
Trust						0.698
Relevant information						0.603
Percentage of variance	14	12	10	10	9	8

Note: Extraction method: Principal component analysis  
Rotation method: Varimax with Kaiser normalisation

Source: own

allowing a choice of different courier companies. Since many customers prefer to pay at the delivery, the payment terms and a choice of the payment method are also important. The factor of shipping explains more than 12 percent of the total variance of the perceived value for on-line clothing shopping.

The following two factors named **annoyance** and **assurance** are the factors that considerably influence customers' purchase intentions. Annoyance factor is associated with goods return and money-back policy and ease or difficulty to use the website and to follow the navigation to make an order on-line. This, to some extent, depends on customer's computer skills and his or her skills prior experience with Internet and/or on-line shopping. Annoyance factor represent aspects that may discourage customers from shopping on-line. However, the factor named assurance is even more important. It represents perceived uncertainty and risk attributes associated with the purchase on-line. Transaction security (security of payment, financial security, loss of privacy due to information provided when shopping on-line), providing true and reliable information, and good customer service represent a sacrifice factor that may limit the willingness of customers to shop on-line, as well. These two factors explain

almost 21 percent of the total variance of the perceived customer value toward shopping clothes on-line.

Subsequent extracted factor explaining almost nine percent of the total variance of customer value toward shopping clothes on-line is associated with a **product presentation** on the web site. The product photographs and description are the only attributes to catch customer attention and persuade him or her to make a purchase. A customer cannot see and touch the product physically. What is more in terms of purchasing clothes on-line, a customer cannot try on selected clothes and may have a difficulty to imagine how he or she would look like when wearing the clothes.

The sixth factor titled **trust** is related to the customer e-shop perception, its reputation and image. This factor can be considered to be another sacrifice factor that may lower the benefits of on-line shopping. Providing relevant information such as an address of the e-shop, telephone number and e-mail address enabling a personal contact with a customer, references and certain quality certificates may reduce a risk and increase trust of the customers.

The variables constituting six customer value attributes extracted by the factor analysis are presented in the table 4 below.

**Tab. 4: Perceived customer value dimensions toward shopping clothes on-line**

Factors	Number of variables	Customer evaluation	Variability percentage
Website	4	3.72	14.054
Shipping	4	3.64	12.121
Annoyance	2	3.69	10.423
Assurance	3	3.47	10.117
Product presentation	2	3.46	8.907
Trust	2	3.60	7.940
<b>Total</b>	<b>17</b>	<b>3.60</b>	

Legend: 1... very unsatisfied – 5 very satisfied

Source: own

In comparison to the customer value dimensions (technical aspects of the website, communication with customers, shipping, first impression on the website, assortment, trust and reputation, and price) used in the conceptual framework of the study, the factor analysis identified six dimensions of perceived customer value toward shopping clothes on-

line (see Tab. 4), and reduced the number of variables from 25 to 17. Whereas three factors (web site appearance, shipping and product presentation) are functional and can be attributed to the benefits that customers expect to get when shopping clothes on-line, the other three extracted factors (annoyance, assurance and trust) are affective and risk related ones,

and can be labelled as attributes of sacrifice.

Attributes identified by factor analysis were statistically tested by ANOVA and t-test in order to explore differences in on-line shopper perception by gender, age and income categories, shopping frequency category and the category of money spent on clothing bought on-line. Statistically significant differences in on-line shopper customer value attribute perception by gender were found in perception of web design ( $F = 4.405$ ,  $p = 0.036$ ) and providing relevant information ( $F = 7.996$ ,  $p = 0.005$ ). Women were more satisfied with the web design and provided information than men.

In terms of age ( $F = 3.291$ ,  $p = 0.006$ ), it was statistically proved that older people were satisfied with the speed of the e-shop response to a greater extent rather than younger people and people in productive age. Exploring differences in on-line shoppers perception by education, it was found that the overall web impression ( $F = 2.939$ ,  $p = 0.033$ ) and flexibility in shipping ( $F = 3.648$ ,  $p = 0.013$ ) were perceived by on-line shoppers differently. Shoppers with the secondary and higher education had more positive web impression and were more satisfied with the e-shop flexibility in shipping. Testing differences in customer on-line value attributes perception by on-line shopping behaviour, the findings show that online shoppers who spend more on clothing bought on-line are also more satisfied with the delivery speed ( $F = 5.722$ ,  $p = 0.001$ ). On-line shopping frequency had no influence on on-line shoppers perception of customer value attributes.

## Conclusions

This article attempts to identify perceived customer value dimensions of on-line clothes shoppers as the key antecedents that are likely to influence consumer purchase process in B-to-C e-commerce. There is a clear indication in the literature that customer satisfaction is influenced by customer value and customer value contributes to an increase of customer satisfaction. These facts were considered in the research design. The variables used in the study on perceived customer value attributes were evaluated in terms of customer satisfaction instead of using a scale that enables respondents to express their views or perceptions of the selected items.

The attributes identified by factor analysis are the attributes of benefits and sacrifices. The

research showed relatively high satisfaction with all identified customer value dimensions in clothing online shopping. If customers are satisfied even with the sacrifice attributes, it shows that the negative impact of those attributes on perceived customer value and customers' purchase intention was eliminated by e-shops to such extent that it might be ignored by customers, or what is more, it is perceived as a benefit. For example, if there is almost no risk associated with the payment, transaction security, shipping or goods return in case the clothes do not fit, these attributes can be perceived as benefits and certainly encourage customers to on-line shopping.

The most important dimensions that represent attributes of the perceived customer value concept for shopping clothes on-line identified by the study are as follows: website appearance and design, shipping, product presentation, trust, assurance and annoyance caused mainly by the goods return and money-back policy. All those attributes including the sacrifice ones received a positive evaluation in terms of respondents' satisfaction when shopping clothes on-line. Whereas the benefit dimensions of perceived customer value consist of functional attributes, the sacrifice dimensions are affective ones. They relate to the emotional and psychological aspects associated with trust and assurance.

It is important to mention that price was not identified as an attribute or even a variable composing a perceived customer value attribute. Price was among the variables that were excluded by factor analysis. Unfortunately there is no clear explanation for this finding. This would certainly require more attention and further exploration in another research study. One could only speculate why customers neglect the price when shopping for clothes on-line. One of the possible clarifications could be the fact that it is difficult to compare and look for lower price of clothes simply because internet offers such a big variety of clothing therefore it is difficult or almost impossible to find two exactly the same pieces of clothing on internet and choose the one with the lower price.

Nevertheless, the findings of the research study suggest that providing a user friendly web site with a good product presentation, favourable shipping conditions as well as reducing perceived risk by trust, assurance and favourable shopping experience are the

attributes that enhance perceived customer value in on-line shopping for clothes.

Another conclusion drawn from the findings gained by testing the stated hypothesis is that the Czech clothing online market is still rather homogenous. The number of identified customer value attributes perceived differently by on-line shoppers according to their gender, age and education was very low. There were one or two attributes out of seventeen perceived differently by each demographic category. There was one customer value attribute perceived significantly different by on-line shopper according to their spending on clothing bought online. There were no significant differences in customer value attribute perception found by the frequency of online shopping. The future research shows whether the identified differences will form the base for customer segmentation of the Czech clothing on-line market.

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**ATTRIBUTES CONTRIBUTING TO PERCEIVED CUSTOMER VALUE IN THE CZECH CLOTHING ON-LINE SHOPPING****Jozefína Simová, Ľubica Cinkánová**

*This paper, based on the literature study, presents findings of the research focused on the concept of customer value in on-line shopping for clothes. It examines and identifies attributes of perceived customer value in terms of benefits and sacrifices by applying a multi-attribute model.*

*Customer value concept used in the research was defined and measured in terms of functional and affective dimensions. The perception of selected customer value attributes was measured as customer satisfaction, i.e. as a result of a congruence between the perceived and evaluated reality (benefits and sacrifices offered by on-line shopping), and customer expectations. The attributes evaluated the best were those that contributed to customer satisfaction the most and thus represented important attributes of customer value dimensions. In total, 25 attributes considered to be important for on-line shopping were selected for the questionnaire and explored further in the primary research. A principal components analysis and orthogonal Varimax rotation were used in the analysis to obtain factors that respondents considered to be attributes of the perceived customer value for shopping clothes on-line. The factor analysis identified six dimensions of perceived customer value toward shopping clothes on-line: three factors (web site appearance, shipping and product presentation) are functional and can be attributed to the benefits that customers expect to get when shopping clothes on-line, the other three extracted factors (annoyance, assurance and trust) are affective and risk related ones, and can be labelled as attributes of sacrifice.*

*The number of identified customer value attributes perceived differently by on-line shoppers according to their gender, age, education and shopping behaviour was very low. This means that clothing online market is rather homogenous. The future research will show whether the identified differences will form the base for customer segmentation of the Czech clothing on-line market.*

**Key Words:** *On-line shopping, clothing, customer, customer value, attributes, Czech Republic.*

**JEL Classification:** *M31, L81.*

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