



**Ekonomická univerzita v Bratislave**  
**Fakulta medzinárodných vzťahov**  
**University of Economics in Bratislava**  
**Faculty of International Relations**



Zborník príspevkov  
z 18. medzinárodnej vedeckej konferencie

***Medzinárodné vzťahy 2017:  
Aktuálne otázky svetovej  
ekonomiky a politiky***



***International Relations 2017:  
Current issues of world  
economy and politics***

Conference proceedings  
18<sup>th</sup> International Scientific Conference

Smolenice Castle  
30<sup>th</sup> November – 1<sup>st</sup> December 2017

Publishing Ekonóm  
2017

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ISBN 978-80-225-4488-7



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Fakulta medzinárodných vzťahov Ekonomickej univerzity v Bratislave  
s podporou Taipejskej reprezentačnej kancelárie v Bratislave a Slovenskej asociácie pre  
Organizáciu spojených národov  
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# MEASUREMENT OF TERRITORIAL UNITS COMPETITIVENESS

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In the age of globalization, the issue of territorial units competitiveness is of increasingly central importance for economic growth of countries. The article deals with methods of assessing the territorial units competitiveness and points to possible inaccuracies in the use of different benchmarking methodologies. Four territorial units (Czech Republic, Slovakia, European Union, United States) were assessed through GDP in volume, GDP per capita, labour productivity, indicators of innovation activity and composite indicators. It was found that comparison of territorial units must be carried out in the context of the methodology used so that the conclusions are not inaccurate or even wrong. It is necessary to take into account both the reporting ability of the analysis procedures and the influence of the units used in the indicators<sup>1</sup>.

**Key words:** Competitiveness, GDP, labour productivity, innovation, composite indicator

**JEL:** R11,O11,O16

## Introduction

Competitiveness can be defined in different ways. This term can be understood on many levels. Competitiveness is often linked to the competitiveness of companies. It is possible to measure the competitiveness of the enterprise to other enterprises or in comparison to the competitiveness of enterprises in other states or regions. From another point of view, it is to monitor the competitiveness of the whole economy as compared to other economies. The aim of the paper is to analyse the possibilities of assessing the competitiveness of economies with differently defined indicators.

International comparison of the economic status and development can be rated in various ways, using some economic or human development indicators. Enhancement of economic well-being of the EU countries belongs to the main goals of the 28 EU Member States. It is usually done by comparison of the levels and real changes of the gross domestic product (GDP). The improvement of well-being expects the convergence of socio-economic indicators<sup>2</sup>.

Competition in world markets is more intense due to globalization. There are many ways to increase competitiveness (e.g.: make regular innovations by products and services offered by the company, permanently modernize production technologies, search for new distribution routes and to use ICT resources efficiently, innovate internal business processes in conjunction with a substantial organizational change in internal company environment<sup>3</sup>).

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<sup>1</sup> This paper was supported by the Grant Agency of the University of South Bohemia GAJU č. GA JU 053/2016/S

<sup>2</sup> CARNICKY, S. – MEGYESIOVA, S. – CONKOVA, M. – ZAVADSKY, C. (2017): Productivity development and convergence across the EU Member States, p. 13-17.

<sup>3</sup> RAŠKA, Z. (2007). Inovace ve finančním řízení, p 256.

The development economies combine the growth of competitiveness with innovation activities<sup>4</sup>. Innovations and innovation activities are becoming an object of serious concern to government executives, public institutions<sup>5</sup>, enterprises<sup>6</sup>. However, the main role is for firm, i.e. innovation in terms of creating new products and practices can be an important part of tackling economic growth. OECD and the EU play a key role. These organizations support an appropriate environment for innovation, provide funding for research and remove barriers to the development of innovation.

Innovation contributes to business in several ways. Studies have identified for instance a strong link between enterprises performance and new products. New created products help enterprises to maintain market shares and increase profitability in the given markets<sup>7</sup>.

Many countries have been engaged in the Fourth Industrial Revolution for several years. Industry 4.0 fundamentally changes the character of industry, energy, trade, logistics, and other parts of the economy. The Czech Republic approved in 2016 the Industry 4.0 initiative whose long-term goal is to maintain and strengthen the competitiveness of the Czech Republic. The digitization of the economy takes place across a wide range of industries, and the goal of Industry 4.0 is to bring complete digital interconnection to all levels of value added - from product development to logistics. This means radical change and investment planning in large and small businesses, productivity change, the importance of IT skills in all areas of business and across a range of jobs, which will significant impact on the labour market and education<sup>8</sup>.

There is practically no sophisticated way of measuring the competitiveness of state or administrative units. There are many approaches that can be divided into traditional and modern. Every approach has its strengths and weaknesses. The traditional measure of strengthening competitiveness is the growth of gross domestic product (comparison of GDP growth rate in the form of volume indices). For better international comparisons, it is advisable to compare GDP growth in purchasing power parity (PPP). This approach is problematic because countries where GDP is high cannot achieve such growth as states with very low levels of GDP. Another problem is that the dynamics of the population of compiled units, which may influence the rate of GDP growth in the longer term, is not taken into account<sup>9</sup>.

National accountants have developed sophisticated methods for separating out movements in GDP “at current prices” into two components:

- an indicator of the change in quantity (the “real GDP” or, preferably, “GDP in volume”);and
- an indicator of the change in prices, called the “GDP deflator”.

$$[1 + \text{the growth rate (divided by 100) of GDP at current prices}] = \\ [1 + \text{the growth rate (divided by 100) of GDP in volume}] \times \\ [1 + \text{the growth rate (divided by 100) of the GDP deflator}].$$

This is because one can derive from this fundamental equation the following equation:

$$[1 + (\text{Growth rate of GDP in volume}/100)] = [1 + (\text{Growth rate of GDP at current prices}/100)] \\ / [1 + (\text{Growth rate of the GDP deflator}/100)].$$

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<sup>4</sup> VEBER, J. (2016): Management inovací. Praha: Management Press.

<sup>5</sup> DUSEK, J. (2017): Evaluation of Development of Cooperation in South Bohemian Municipalities in the Years 2007-2014, p. 342

<sup>6</sup> MURA, L. – ROZSA, Z. (2013): The impact of networking on the innovation performance of SMEs, p 1037

<sup>7</sup> TIDD, J. – BESSANT, J. – PAVITT, K. (2007): Řízení inovací: zavádění technologických, tržních a organizačních změn.

<sup>8</sup> INICIATIVA PRŮMYSL 4.0. [on-line]. Ministerstvo průmyslu a obchodu ČR

<sup>9</sup> LEQUILLER, F., – BLADES, D. (2006): Understanding national accounts.

GDP in volume is calculated by dividing GDP at current prices by a price index that is equal to 100 for a set base period. Exactly the same approach is used for spatial comparisons.

GDP in volume is obtained by dividing GDP at current prices by a “purchasing power parity” index, set to equal 100 for a given country.<sup>10</sup>

Competitiveness can also be measured by other indicators such as productivity. Deeper analysis of the productivity is needed to discover the competitiveness, standard of living within a country or its regions. Measures of productivity are important indicators for statistical analysis of economic growth of a country. Generally productivity is a ratio of a volume measure output to a measure of input use. The most used indicator of productivity is labour productivity. Labour productivity as an additional measure of the competitiveness of economies can be defined differently. Indicator of labour productivity shows the efficiency of utilization factors of production and the production possibility of all economy. There are two sources of labour productivity growth: technical progress and increases in the average capital–labour (K–L) ratio<sup>11</sup>. Labour productivity is influenced by many shocks. There are two types of structural shocks: (1) technological shocks, that is changes in the technological progress which affects labour productivity in the long-run, and (2) non technological shocks, that is all the other shocks that affect labour productivity temporarily through its effects on capital accumulation and aggregate demand<sup>12</sup>.

Productivity growth slowed in many OECD countries even before the crisis, which amplified the phenomenon. The slowdown in knowledge-based capital accumulation and decline in business start-ups over this period also raises concerns of a structural slowing in productivity growth. Three policy areas appear to be of key importance to sustain productivity growth: i) foster innovation at the global frontier and facilitate the diffusion of new technologies to firms at the national frontier; ii) create a market environment where the most productive firms are allowed to thrive, thereby facilitating the more widespread penetration of available technologies; and iii) reduce resource misallocation, particularly skill mismatches (OECD 2001)<sup>13</sup>.

The state of development can be rated in various ways, using some economic or human development indicators. Enhancement of economic well-being of the EU countries belongs to the main goals of the 28 EU Member States. The improvement of well-being expects the convergence of socio-economic indicators. The economic crisis activated the divergence of labour productivity<sup>14</sup>.

In addition, modern concepts of competitiveness are based on the thesis of the priority of the quality of the legal environment. The share of creative industries (innovation or scientific progress) on total structure of the national economy is other view on competitiveness. There is an effort to define how economic performance cannot be measured solely by economic growth or declining unemployment, but also by using soft indicators such as the share of creative industries in GDP or the level of education or quality of life<sup>15</sup>.

Another possibility is using of composite indicators (purpose is to provide a synthesis combining indicators into a single indicator) e.g. human development index (HDI). Nowadays, there are many sets of indicators that are typically used by statistical authorities to address

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<sup>10</sup> LEQUILLER, F., – BLADES, D. (2006): Understanding national accounts.

<sup>11</sup> GUEST, R. (2011): Population ageing, capital intensity and labour productivity, p. 371-388

<sup>12</sup> TRAVAGLINI, G. (2012): Trade-off between labor productivity and capital accumulation in Italian energy sector, p 35-48.

<sup>13</sup> OECD (2001). Measuring Productivity - OECD Manual. Measurement of Aggregate and Industry-level Productivity Growth. Paris: OECD Publishing. In Measuring Productivity - OECD Manual, 2001.

<sup>14</sup> CARNICKY, S. – MEGYESIOVA, S. – CONKOVA, M. – ZAVADSKY, C. (2017): Productivity development and convergence across the EU Member States, p. 13-17.

<sup>15</sup> KISLINGEROVÁ, E. (2014): Nové trendy ve vývoji konkurenceschopnosti podniků České republiky: v globální světové ekonomice.

economic, social and environmental phenomena, such as the World Economic Forum (Global Competitiveness Index) or IMD - International Institute for Management Development (World Competitiveness Ranking). This index evaluates how countries direct their resources and competencies to increase prosperity.

## 1 Data and methodology

The objective of this article is to analyse the selected options for assessing the competitiveness of economies and to point out differences in results using the same indicators expressed differently. First analysis was made with helping an index of GDP (volume index) and by using an index of GDP per capita.

The main source of data was Eurostat and the OECD (The OECD Economic Outlook). A volume index (GDP) is a weighted average of the changes between two periods in the quantities of a given set of goods or services. The two periods can be consecutive or non-consecutive. The quantity ratios are independent of the units in which the quantities are measured. Most of the indices can be expressed in the form of weighted averages of these price or quantity ratios.

In most OECD countries, the national accounts in volume are calculated at the prices of the previous year and then chained. The chained accounts use as weights the prices of the previous year and are therefore suitable for measuring changes in volume. Their drawback is their non-additivity.

**The Laspeyres volume index** ( $Lq$ ) is a weighted average of the quantity ratios:

$$Lq = \frac{\sum_i \frac{q_{i,t}}{q_{i,0}} \cdot v_0}{\sum_i v_{i,0}} = \frac{\sum p_0 q_t}{\sum p_0 q_0}, \quad v_{i,0} = p_{i,0} \cdot q_{i,0} \quad (1)$$

The period providing the weights for the index is known as the “base” period.

In next step was used a spatial index of GDP. In the case of a spatial index, the base is a country or a region, and not a period. For the base in spatial comparisons, the OECD usually uses either the average level of prices for OECD countries or more simply, the level of prices in the United States or the level of prices in EU (using EUROSTAT).

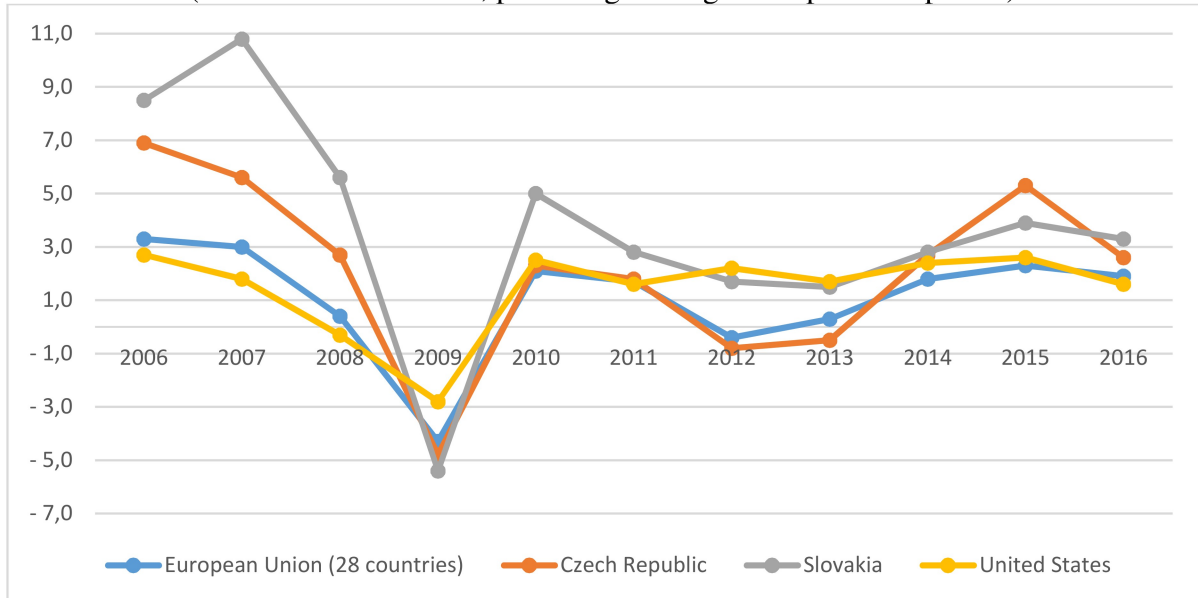
Labour productivity is as another benchmark of the competitiveness of economies. It can be defined in different ways. The most used definition is GDP per hour worked. In this case, it is interesting to compare not only the indicator level but also the index.

Growth of competitiveness is mainly influenced by innovation activities, it can be further used to compare e.g. the indicator of ICT of value added, and share of gross domestic spending on R&D. ICT value added is the difference between the Information and Communication Technology sector gross output and intermediate consumption. The aggregate of information industries here includes ISIC rev. 4 Division 26 (Manufacture of computer, electronic and optical products) and Section J (Information and communication), which in turn consists of Divisions 58-60 (Publishing and broadcasting industries), 61 (Telecommunications) and 62-63 (Computer programming, and Information service activities). Gross domestic spending on R&D is defined as the total expenditure (current and capital) on R&D carried out by all resident companies, research institutes, university and government laboratories, etc., in a country. These indicators are measured in percentage of value added.

## 2 Results

The competitiveness of the four countries was first assessed by means of growth rates in volume of GDP for four countries or regions (figure 1) and GDP per capita respectively (Table 1).

**Figure 1: Gross domestic product at market prices**  
(Chain linked volumes, percentage change over previous period)



Source: Own calculations based on the data OECD Economic Outlook

Figure 1 shows a fluctuation in all regions surveyed in the economic crisis (2009) when GDP growth was negative. A further decline in the growth rate of GDP is in 2012-2013 in particular for two territorial units (EU (28 countries) and Czech Republic). In the last year under review, GDP growth in Slovakia and the Czech Republic is higher than the EU average (28 countries) than in the US.

The above international comparison is not completely convincing. There is in fact a fundamental difference between the United States, Europe, Czech Republic and Slovakia that is often overlooked. That is because the population of the United States is structurally more dynamic than European Union. This means that it is better to compare growth in GDP per inhabitant rather than in GDP itself.

**Table 1: Growth in real GDP and in real GDP per head 2010-2015, average annual growth rate in percentage**

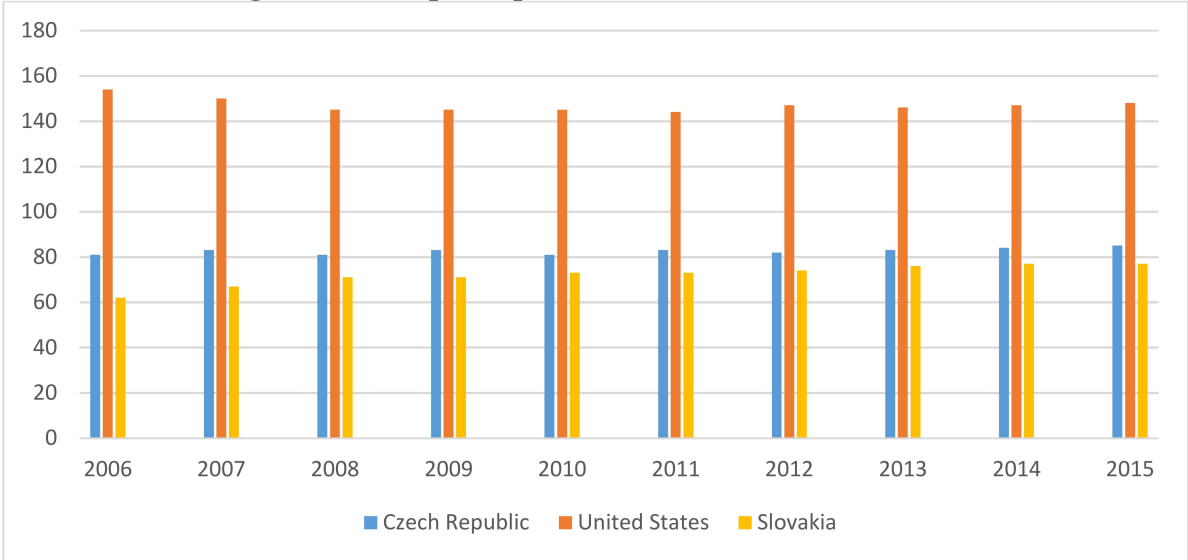
	Volume index	Per capita, constant prices, constant exchange rates, OECD base year
Czech Republic	1.57	1.53
United States	2.04	1.27
European Union (28 countries)	0.96	0.74

Source: Own calculations based on the data OECD Economic Outlook

The difference between the growth rates per capita (United States) was only 0.53 points in the case of European Union (instead of 1.08) and 0.26 points for the Czech Republic (instead of 0.47 points). The differences between the three countries surveyed are not so significant if we use the GDP growth per capita to compare.

Another option to compare the development of regions' competitiveness is to use a spatial index where the basis of the comparison is the country or region and not the value of the indicator in another period. Figure 2 shows a comparison of GDP per capita with "purchasing power parities (PPP)".

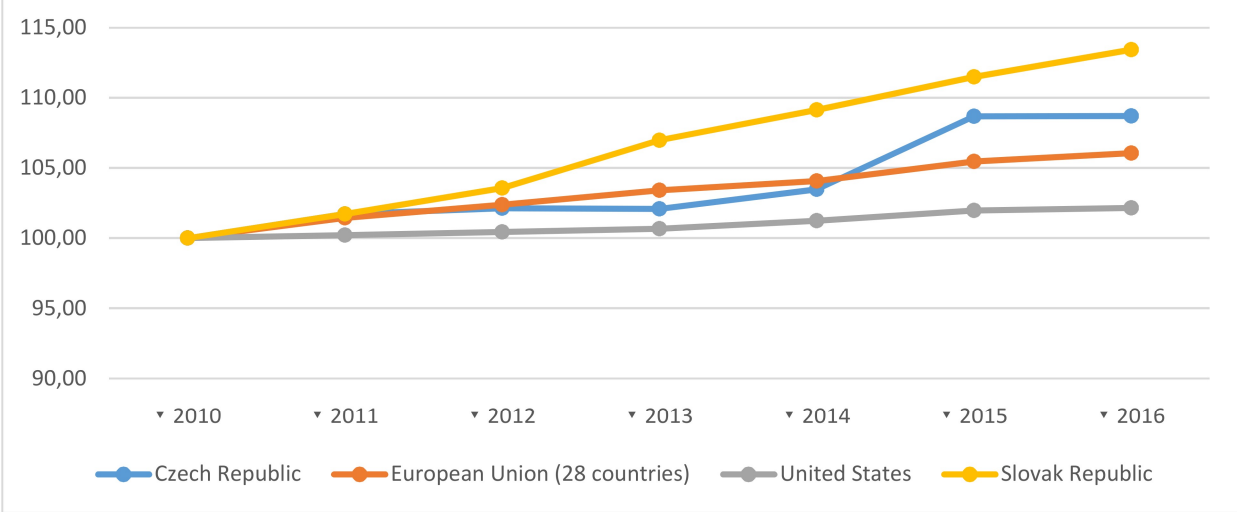
**Figure 2: GDP per capita in PPP (index, EU28=100 %)**



Source: Own calculations based on the data Eurostat

Figure 2 shows that the United States has the highest GDP per capita than the EU (28 countries) and the value exceeding average EU about 48 %. Czech Republic have level of GDP per capita about 85 % of EU (28) and Slovakia even at 77 % of the EU average (28). The development of the monitored GDP per capita indicator in the Czech Republic and Slovakia is still growing despite of business cycle fluctuations.

**Figure 3: GDP per hour worked, Total, 2010=100**



Source: Own calculations based on the data OECD Economic Outlook

Figure 3 compares the development of labour productivity. Based on this graph, we can say that labour productivity grew at least in the United States and the most in Slovakia. The initial level of the labour productivity indicator influences growth rate of this indicator. In the beginning, the United States had the highest value for labour productivity, and logically, the



growth rates were slower. While in Slovakia, the level of labour productivity was lower and the grow rates was higher due to convergence.

Competitiveness can also be assessed by the share of ICT value added (Table 2) respectively share Gross domestic spending on R & D (Figure 4). These indicators make it possible to see if there is enough innovation in the economy associated with the implementation of digitization and robotization elements in the context of Industry 4.0.

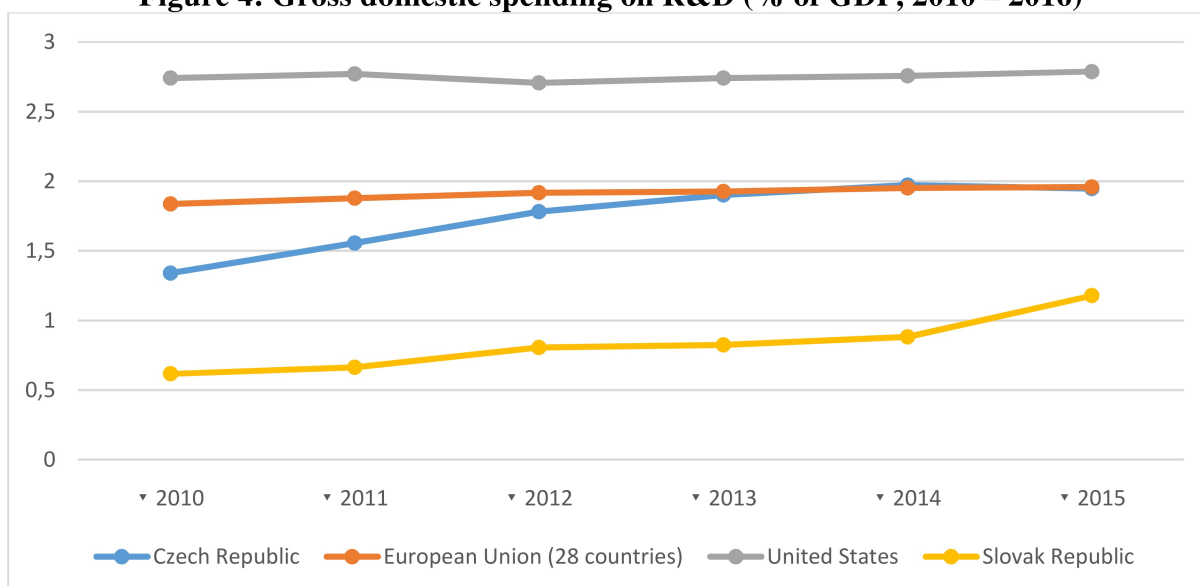
**Table 2: Share of value added ICT on total value (in % )**

Location	2011
Czech Republic	5.70
Slovak Republic	5.90
United States	7.10

Source: Eurostat

The share of ICT value added is again highest for United States. This indicator is measured in USD and as a percentage of GDP. The differences in the share of ICT in the creation of the gross value added of the state are to large extent also due to the structure of individual economies and their production orientation.

**Figure 4: Gross domestic spending on R&D (% of GDP, 2010 – 2016)**



Source: Own calculations based on the data OECD Economic Outlook

Share of Gross domestic spending on R & D is the highest in the United States with stable growth since 2010 (approximately 2.7 % per year). In the Czech Republic, this share has been closer to the EU (28) average since 2013. The Slovak Republic had the lowest share of gross domestic spending on R & D.

**Table 3: Ranking of states in composite indicators in 2016**

	World Competitiveness Ranking (63 countries)	Global Competitiveness Index World Economic Forum (140 countries)
Czech Republic	28	31
United States	4	3
Slovak Republic	51	67

Source: IMD WORLD COMPETITIVENESS CENTER

With the modern concept of competitiveness assessment concepts, which take into account more areas such as innovation, business sophistication, labour market efficiency and technological readiness in one composite indicator is based on the ranking of territorial units (Table 3).

### Conclusion

In the age of globalization, the issue of territorial units competitiveness is of increasingly central importance for economic growth of countries. Bruneckiene and Paltanaviciene (2012) confirm this opinion and say that country competitiveness is necessary understood as a complex of competitiveness at the international level of individuals, enterprises, economic branches and conditions established in the country. Competitiveness of territorial units (countries) can be assessed through various indicators such as real GDP growth rates, GDP per capita, labour productivity, and indicators of innovation activity. It was found that the comparison of selected local units by volume index of GDP leads to greater variability than in a comparison to the growth rates GDP per capita. A useful tool for comparing territorial units is a spatial index.

The ranking of the success of territorial units can be create by using multidimensional comparisons. Based on many indicators, some world organizations compile composite indicators that summarize selected indicators into a single benchmark indicator (IMD World Competitiveness Centre).

Paper has shown that different results of evaluation competitiveness can be obtained depending on the comparison methodology used. Evaluation of territorial units must be made in the context of the methodology used. Otherwise, the conclusions may be inaccurate or even wrong. It is necessary to take into account both the reporting ability of the analysis procedures and the influence of the units used in the indicators.

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# DOPAD UKRAJINSKEJ KRÍZY NA ŠTÁTY V4

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Vyšehradská skupina je výrazom úsilia krajín stredoeurópskeho regiónu. Zmyslom tejto skupiny od jej vzniku bolo: spoločné úsilie o demokratizáciu, vstúpenie do Európskej únie a NATO. V žiadnom prípade sa nemalo jednať o nijakú formu alternatívy k Európskej únii. Európska migračná kríza však v členských krajinách Vyšehradskej štvorky podporila súdržnosť v otázke kvót na prerozdelenie imigrantov. Spoločný negatívny postoj ku kvótam vyústil až do úvahy akejsi alternatívy, respektíve k alternatívnejmu pohľadu na prerozdelenie imigrantov vo vnútri únie. Je Vyšehradská štvorka skutočne súdržná, alebo len ad hoc, keď sa to hodí? Aby sme si odpovedali, pozreli sme sa na krajiny V4 optikou ukrajinskej krízy. Sledovali sme bezpečnostno-energetické ukazovatele a agendy krajín Vyšehradskej štvorky. Článok v závere dokazuje, že o súdržnosti V4 možno hovoriť výlučne len v teoretickej rovine.

**Kľúčové slová:** V4, bezpečnosť, NATO, medzinárodné vzťahy, ukrajinská kríza

The Vysehrad Group is an expression of the efforts of Central European countries. The purpose of this group since its inception has been: joint efforts to democratize, join the European Union and NATO. In no case was it to be a form of an alternative to the European Union. However, the European migration crisis in the member states of the Vysehrad Group has supported cohesion in the issue of quota for the re-distribution of immigrants. The common negative attitude to quotas has resulted in some alternatives or an alternative view of the distribution of immigrants within the Union. Is the Vysehrad Quartet really cohesive, or just ad hoc when it suits it? To answer, we looked at the V4 countries with the point of view of the Ukrainian crisis. We have watched the security - energy indicators and agendas of the Vysehrad Quartets. Finally, the article demonstrates that V4 cohesion can be said only in the theoretical plane.

**Key words:** V4, security, NATO, international relations, Ukrainian crisis

**JEL:** F51, F53

## Úvod

Rozpadom bipolárneho rozdelenia sveta na začiatku deväťdesiatich rokov 20. storočia sa odohrala najväčšia geopolitická zmena v medzinárodných vzťahoch – rozpad sovietskeho impéria. Ukrajina vyhlásila nezávislosť a Rusko stratilo druhý najväčší štát v Sovietskom zväze. Podľa Z. Brzezinského sa Rusko už nikdy nestane impériom, pokiaľ nezíska Ukrajinu pod sféru svojho vplyvu.

Ukrajina sa za éru svojej samostatnosti vykryštalizovala na krajinu s ambíciou vstúpiť do európskych štruktúr a odklonila sa od proruskej rétoriky. Toto malo za dôsledok vznik ukrajinsko-ruskej krízy na konci roku 2013. Primárnym cieľom článku je analýza dopadu ukrajinskej krízy na štáty V4, pričom sme sledovali ukazovatele z bezpečnostno-energetickej agendy Českej republiky, Maďarskej republiky, Poľskej republiky a Slovenskej republiky. Všetky tieto vymenované štáty na začiatku deväťdesiatich rokov vytvorili konferenciu Vyšehradskej spolupráce. Zoskupenie V4 si určilo hlavné priority, ktoré boli v oblasti spoločnej