



THE ROAD INFRASTRUCTURE AS A DETERMINANT OF THE ENTREPRENEURIAL ENVIRONMENT DEVELOPMENT IN THE CZECH REPUBLIC REGIONS

Koišová Eva¹, Waldemar Gajda²

¹ A. Dubček University of Trenčín, ²Warsaw Management School

Annotation

In the connection with the regions development, the road infrastructure is considered as a factor which affects the economic and social development characteristics of the regions. It is possible to reduce regional disparities gradually by enhancing and improving quality of the road infrastructure and this way to contribute to entrepreneurial environment improvement. In the paper, we are dealing with the road infrastructure and its effect on the selected indicators of the entrepreneurial environment such as: GDP and the number of economic subjects (enterprises) in the Czech Republic. For the need of analysis, we use data on all three researched factors from the time series 2010 - 2014. The aim of this paper is to analyse the development of the road infrastructure, GDP and economic subjects of the regions in the Czech Republic and to quantify the dependency power between the road infrastructure, GDP and the economic subjects. For the purpose of the research, we have chosen administrative approach to structure regions according to NUTS III classification. The strong correlation between the road infrastructure and GDP has not been confirmed in all observed regions as well as the effect of the road infrastructure and the number of economic subjects. We used methods of time series analysis, variation coefficient, correlation coefficient, comparison and synthesis.

KEY WORDS: region, road infrastructure, entrepreneurial environment, GDP, economic subjects.

Introduction

There are still non-unified opinions of economists and geographers on the effect of the road transport on the development of the regions. Some of them consider the road transport as a catalyzer of the economic development. Other group of authors (Rephann 1993, Banister a Berechman 2001, Marada, Květoň, Vondráčková 2006) understands it as necessary, however not sufficient condition of this development. Whitelleg (1994) came to the similar conclusions in his work. According to him, the causal relationship between good road connection and economic success of the region does not exist. On the contrary, Polish author Rosik (2004) brought interesting work analysing theories of the regional development from the road infrastructure perspective. According to this author, in some theories such as the theory of balanced and unbalanced development the road infrastructure is the central point.

From the creation of favourable entrepreneurial environment perspective, the road transport plays its irreplaceable role. The success of the enterprise is mostly determined by the environment in which enterprise operates. It does mean what conditions exist for the development of entrepreneurial activities in a given surroundings. Therefore, economics realize their infestations in the road transport with the aim to increase availability of enterprising also in less developed regions which have the high rate of unemployment and by this way to strengthen competitiveness of the region.

The road infrastructure, as a part of the transport infrastructure, contributes to the social and economic development of the region as well as it helps to increase quality of the entrepreneurial environment, because it

helps to interconnect regions, places, people and economics (Patarasuk 2013). According to Masárová and Šedivá (2013), the road infrastructure is considered as one of the cornerstones for achievement of the economic growth, the increase of competitiveness and the society prosperity, the improvement of the social status of citizens and the increase of employment. The improvement of the road network increases availability, mobility and decreases distance, travelling costs and travel time. Havierníková and Janský (2014) in their work, except other authors, researched the task of the road infrastructure in the area of the regional development and regional disparities.

In the connection with the regions development, the road infrastructure is considered as factor which affects the economic and social development characteristics of the regions. Therefore, it is possible to reduce regional disparities gradually by means of enhancing and improving quality of the road infrastructure (Masárová and Koišová 2015). Stephan (1997), in his research work, pointed to strong correlation between the road infrastructure and created product in German manufacturing industry at the level of federal states. According to him, differences in the road infrastructure are one of the factors explaining differences in productivity between production in eastern and western countries of Germany.

Goals and methods

The aim of this article is to analyse development of the road infrastructure, GDP and economic subjects in the regions of the Czech Republic and to quantify the strength of dependency between the road infrastructure, GDP and economic subjects. In the paper, for the need of

analysis, we use data on all three researched factors from the time series 2010 - 2014 such as road infrastructure, economic subjects and gross domestic product have been available. The length of the time series was determined based upon available data on researched factor economic subjects where data on all regions were not available. Other factor was regional GDP where year 2015 data were not available. We used data base of the Czech Statistical Office and Ředitelství silniční dopravy České republiky (ŘSD ČR).

For the purpose of the research, we selected administrative approach to structure regions according to NUTS III classification. In the Czech Republic (ČR), NUTS III regions are these: Central Bohemia, South Bohemia, Plzeň, Karlovy Vary, Ústí nad Labem, Liberec, Hradec Králové, Pardubice, Vysočina, South Moravia, Olomouc, Zlín, Moravia-Silesia and Prague.

In order to determine relative variation, the variation coefficient is used. It is the ratio of standard deviation and the arithmetic mean expressed in percentage.

$$V_x = \frac{\sigma}{x} \quad (1)$$

In order to quantify dependency strength between researched factors, we used correlation coefficient which measures strength of statistical dependency between two quantitative variables. It does not express causal-consecutive relationship of variables, but it explains to which extent one, respectively more phenomena (independently variable values) invoke effect on dependent variable. We use Pearson correlation coefficient.

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}} \quad (2)$$

Where x, y are random variables. We calculate them from n matched values (x_i, y_i) measured on n randomly selected units. Correlation coefficient r has values from range $(-1; 1)$.

Analysis of the selected factors of the entrepreneurial environment

In the following part, we will be observing development of the selected factors such as road infrastructure (specifically expressways and motorways), gross domestic product and economic subjects (enterprises). In order to determine disparities in development of the the selected factors, we will observe also variation coefficient.

Road infrastructure

Expressways and motorways have special status in the economy development. There are dedicated for transport connection between important centers of state and international importance and to connect to motorway network of the neighbouring states. They copy routes of the biggest transport load, and at a certain conditions take significant part of the transportation from parallel lower level roads. They are marked as superior road infrastructure (Masárová and Šedivá 2013). In the connection with the entry of the Czech Republic into the EU, it was paid a big attention to the roads which were part of the Trans-European Transport Network.

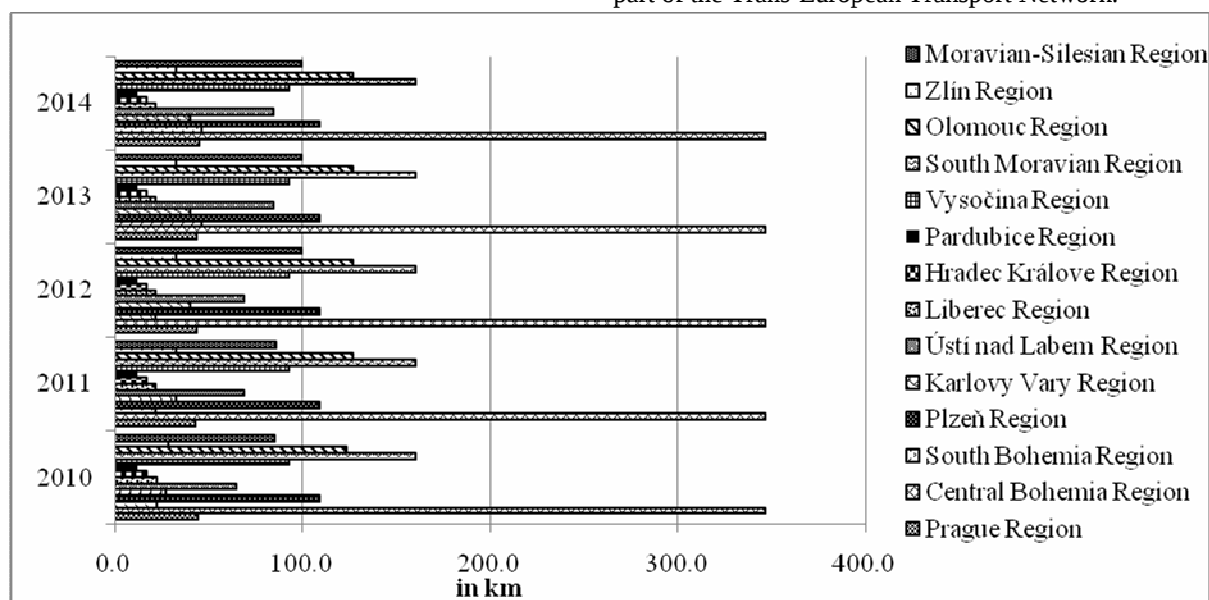


Fig. 1. Development of the length of motorway and expressways together in the Czech Republic
Source: Processed based upon RSD ČR data

The longest expressways and motorways network is in the Central Bohemia Region 346.3 km in all observed time series. We observed significantly the lowest length of the motorways and expressways in the Pardubice (12 km) and Hradec Králové Region (16.8 km). It is

necessary to note, that there are no expressways in the Vysočina and Plzeň Region and there are no motorways in the Liberec and Karlovy Vary Region.

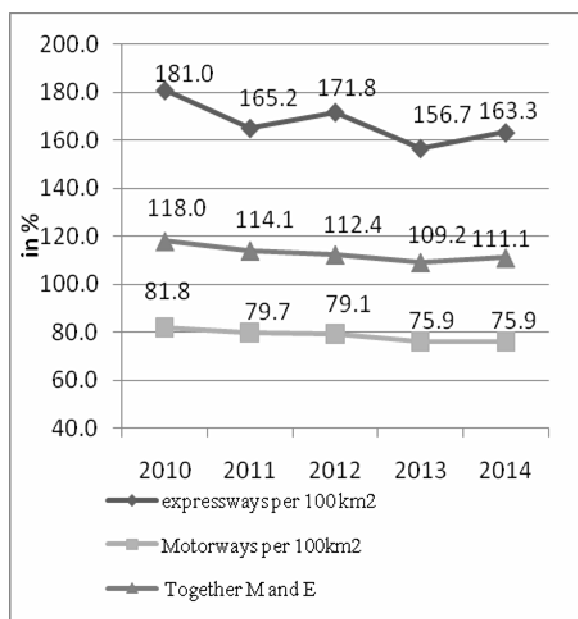


Fig. 2. Variation coefficient of amenities of ČR regions with road communications (%)

Source: Processed based upon RSD ČR data

In order to calculate variation coefficient, we calculated the length of expressways and motorways per 100 km² of the region area. From the Figure 2 it follows that the highest variability is in the area of expressways in the regions in the Czech Republic. It was decreased from 181 % in 2010 to 163.3 % in 2014. The motorways variability is slightly lower but still very high. Also in the case of motorways, it was bigger decrease of disparities as well as in the case of expressways from 81.8 % in 2010 to 75.9 % in 2013 and 2014. The variability of the overall length of the road communications ranges from 118 % in 2010 to 109.2 % in 2013 when the lowest disparities were recorded.

Gross Domestic Product per capita

The entrepreneurial environment, but mainly entrepreneurial activities are also affected by the development of the gross domestic product which is a main macroeconomic indicator which evaluates economic rank of the state as a whole as well as its regions. GDP increase is transitioned into a larger amount of finance available for a new established enterprise.

Tab. 1. Development GDP per capita in the Czech Republic in Kč, Source: Processed based upon ČSÚ data

Region	2010	2011	2012	2013	2014
The Czech Republic	375,921	383,218	384,575	387,900	404,843
Prague Region	811,822	808,490	803,559	807,486	829,168
Central Bohemia Region	333,680	345,593	348,294	347,177	369,335
South Bohemia Region	317,054	319,614	326,066	331,474	343,817
Plzeň Region	346,460	353,547	345,375	361,465	384,101
Karlovy Vary Region	269,200	272,823	270,953	270,921	276,941
Ústí nad Labem Region	298,627	301,370	301,682	300,926	309,564
Liberec Region	287,144	293,619	298,671	300,639	315,209
Hradec Králové Region	327,441	330,297	331,871	333,658	356,040
Pardubice Region	308,768	320,213	305,082	312,191	327,545
Vysočina Region	300,530	315,793	322,618	326,186	334,994
South Moravian Region	353,185	361,063	370,535	385,622	397,233
Olomouc Region	285,621	296,099	299,335	299,515	314,478
Zlín Region	313,138	323,620	323,256	329,349	359,354
Moravian-Silesian Region	311,598	328,364	331,321	323,090	337,741

From Table 1 it follows that the highest GDP per capita is in the Prague Region where it reached value of 829,168 Kč per capita. The lowest GDP per capita was reached in the Karlovy Vary Region in 2010 amounted to 269,200 Kč per capita, but in 2014, it increased approximately by 3% compared to 2010.

In the whole observed time series none of the regions reached half of GDP of the smallest region which is the Prague Region. The South Moravia Region was nearest to this value in 2014.

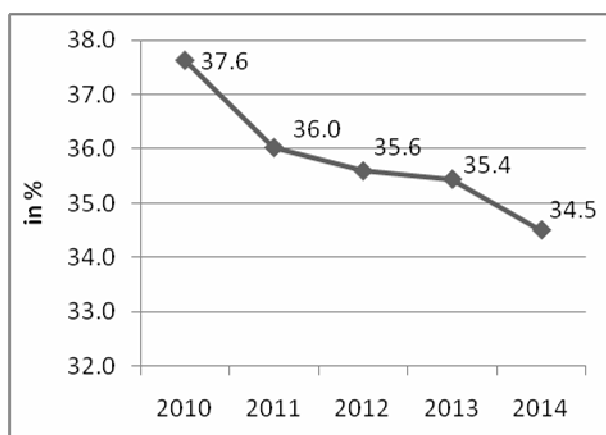


Fig. 3. Variation coefficient GDP (%)
Source: Processed based upon ČSÚ data

We can state that there are not high values of variation coefficient in the Czech Republic which means low disparities in GDP development. We can positively evaluate this fact. The biggest disparities in GDP development per capita were in 2010, but these were developing favourable gradually, and at the end of the observed period 2014 were decreased up to the level of 34.5 % yet. The Czech Republic within the Visegrad

Group is the most powerful economy which is also supported by low regional disparities of GDP.

The number of economic subject

Qualitative entrepreneurial environment is an important factor of economic development. Therefore, on the present, the entrepreneur development represents general concept for central and local governments as economic development factor especially in stagnant parts of the country. According to Czech Statistical Office, economic subjects are business companies, cooperatives, state enterprises, natural persons as sole traders, self-sufficient farmers and other private entrepreneurs. In Table 2, we can see development of the number of economic subjects in the Czech Republic according to regions.

Again, we can observe the highest number of economic subjects again in the Prague Region where we recorded 557,736 subjects in 2014. In 2012, in the Central Bohemia Region we recorded 323,025 economic subjects. It is the second region with the highest number of economic subjects in the whole observed period.

Tab. 2. The number of economic subjects in the Czech Republic, Source: Processed based upon ČSÚ data

	2010	2011	2012	2013	2014
The Czech Republic	2, 637,551	2,703,444	2,727,654	2,694,737	2,733,459
Prague Region	506,273	529,377	544,840	540,360	557,736
Central Bohemia Region	307,761	317,598	323,025	314,688	319,758
South Bohemia Region	155,762	158,543	160,091	159,363	160,786
Plzeň Region	144,632	147,419	147,750	141,202	142,307
Karlovy Vary Region	82,322	83,396	83,103	76,802	76,602
Ústí nad Labem Region	176,422	178,718	179,126	172,030	173,415
Liberec Region	117,230	118,766	119,908	114,472	115,262
Hradec Králove Region	132,423	134,689	135,372	133,970	135,019
Pardubice Region	112,121	114,072	115,333	115,116	116,363
Vysočina Region	103,510	105,185	106,578	107,395	108,800
South Moravian Region	283,202	291,162	294,308	295,523	300,204
Olomouc Region	136,229	138,970	135,201	137,119	138,347
Zlín Region	134,374	136,725	138,269	138,197	138,832
Moravian-Silesian Region	245,290	248,824	244,750	248,500	250,028

We can see the lowest values in the Karlovy Vary Region where we can also observe unfavourable

development because in 2014 the number of the economic subjects decreased from 83,396 in 2011 to 76,602 in 2014.

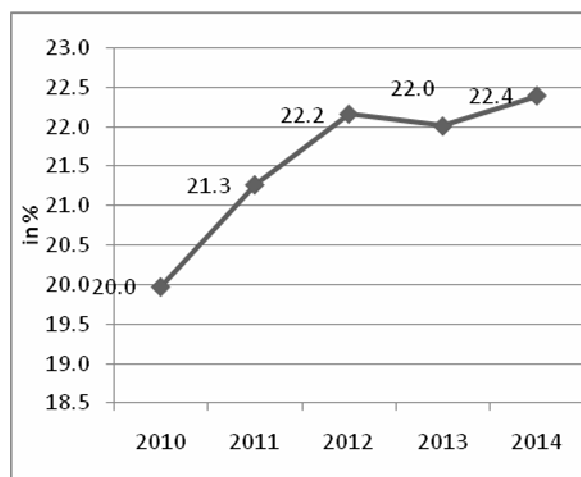


Fig. 4. Variation coefficient of the economic subjects (%)
Source: Processed based upon ČSÚ data

In order to calculate variation coefficient, we calculated the value per 1,000 citizens. Variation coefficient had lower values in 2010, but its development was unfavourable. The value of the coefficient is increasing which causes that disparities are increasing also. In the Czech Republic mainly the Karlove Vary

Region contributed to the disparities increase in the observed factor.

Evaluation of the dependency between road infrastructure and GDP per capita

In order to quantify strength of dependencies between the road infrastructure and GDP, we used correlation coefficient. In order to calculate these indicators, we calculated measured values of independent variable i.e. the road infrastructure per 1000 citizens and dependent variable i.e. GDP is stated per capita.

Based upon calculated correlation coefficients, we can state, that we recorded strong direct dependency in the Prague and South Bohemia Region. It results from this, that the more the road infrastructure is increasing in the region, the more GDP is increased. In the Liberec and South Bohemia Region, we recorder strong negative correlation. In these regions, increasing of the road infrastructure does not contribute to the increasing of the regional GDP, but contrariwise it leads to its decreasing. The road infrastructure of the Prague, South Bohemia and slightly of Zlín and Vysočina Regions contributes to the improvement of the entrepreneurial environment.

Table 3. Correlation coefficients. Source: Own processing

Region	Prague Region	Central Bohemia Region	South Bohemia Region	Plzeň Region	Karlovy Vary Region	Ústí nad Labem Region	Liberec Region
Correlation coefficients	0.89294	-0.67639	0.853965	0.003141	0.492678	-0.18594	-0.91849
Region	Hradec Králove Region	Pardubice Region	Vysočina Region	South Moravian Region	Olomouc Region	Zlín Region	Moravian-Silesian Region
Correlation coefficients	-0.29587	0.270255	0.518392	-0.85522	0.151835	0.554911	0.013168

Evaluation of dependency between the road infrastructure and the number of economic objects

In order to calculate these indicators, we calculated measured values of independent variable i.e. the road infrastructure per 1,000 citizens and dependent variable i.e the number of economic subjects per 1,000 citizens in the region.

We measured the strong direct dependency between the road infrastructure and the number of economic subjects in the Zlín and Pardubice region. The more the road infrastructure is increased in the region, the more it influences the number of economic objects in that region. The strong indirect dependency is in the South Moravia Region and slight indirect dependency is in the Olomouc and Karlovy Vary Region.

Table 4. Correlation coefficients. Source: Own processing

Region	Prague Region	Central Bohemia Region	South Bohemia Region	Plzeň Region	Karlovy Vary Region	Ústí nad Labem Region	Liberec Region
Correlation coefficients	0.383397	-0.06838	0.495739	0.0928	-0.40517	-0.26124	0.220235
Region	Hradec Králove Region	Pardubice Region	Vysočina Region	South Moravian Region	Olomouc Region	Zlín Region	Moravian-Silesian Region
Correlation coefficients	0.0567	0.798051	0.528604	-0.96282	-0.48631	0.891115	0.45257

Conclusions

The development of the entrepreneurial environment depends on the economic surroundings of the subject. In the paper, we analysed three factors which determine economic surroundings such as the road infrastructure, GDP and the number of economic subjects in Czech Republic regions. The road infrastructure is one of the factors which significantly affects economic and social development and prosperity of the regions. Expressways and motorways have special status in the regional development.

Based on the road transport analysis, we can state that the longest motorways and expressways network is in the Central Bohemia Region and we also have recorded significantly the lowest length of the motorways and expressways in the Pardubice Region. We have found out, by the research of the variation coefficient, that the highest variability in the road infrastructure equipment of the Czech Republic regions was in 2010. Since 2010 it decreased in 2013 from 118 % to 109 % and in 2014 it slightly increased. Other researched factor was GDP per capita in the particular Czech Republic regions. We have selected this indicator due to the fact that GDP is the main macroeconomic indicator. The Prague Region shows the highest values in the whole observed period. Other regions did not even reach 50 % of the GDP per capita value of the best region. The Prague Region belongs to the most developed EU regions. GDP variation coefficient shows that the biggest GDP per capita development disparities were in 2010, but these were developing gradually and favourably and at the end of the observed period they even decreased. The highest number of the economic subjects is in the Prague and Central Bohemia Region, whilst the lowest number is in the Karlovy Vary Region. Even though the variation coefficient has the lowest values, its development points out disparities increasing in the development of the economic subjects.

By evaluating the dependency between the road infrastructure and GDP per capita, we came to a conclusion that there is strong direct dependency in the Prague Region and the South Bohemia Region where the increase of the road transport affect the GDP per capita development favourably. The Liberec and South Moravia Region show negative dependency. In these regions, the increase of the road infrastructure does not contribute to the increase of regional GDP, but on the contrary, it leads

to its decreasing. Measuring dependency between the road infrastructure and the number of economic subjects, we identified strong direct dependency between the road infrastructure and the number of economic subjects in the Zlín and Pardubice Region. The more the road infrastructure is increasing in the region, the more it will affect the number of the economic subjects in the region. The strong indirect dependency is in the South Moravia Region whilst slight indirect dependency is in the Olomouc and Karlovy Vary Region.

To summarize, we can state that the Czech Republic within the Visegrad Group is the most powerful economy with moderate and low regional values of disparities.

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Ing. Eva Koišová, PhD., Department of Economy and Economics, Faculty of Social and Economic Relations, Alexander Dubcek University of Trencin, Studentská 3, 915 50 Trenčín, Slovakia. Position: Assistant Professor. Mail: eva.koisova@tnuni.sk. She is an authoress of many scientific publications and papers issued domestically and abroad (Czech Republic, Lithuania, Turkey, Bulgaria, Poland, UK and Canada). The area of scientific interest is Regional economy and development, finance and enterprise financing and Finance and currency.

Waldemar GAJDA, dr inż., doktor nauk ekonomicznych. Rector. Warszawska Szkoła Zarządzania – Szkoła Wyższa ul. Siedmiogrodzka Address. 3A 01-204 Warszawa, Phone. +48 885 888 788 E-mail. waldgaj@vp.pl

