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## Article

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DANUBE: Law, Economics and Social Issues Review

## Provided in Cooperation with:

European Association Comenius (EACO), Brno

*Suggested Citation:* Majerová, Ingrid; Nevima, Jan (2018) : Influence of national competitiveness indicators on the export performance of the Visegrad Group Plus countries, DANUBE: Law, Economics and Social Issues Review, ISSN 1804-8285, De Gruyter, Warsaw, Vol. 9, Iss. 1, pp. 19-36,  
<https://doi.org/10.2478/danb-2018-0002>

This Version is available at:

<https://hdl.handle.net/10419/184537>

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## INFLUENCE OF NATIONAL COMPETITIVENESS INDICATORS ON THE EXPORT PERFORMANCE OF THE VISEGRAD GROUP PLUS COUNTRIES

Ingrid Majerová<sup>1</sup>, Jan Nevima<sup>2</sup>

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### Abstract

A high level of competitiveness is the goal of every economic entity, whether individuals, companies, regions or nations. This paper discusses the issue of national competitiveness, which can be further divided into non-measurable and measurable input and output indicators. Output indicators are analysed in this paper, among which are a degree of openness, export performance, transformational performance and relative power of specialization. The aim is to find the relations among these indicators in the selected EU countries that form the Visegrad Group Plus, namely the Czech Republic, Slovakia, Hungary, Poland, Austria and Slovenia. These linkages have been tested by a panel regression model during the period 1995 to 2015. Strong impact of all indicators on export performance was assumed. However, this hypothesis was proved only partially, namely regarding the influence of openness degree and transformational performance on the export performance in period fixed effects.

### Keywords

Competitiveness, Determinants of Competitiveness, Panel Regression, Period and Cross Effects, Visegrad Group Plus

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### I. Introduction

Competitiveness is the ability of a country to facilitate an environment in which enterprises can generate sustainable value (IMD, 2015). It has to be constantly compared with other economies and regions because of its relative value (Margan, 2012). The issue of competitiveness can be analysed from different spatial aspects and can be divided into microeconomic, sectoral (regional) and macroeconomic (national).

The last-mentioned type of competitiveness is discussed in this paper. National competitiveness is measured by two kinds of indicators – measurable ones, i.e. quantitative, which

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include indicators of inputs (costs) and outputs, and non-measurable ones, i.e. qualitative. Non-measurable indicators include comprehensive competitiveness of the economy and are determined by two ways: through the Global Competitiveness Index of the World Economic Forum, WEF and the World Competitiveness Scoreboard of the Institute for Management Development, IMD. The measurable input indicators are based on the analysis of unit labour costs, labour productivity, relative prices and the real effective exchange rate. Measureable output indicators express a degree of openness of the economy, its export performance, the intensity and the structure of foreign trade and value added of exports through the transformational performance.

Many authors, in this regard, focus on an analysis of national competitiveness in the EU, or more particularly of the countries of the Visegrad Group, but so far not many texts have been published focusing on the enlarged group of the Visegrad Group Plus. This extended group of countries includes the Visegrad Group countries and Slovenia and Austria (hereafter V4+), namely on the basis of the Regional Partnership Agreement from the year 2001. We decided to analyse this issue not only for the above-mentioned reason, but also because these countries are geographically close to each other and are part of the Central European region economically and politically, which plays an important role in the development of Europe and its competitiveness. The enlargement of the Visegrad Group, even though it was intended to happen, has never been achieved, and nowadays the open V4+ format serves as a tool for cooperation with other countries, such as Ukraine, Slovenia and Austria.

This paper aims to analyse the macroeconomic measurable indicators and their mutual relations in the V4+ from 1995 to 2015. Earlier or later data are not fully available for these monitored countries. All measurable output indicators were selected for this analysis, and it is assumed that the export performance is influenced by the degree of openness, the relative power of specialization and the transformational performance. Annual data were collected from the UNCTAD and the World Bank databases and then converted into indexes. The verification of the mutual relations of these indicators was made through a panel regression – both period and cross effects, and tested for statistical significance, multicollinearity and heteroscedasticity in the statistical program EViews.

The paper is the first entry into the issue of the influence of macroeconomic indicators of competitiveness on the export performance of the Visegrad Group Plus countries. This topic is highly topical and is based on the need for greater competitiveness of individual economies, which further ensure the European Union's competitiveness. The export performance examined is, in the context of the competitiveness targets contained in Europe 2020, driven by international competitiveness concerns (after the Lisbon Strategy declared that the EU should be the most competitive economy by 2010).

We make two important contributions to this issue. We show that the development of degree of openness and transformational performance influence the export performance in a very deep and in a positive sense. Next, we show that the level of high-tech products has no impact on export productivity in the monitored countries. Hence, we conclude that support of exported production that creates added value should be considered in order for the Visegrad Group Plus countries to compete successfully in international markets.

The rest of the paper is structured as follows. The next section reviews the literature on the international competitiveness concept. Section III focuses on other authors' approaches in this field. Section IV presents the chosen determinants of national competitiveness and their development in the monitored period. Section V provides data, methodology and the results of the estimations. Finally, section VI consists of concluding remarks.

## II. Literature review of competitiveness issue

Until the 1970s, international trade theory had been dominated by a theory of competitive advantage, which assumes that a country can enhance its competitive advantage if it specialises in the production of such products that can be produced relatively more efficiently than in other countries (Krugman et al., 2015). Macroeconomic competitiveness is a young term that was mentioned first in the literature at the beginning of the 1980s (Czakó, 2003). Some authors argue that the definition of the competitiveness of a nation is much more problematic than that of a corporation (Krugman, 1994, or Siggel, 2006).

National competitiveness was then defined as the country's ability to create, produce, distribute and/or service products in international trade while earning rising returns on its resources at the beginning (Scott and Lodge, 1985). International competitiveness was viewed as an ability to produce goods and services that meet the test of international competition while the citizens enjoy a standard of living that is both rising and sustainable (Thyson, 1992). At the beginning of the 1990s, a competitive nation was defined as one that can succeed in international trade via high technology and productivity, with accompanying high income and wages (Hastopulos, Krugman and Summers, 1988, or Markusen, 1992, or Dollar and Wolff, 1993).

An approach applied to evaluate competitiveness which uses the real exchange rates or real effective exchange rates was proposed by Lipschitz and McDonalds (1991), or Marsh and Tokarick (1994). They argue that under-valuation enhances the international competitiveness of domestic producers, unlike over-valuation, which reduces it.

Reinert (1995) approaches competitiveness as a reflection of important features of the world economy while refusing the neoclassical theory of equilibrium prices of production factors. In his concept, competitiveness is obvious only in such economies where the benefit of increased productivity in the form of rents remains in the country of its origin. Competitiveness is a degree of production that passed the test of international competition, but at the same time maintains and develops its incomes at the national level (OECD, 1992). This narrow concept, initially synonymous with export performance, was replaced by a broad concept (Outrata, 2012). Such a concept regarded competitiveness as the ability not only to produce goods and services that will succeed in the international market, but also the ability to maintain and enhance a high and sustainable level of economies. If an economy is able to penetrate foreign markets and international trade in order to gain comparative advantages, it is then competitive (Hindls, 2003). According to Kitson, Martin and Tayler (2004), competitiveness is a function of dynamic progress, innovation and the ability to change and improve.

Aggregate competitiveness is based on the growth of productivity through the growth of macroeconomic indicators, living standards and employment, but where all of these

variables must have a sustainable basis (Slaný, 2006). Aiginger (2006) connects competitiveness with the country's ability to create prosperity. Petrovic, Antevski and Vesic (2008) analysed national competitiveness from the integration point of view and argued that regional economic integration creates supportive conditions for the development of national economic competitiveness through regional trade liberalization, performing business activities in a wider, integrated market and a certain level of common protection against competitors from third countries.

Rutkauskas (2008) says that regional and national competitiveness measuring is assumed as a three-dimensional indicator, which depends on the fields of activity dominating in the country, international economic relations and legal, financial, ecological, natural resources and geographical location of the Environment-Competitiveness.

Verner (2011) claims that national competitiveness may express a capability of the country to sell abroad more than it purchases. On the other hand, competitiveness remains a concept that is not well understood and that may be perceived in different ways and levels despite the widespread acceptance of its importance (Nevima and Melecký, 2011).

Competitiveness is also frequently associated with the issue of an increase in economic welfare, prosperity, living standards and wealth distribution (Staníčková, Poledníková and Skokan, 2011), and as one of the most frequently monitored characteristics of the national economies it is becoming part of the evaluation of prosperity, welfare and living standards (Skokan and Zotyková, 2014).

The source of national (macro) competitiveness is regional competitiveness (Ramík and Hančlová, 2012). The European Commission defined competitiveness as the ability to provide an ever-increasing standard of living in decreasing involuntary unemployment (the European Commission, 2012).

Delgado, Ketels, Porter and Stern (2012) define a new term – foundational competitiveness – an expected level of output per working-age individual given the overall quality of a country as a place to do business. Their definition goes beyond the expected level of productivity per employed worker since prosperity is ultimately rooted in the ability to achieve high productivity and at the same time mobilise a high share of the available workforce.

According to Atkinson (2013), a true definition of competitiveness is the ability of the region to export more in value-added terms than to import, including the terms of trade, to reflect all government “discounts” and import barriers. The idea of national competitiveness shows the ability of the country to sustain a high level of national income and a favourable position in the world economy and the ability of a country to create a business environment in which the local companies are able to compete internationally (Bartha and Gubik, 2014). Nevima and Majerová (2015) claim that the basic economic assumption for strengthening competitiveness is convergence.

### **III. Literature review of used methodologies**

As mentioned above, a comparison of competitiveness is very popular in the case of the European Union and Visegrad Group countries. The authors use various methods to obtain the required results.

Muntean, Nistor and Nistor (2010) constructed the Index of regional competitiveness for this purpose. This index was constructed for the regions of Romania and has three parts with various weights – an economic indicator (i.e. GDP, productivity, net exports, capital formation), a social indicator (i.e. employment, employment-women, life expectancy) and a technological indicator (i.e. R&D, tertiary education or employment in the high-technology sector).

Melecký (2011) used two selected methodological approaches to evaluate competitiveness: the macro-econometric modelling and the Data Envelopment Analysis (DEA). The econometric panel data regression model determines the order of the impact of each NUTS 2 region in the Visegrad Group on the overall competitiveness of the European Union. The DEA method provides a different view of regional competitiveness, assuming that efficiency mirrors competitiveness. Ramík and Hančlová (2012) evaluate regional competitiveness and the regional differences and disparities in the V4 countries. The technology for the evaluation is based on the application of two methods of multi-criteria decision-making. The first is the method of Ivanovic deviation, the second is the DEA method.

Suchaček et al. (2014) had an interesting view on regional competitiveness analysing a problem of the media impact, or Doleželová et al. (2014), who analyse the influence of brownfields.

Grodzicki (2014) investigates the competitiveness of V4 economies from a new perspective related to the fragmentation of global value chains (GVC). In the paper, a new methodology analysing the competitiveness of economies developed by Timmer (2012) was introduced, making use of the World Input-Output Database.

Daszkiewicz and Olczyk (2014) used a polar diagram and a dendrogram for ranking the V4 countries in the field of macroeconomic competitiveness. Bartha and Gubik (2013) used a FOI model that offers a new typology of development factors, yet is also able to structure these factors along the three clear development directions.

Soosova (2014) focuses on the evaluation of competitiveness based on the country's involvement in international trade by individual commodity areas and highlights the comparative advantages of the countries surveyed. For this purpose, she uses the RCA index and Michaely index. Prokop and Stejskal (2015) applied an analysis of the municipal strategy planning at the NUTS3 level to measure regional competitiveness.

Čekmeová (2016) used the Constant Market Shares Analysis to determine whether the export performance of the V4 countries was improving as a result of increased competition or due to the horizontal and commodity structure of the trade. Based on this analysis, the first assumption proved to be correct.

We did not find any work related to the complex issue of national competitiveness in all countries of Visegrad Group Plus. Only a few authors deal with some of the partial issues of national competitiveness in the mentioned countries. Kovačič (2008) made a comparison of five countries (except Austria) ranking factors of, then applied a standard deviation method and found out that Slovenia is in the leading position. Majerova and Nevima (2015a) examined the relationship between exports, and transformational performance in the Czech Republic, Poland and Austria in the period of 1995–2010, and

a close relationship among all of them was detected. Majerova and Nevima (2015b) tested macroeconomic determinants of the competitiveness of V4+ during the period 1995 to 2013, and correlations among them were found. Similar results were discovered in the work of Majerova and Nevima (2016), where the authors focused on two determinants (a degree of openness and transformational performance) of national competitiveness in these countries.

#### **IV. Determinants of national competitiveness**

We could agree that the basis of competitiveness of the economy is competitiveness in foreign trade. In order that the economy is competitive as a whole and at the same time functions within its various entities, it must operate under certain conditions. These conditions, called the Golden Rules of Competitiveness, were set by Garelli in 2006 and updated in 2014. For the purpose of our paper, rule no. 7 is particularly important, namely “Balance aggressiveness on international markets with attractiveness for added value activities in order to sustain a current account surplus”.

As mentioned before, macroeconomic competitiveness was initially a synonym for export performance, and the evaluation and testing were carried out on this basis (Majerová and Nezval, 2013). Over the course of time, this narrow concept has been replaced by a broad concept which includes a concept of competitiveness explained as the ability not only to produce goods and services that will succeed in the international market but also the ability to maintain and enhance a high and sustainable level of economies (the European Commission, 2012).

International competitiveness is measured by two kinds of indicators: a measurable one, which includes indicators of inputs (costs) and outputs (measured results), as well as a non-measurable, qualitative one. Measurable data include only a part of competitiveness and are based on hard data. Non-measurable indicators use both hard and soft data (interview surveys for recording indicators that cannot be measured with hard data). This measurement is made by international organizations such as The International Institute for Managerial Development in Lausanne (IMD) or The World Economic Forum in Geneva (WEF).

We deal with the first type of indicators, measurable output indicators, namely the export performance of the economy, the degree of economy’s openness, the intensity and structure of specialization through the indicator of the relative strength of specialization and value-added exports through the transformational performance indicator.

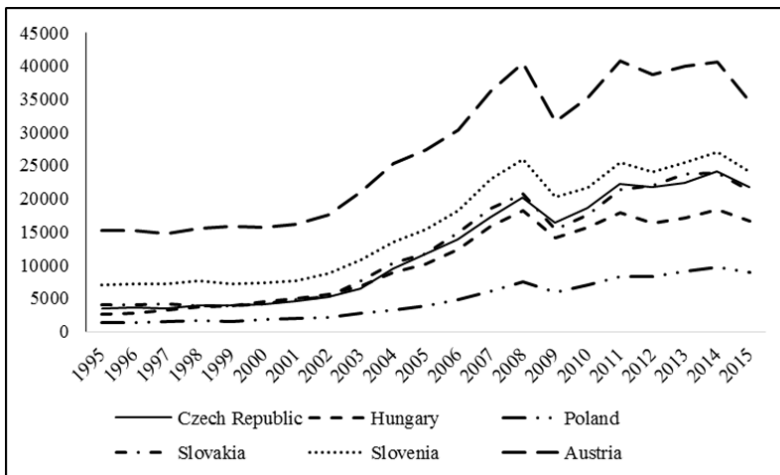
As stated above, the productivity of an economy is very important for its competitiveness. This productivity in foreign trade reflects the export performance. It can be measured by the volume of exports per capita, see Equation 1. Since this indicator is related to the productivity, the number of the citizens was also selected within productive age, i.e. people between 15 and 64 years old. This indicator should grow in all countries, and it suggests the ability of the country to participate in the international division of labour and to benefit from that.

$$EV = \frac{VX_i}{NC_i}, \quad (1)$$

where  $EV$  represents export performance,  $VX_i$  is the value of exports of goods and services in the country  $i$  and  $NC_i$  is the number of productive citizens in the country  $i$ . Figure 1 shows the development of the export performance of economies in time and it was found that the productivity of foreign trade is very high in Austria, which surpasses other compared economies. On the other hand, Poland has the worst value of export performance in comparison with Austria, and less than half the value compared to the Czech Republic. At the same time, we can say that the consequences of the economic crisis (in the form of  $EV$  decrease) are the most insignificant in Poland, while Austria demonstrated a significant drop.

Export performance as a conclusive indicator of measuring competitiveness is not dependent on the size of the economy (compared to another indicator, namely a degree of openness) since the smallest performance is reached by the largest monitored economy (Poland) and the highest performance is reached by the third smallest economy (Austria).

**Figure 1: The development of export performance in V4+**



Source: authors' own processing

The basic indicator that characterises the intensity of foreign trade is the economy's degree of openness. It shows the degree of the national economy's connection with the world economy. The trade openness measures tend to be narrow, and there is typically either exports to GDP, imports to GDP, or turnover (exports plus imports) to GDP (Squalli and Wilson, 2011). For our purpose, the ratio of exports to the country's GDP was used, as shown in Equation 2.

$$MO = \frac{VX_i}{GDP_i}, \quad (2)$$

where  $MO$  is a degree of openness,  $VX_i$  is a value of exports of goods and services in the country  $i$  and  $GDP_i$  represents the gross domestic product in the country  $i$ .

A relationship between the size of the economy and its openness exists in the case of this indicator. Based on many empirical studies, there are generally accepted rules – firstly,

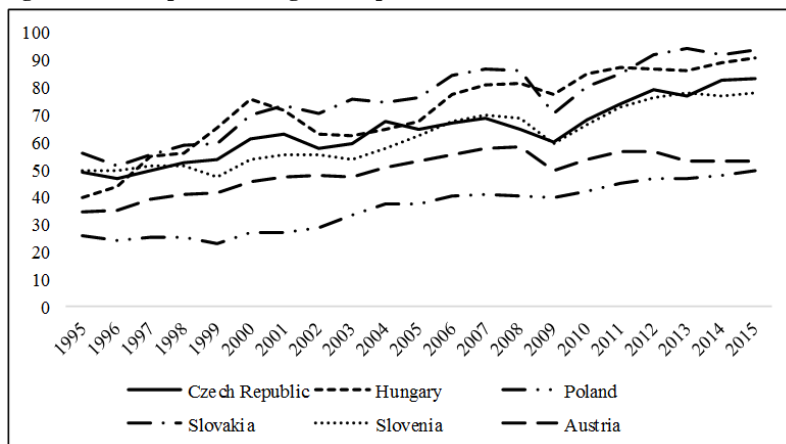


the greater the economy, the less the average relative involvement in the international division of labour and vice versa. Secondly, the more advanced the economy – regarding comparable economic size – the more intensive its involvement in the international division of labour, compared to an economy with a lower level of economic development.

By analysing the size of individual economies in particular, we can conclude that the above rule does not hold true in all cases (as shown in Figure 2), since Slovakia and Hungary would be the most open economies (but not the smallest ones), followed by the Czech Republic, Slovenia (as the smallest), Austria and Poland (as the greatest). When we take into account the division by the country's size as a group (small or medium-sized economies), i.e. Austria, Slovakia, Hungary, Slovenia and the Czech Republic in one group (small) and Poland as an economy of medium size (i.e. larger), the rule is confirmed.

On the other hand, by comparing the economic level (GDP per capita), we can say that this rule is not true either – a country with the highest economic level – Austria, has a small degree of openness, while Hungary, as the country with the lowest economic development, has a high level of this indicator.

**Figure 2: Development of degree of openness in V4+**



Source: authors' own processing

Not only a quantitative measure of exports in the measurement of international competitiveness is important, but also its structure. For a more competitive economy, it is vital that the exports are represented mainly by technologically intensive commodities. As Chaudhuri and Ray (1997) claim, technological innovation and diffusion are major factors contributing to national competitiveness.

The analysis of comparative advantage was already used by Balassa (1965), creating the index of the revealed comparative advantage (RCA), which measures the relative export performance by country and industry/commodity, defined as the country's share of world exports of a commodity, divided by its share of the total world exports. Many authors used the RCA index in their research, e.g. Balassa (1977, 1986), Utkulu and Seymen (2004), Batra and Khan (2005), Assadzadeh et al. (2013) or Bilas and Bošnjak (2015).

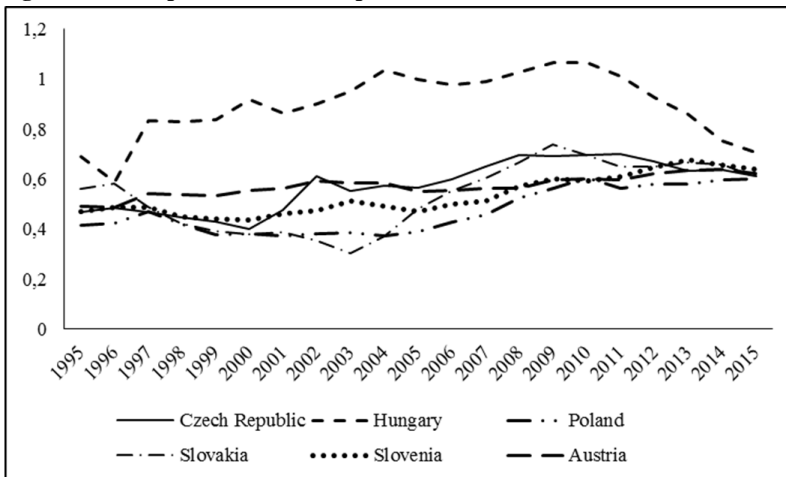
We have selected one indicator that reflects the level of innovative treatment for the purposes of our analysis – the structure of specialization in international trade, which is an indicator of the relative strength of specialization. This indicator characterises a relative advantage or disadvantage in the trade for a specific product (or group of products) of the selected economies in a group of the countries (Kadeřábková and Žďárek, 2006) and can be expressed by the following Equation 3.

$$RS = \frac{\frac{X_{ij}}{\sum_i X_{ij}}}{\frac{X_i}{\sum_i \sum_j X_{ij}}}, \tag{3}$$

where  $RS$  is the coefficient of the relative strength of specialization,  $X_{ij}$  is the export of  $j$ -commodity or group of commodities from  $i$ -economy,  $\sum_i X_{ij}$  represents the sum of world export of  $j$ -commodity or commodity group from  $i$ -economy,  $X_i$  is an export of commodity of manufacturing industry and  $\sum_i \sum_j X_{ij}$  represents the whole world export of manufacturing industry.

In our analysis, we have selected technologically demanding products for  $X$  (high-tech, such as medicine, communication equipment, computer equipment, medical equipment, aircraft, etc.). Based on the above formula, we have compiled a ranking of economies according to their relative strengths of specialization during the mentioned period. The economies that show a high rate of specialization should achieve greater competitiveness than the other ones, and vice versa.

**Figure 3: Development of relative specialization in V4+**



Source: authors' own processing

Figure 3 shows that the most competitive country is surprisingly Hungary, although with a declining trend, which approximates to other compared economies. This high level is caused by the fact that Hungary is the largest electronics producer in CEE and has a leading

position in attracting FDI. On the other hand, the decline caused the same level of high-tech exports as in 1995 due to the sale or restructuring of multinational companies operating in Hungary. The trend is that the level of specialization in all economies consolidates and approaches an almost identical level.

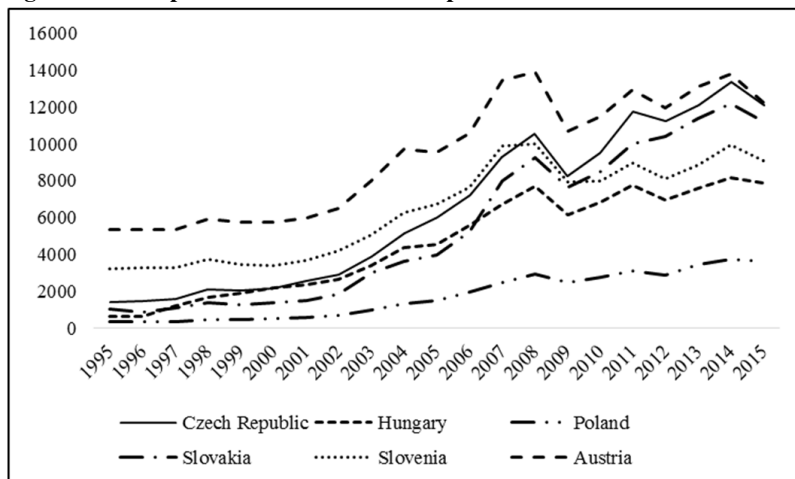
In the text above, the intensity, productivity and structure of export were surveyed. Now, the effectiveness of export will be analysed, namely in the case of the transformational performance. The transformational performance indicator expresses the efficiency and represents the economy's ability to increase the value of imported raw and materials inputs in the form of a greater or lesser proportion of added value, realised by exports of manufactured products (Fojtíková, 2008).

The same rule is applied in the case of the previous indicator: the higher the value of the indicator, the higher the value of added exports per capita; the higher the efficiency, the higher the competitiveness. As an indicator of the relative strength of specialization, this indicator reflects a certain relationship per capita, namely the difference between export manufacturing industries and import of the primary production per capita (Plchová, 2011). This linkage is shown in Equation 4.

$$TV = \frac{X_m - I_p}{NC_i}, \quad (4)$$

where  $TV$  is the indicator of the transformational performance of  $i$ -economy,  $X_m$  represents the export of the manufactured commodities (SITC 5-8),  $I_p$  is the import of the primary production (SITC 2 and 3) and  $NC_i$  is the number of citizens in the country  $i$ .

**Figure 4: Development of transformational performance in the V4+**



Source: authors' own processing

According to Figure 4, the value added of exports per capita is the highest in Austria and is almost ten times higher than the value added of Poland. The Czech Republic is in second place (its value has remained the same as the value of Austria for the last two years), next is

Slovakia, followed by Slovenia and Hungary, and Poland is last. The highest improvement was achieved in the Czech Republic, whose value added more than doubled within the period, while a similar improvement was reached by another former centrally-planned economy – Slovakia. Poland showed the least progress, its transformation performance remained almost unchanged within the monitored period.

## V. Methodological approach and problem solving

The problem of competitiveness will be analysed on an extended group of countries, namely the selected countries of the V4+, which includes the V4 countries, plus Slovenia and Austria. The aim of this paper is to determine the dependence of measurable determinants of macroeconomics competitiveness of analysed economies, using the correlation and panel regression analysis during the period 1995 to 2015. The values of export and SITS classification were calculated from the UNCTAD database (UNCTAD, 2016). The data for GDP and population were downloaded from the World Bank (World Bank 2016a, 2016b).

To evaluate competitiveness, we used a method of the panel regression analysis (i.e. Heryan, 2011), which is described by Equation 5.

$$Y_{it} = \alpha + \beta_1 X_{it} + \dots \beta_n X_{it} + \varepsilon, \quad (5)$$

where  $Y$  is the dependent variable,  $X$  is the independent variable,  $\alpha$  and  $\beta$  are coefficients,  $\varepsilon$  is the error term,  $i$  and  $t$  are indices for individuals and time. For our purposes, the equation was modified to the form of Equation (6)

$$EV_{it} = \alpha + \beta_1 MO_{it} + \beta_2 RS_{it} + \beta_3 TV_{it} + \varepsilon, \quad (6)$$

where the endogenous dependent variable  $EV_{it}$  means the development of export performance of  $i$  countries in time  $t$ , and exogenous regressors are  $MO_{it}$ , which is the degree of openness change,  $RS_{it}$  is the relative specialization's development and  $TV_{it}$  means the growth of transformational performance.

The tests show that the original values of indicators at the first level are not stationary (see Table A in Appendix) and it was necessary to use the differentiation of time series to obtain an approximation of this series. For this reason, the values of individual indicators were calculated on the first difference. The logarithm was used for all indicators except the indicator of relative specialization, which is a coefficient (see Equations 7 to 10):

$$dEV = (\log(EV) - \log(EV(-1))) \cdot 100 \quad (7)$$

$$dMO = (\log(MO) - \log(MO(-1))) \cdot 100 \quad (8)$$

$$dRS = RS - RS(-1) \quad (9)$$

$$dTV = (\log(TV) - \log(TV(-1))) \cdot 100 \quad (10)$$

Table A in the Appendix shows that the first difference of the selected variables is stationary. Therefore, the regression analysis used the stationary on the first differences (dif) – which

is the development of economic variables. The impact of the development of the degree of openness (dif)MO, relative specialization (dif)RS and transformational performance (dif)TV on the development of export performance was examined.

The fixed effects method was used as the countries of V4+ were not selected randomly, but intentionally, and we wanted to draw inferences only about the examined individuals. To verify the accuracy of using such an approach, the data were tested via the Hausman test. Based on the results, our approach was proved and thus the possibility of using a random effects model was excluded.

This fixed method was carried out using period, cross and both effects, 126 observation and time series length of 21. Spatial correlation was determined by using the Pearson correlation coefficient, another constancy variance was tested using graphical methods. The autocorrelation was tested by the Durbin-Watson test (DW stat). The value serves for evaluation of autocorrelation presence (serial dependency of residual components connected with sectional and time influences of the panel model).

It was also necessary to determine whether it is possible to use a single equation (based on Equation 6) for all monitored economies, or it is necessary to create a separate equation for each economy. For this purpose, testing the presence or absence of differences in the monitored constants in individual economies was carried out. The coefficient test was used, namely the Likelihood ratio test. Two hypotheses were determined,  $H_0$  says that the constants do not differ among the countries, and hypothesis  $H_A$  rejects the hypothesis  $H_0$ . The null hypothesis was accepted:  $p$ -value equalled 0.92, autocorrelation was rejected – DW stat had a level of 1.8. This test confirmed the concretization of one equation, which is mentioned below (Equation 11).

$$EV_{it} = 1.8433 + 0.2778MO_{it} - 9.8813RS_{it} + 0.6223TV_{it} + \varepsilon \quad (11)$$

Table B in the Appendix clearly rejects the existence of multicollinearity among regressors. In terms of Table C in the Appendix, fixed effects were used in cross panels, in the period, and both of them at the same time.

**Table 1: Models Output**

	Both effects	Period effects	Cross effects
(const.) C	5.3379 <sup>a</sup>	4.7798 <sup>a</sup>	1.8014 <sup>b</sup>
(dif)MO	0.3128 <sup>a</sup>	0.2659 <sup>a</sup>	0.2793 <sup>a</sup>
<b>(dif)RS</b>	<b>10.3754</b>	<b>4.2310</b>	<b>-9.9341</b>
(dif)TV	0.2584 <sup>a</sup>	0.3297 <sup>a</sup>	0.6320 <sup>a</sup>
Adjusted R-squared	0.9298	0.9301	0.7094
DW stat	2.4796	2.1351	1.8205 <sup>a</sup>

Note: a statistics significance on the level 0.01, b statistics significance on the level 0.05

Source: authors' own processing

In Table 1, we can observe significant fundamental relationships. In the case of using the two kinds of fixed effects (in the period and in cross-section panel), we can observe a positive statistically significant impact of the development of the openness degree and transformational performance on the growth rate of export performance. This phenomenon

is evident in all cases; however, the development of relative specialization always appears as statistically insignificant. In terms of the response value, models achieve about 93%, except the third case of the model with fixed effects in a cross-section of the panel. This variant, however, rejects the results of Table C in Appendix. Here, the introduction of only fixed effects in the cross-section of panels seems insignificant. On the other hand, the variant of the fixed effects of the period appears important (the links between the selected countries in individual panels – Table 1 in italics). In terms of the autocorrelation of residual ingredients, moderate negative relationships are monitored.

## **VI. Conclusion**

Competitiveness is a frequent topic that is discussed, and it is very useful to compare various geographical areas to obtain certain results about its development. Competitiveness is the ability of companies, regions or nations to offer products and services that meet the quality standards of local and world markets at prices that are competitive and provide adequate returns on the resources employed or consumed when producing them.

Economic competitiveness was initially synonymous with productivity in exports, and its evaluation was thus founded on this basis. Over the course of time, this approach has been replaced by a broad one that also includes the concept of competitiveness as the ability to maintain and enhance a high level of sustainable economies.

The measure of competitiveness can be approached from a national, regional or company level. From the perspective of a macroeconomics point of view, non-measurable (soft data) or measurable (hard data) indicators may be chosen. The measurable output indicators were chosen for the purposes of this paper. The aim of this paper was to determine the effects of macroeconomic competitiveness in the sense of the dependence of measurable determinants. For this purpose, the data of Visegrad Group Plus economies – the Czech Republic, Hungary, Slovakia, Poland, Slovenia and Austria – were chosen.

Firstly, the indicators of national competitiveness were calculated, namely from the data obtained in the databases of UNCTAD and the World Bank. Regarding their progress, it was found that these indicators exhibit a similar trend in all the economies. It was also observed that the fluctuation in time is smaller in the case of larger economies (Poland), while the resistance against external disturbances in the case of small economies is smaller. This occurs due to the degree of openness of economies.

Secondly, the correlation and panel regression analysis in the monitored period was applied. It was assumed that the degree of openness, transformational performance and the relative power of specialization interact with export performance. The data were tested for the absence of autocorrelation and multicollinearity, the stationarity tests were made and the first differences of the selected indicators were used for calculations. After this, three kinds of effects were chosen – period, cross and a combination of all of them. It was found that the development of the degree of openness and transformational performance influence export performance very deeply, and at the same time, the level of high-tech products has no impact on the export productivity of the Visegrad Group Plus countries. Our hypothesis was thus confirmed only partially.

In our future research, we will try to test and compare the macroeconomic (national) determinants of the competitiveness of the V4+ countries with other members of the European Union.

### **Acknowledgements**

The paper was supported by two projects: by a students' grant project "The influence of the Selected Macroeconomic and Microeconomic Determinants on the Competitiveness of the Regions and Companies in Countries of the Visegrad Group Plus", a project registration number SGS/13/2015, and by a project of OPVK "With a focused research in the area of small and medium enterprises to achieve a competitive knowledge economy", a project registration number CZ.1.07/2.3.00/20.0016 (within its sustainability).

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## Appendix

**Table A: Panel unit root test**

Exogenous variables: Individual effects; Automatic selection of maximum lags				
Method	(dif)EV	(dif)MO	(dif)RS	(dif)TV
<i>Null: Unit root (assumes common unit root process)</i>				
Levin, Lin and Chu $t^*$	0.0000	0.0000	0.0000	0.0000
<i>Null: Unit root (assumes individual unit root process)</i>				
Im, Pesaran and Shin W-stat	0.0000	0.0000	0.0000	0.0000
ADF – Fisher Chi-square	0.0000	0.0000	0.0001	0.0000
PP – Fisher Chi-square	0.0000	0.0000	0.0001	0.0000
Method	EV	MO	RS	TV
<i>Null: Unit root (assumes common unit root process)</i>				
Levin, Lin and Chu $t^*$	0.7985	0.3891	0.8663	0.7656
<i>Null: Unit root (assumes individual unit root process)</i>				
Im, Pesaran and Shin W-stat	0.9998	0.9821	0.9871	0.9989
ADF – Fisher Chi-square	1.0000	0.9869	0.9594	0.9998
PP – Fisher Chi-square	1.0000	0.8830	0.9801	1.0000

Source: authors' own processing

**Table B: Covariance analysis: rejection of multicollinearity**

Correlation $t$ -Statistic Probability	(dif)MO	(dif)RS	(dif)TV
(dif)MO	1.0000 — —		
(dif)RS	–0.0825 –0.8598 0.3895	1.0000 — —	
(dif)TV	0.4369 5.0894 0.0000	0.1697 1.8601 0.0642	1.0000 — —

Source: authors' own processing

**Table C: Test cross-section and period fixed effects**

Effects Test	Prob.	Prob.	Prob.
Cross-section F	0.0081	0.9301	
Cross-section Chi-square	0.0013	0.9098	
Period F	0.0000		0.0000
Period Chi-square	0.0000		0.0000
Cross-Section/Period F	0.0000		
Cross-Section/Period Chi-square	0.0000		

Source: authors' own processing