



Quantification of the Selected Macroeconomic Impacts on the EEA Countries Competitiveness Assessment

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ABSTRACT

The contribution focuses on quantification of the selected macroeconomic impacts on the assessment of competitiveness of countries in the European Economic Area (EEA). In the first part of the paper we present a brief description of the selected macroeconomic variables and indices evaluating competitiveness, and we justify the selection of these input variables for our model. The following part of the paper presents the formulated hypotheses aimed mainly at identification of different natures and the degree of dependence between the selected spectrum of the competitiveness indices and the macroeconomic indicators, which we consider to be the main objective of our contribution, as well as the identification of the potential for further investigation of the issue. The next part contains a more detailed description of the method used, which was, in this case, a panel analysis including correlational, regressive, Breusch-pagan, and Hausman test statistics. The subsequent part of the paper, using the visual-graphic table apparatus, provides our summaries of the results of the analyses conducted, and it describes them in detail along with our own commentary. The last part of the proposed article provides a room for summarizing the main findings as well as the related discussion.

INTRODUCTION

Particularly in the turbulent period of the last years, the anticipated interconnection of the impacts between several parameters of the economy on its competitiveness could have lost part of its intensity or significance. For this reason, the focus of this contribution is to quantify the selected macroeconomic indicators to evaluate the competitiveness of the countries in the European area. For the purposes of this test, we chose the indicators of the so-called macroeconomic magic quadrangle, i.e. GDP growth rate, inflation rate, rising unemployment rates, and current account balance at nominal GDP, which characterize, to a sufficient degree, the macroeconomic situation of the countries (Bienkowski 2008; Štefko and Gallo 2015). In terms of the indices assessing the

competitiveness of the business environment of the countries in this evaluation, we will consider the Index of Economic Freedom (EFI), the World Competitiveness Scoreboard (WCS) and the Global Competitiveness Index (GCI). The GCI, EFI, and WCS indices are mutually consistent as they share the focus of multiple sub-index areas listed in Table 1.

Table 1. Consistence of the sub-indices of the main indices EFI, WCS and GCI

<i>Index / Sub-index</i>		
<i>EFI</i>	<i>WCS</i>	<i>GCI</i>
Property rights	Personal security and property rights	Property rights
Freedom from corruption	Bribing and corruption	Ethics and corruption
Government spending	Government expenditure	Government efficiency
Labor freedom	Labor market	Labor market freedom
Trade freedom	International trade	Burden customs procedure
Fiscal freedom	Fiscal policy	
Business freedom	Business legislation	
Investment freedom		Ease of access to loans
Monetary freedom		
Financial freedom		
	Domestic Economy	Macroeconomic freedom

Source: own processing based on HF 2017; IMD 2017a; WEF 2017.

Table 1 clearly demonstrates that the WCS and GCI indices share an over-majority of the categories defined on the basis of the sub-index characteristics of the EFI index. We consider them to be mutually comparable because they cover a partially identical spectrum of indicators, even though the overall result of the index is also affected by the non-conforming components and the different methodology of obtaining and processing the input data.

1. RESEARCH HYPOTHESES

Within the given issue, we assume the existence of a positive relationship between the competitiveness assessment and the GDP growth rate, which corresponds to the fact that the less competitive economy produces fewer products. Another expected option is the negative dependence between the competitiveness assessment and the year-on-year change in the consumer prices of the given economy, which is based on the dependence of inflation and foreign trade because the reduction of inflation creates a competitive advantage for the subjects operating in economics as compared to those operating in other economies. Although the relationship between inflation and unemployment is represented by a curve of indirect proportions, we believe that even unemployment will be represented by the same relation to competitiveness as inflation. This is because, in a number of European countries (especially the countries of Southern, Southeastern, Central and Eastern Europe), we expect the existence of structural unemployment which creates barriers to the growth of the economy as a whole, but also its competitiveness, as the shortage of the nec-

essary jobs puts pressure on the wage increase, thus increasing the costs of the subjects. Based on these arguments, we formulate our postulates as follows:

- H1: Within the European Area countries, there is a directly proportional dependence between the competitiveness of the economy and the year-on-year GDP growth rate.
- H2: Between the consumer price increase, i.e. inflation, and the resulting assessment of the country's competitiveness there is an indirectly proportional dependence.
- H3: The relationship between the percentage of unemployment and the assessment of competitiveness in the countries surveyed is represented by an indirect proportion.

2. DATA STRUCTURE AND METHODS

The selected independent variables represent several aspects of the country as an economic entity. The first is the year-on-year change in the size of GDP representing changes in the performance of the economy, but with some specificities linked to the concept of measuring the domestic product. Even the choice of inflation is not accidental, because the fluctuation of consumer prices brings with it an increased distribution of capital between the individual company groups, in terms of concentration in favor of the economic subjects (based on the more frequent growth than the fall in prices), which allows the accumulation of savings from which the labor force productivity in the form of investments can increase, hence increasing the competitiveness. At the same time, lowering the consumer prices may be a competitive advantage over foreign entities. Therefore, this ambiguity may, in some cases, be a source of contradictory tendencies.

Table 2. List of the variables used in the regression models

<i>Variable</i>	<i>Description</i>	<i>Source</i>	<i>Use</i>
<i>EFI</i>	Economic Freedom Index score [points]. This variable is a competitiveness assessment calculated according to the available methodology. (dependent variable)	HF (2017)	Panel A
<i>WCS</i>	World Competitiveness Scoreboard score [points]. The variable is determined as a competitiveness rating calculated according to the given methodology. (dependent variable)	IMD (2017b)	Panel B
<i>GCI</i>	Global Competitiveness Index score [points]. This variable represents the assessment of competitiveness according to the chosen methodology. (dependent variable)	WEF (2017)	Panel C
<i>GDP</i>	Gross Domestic Product growth rate [%]. This variable is defined by the percentage change in the year-on-year volume of the GDP indicator for the observed country. (independent variable)	Eurostat (2017a)	Panels A, B & C
<i>INF</i>	Inflation rate [%]. The variable is calculated as the year-on-year percentage change in the level of consumer prices. (independent variable)	Eurostat (2017b)	Panels A, B & C
<i>BOT</i>	Balance of Trade of the economy [%]. The variable is characterized by the percentage of trade balance to its total aggregate output, i.e. GDP. (independent variable)	Eurostat (2017c)	Panels B & C
<i>UNE</i>	Unemployment [%]. Unemployment is the ratio of the proportion of unemployed workers to the total population of the economically active population. (independent variable)	Eurostat (2017d)	Panels A, B & C

Source: own processing)

The percentage of the unemployed to the total economically active population represents a potential for the low costs associated with the labor factor, unless it is the structural unemployment that produces the opposite effect. Thus the presence of bifurcation on the opposing stimuli exists also in this case. The summary of the dependent and independent variables used together with their source is presented in Table 2.

Within the data structure, it is also important to mention that because of the use of causality in the Granger sense, there is an independent variable representing the time lag ($t-1$) of the given dependent variable. The remaining independent variables are also associated with a time lag ($t-1$), due to the fact that any rating for a given year is constructed from the data development in the immediately preceding year, as the data for the current year at the time of compilation are not yet available. Based on the data structure, including both the cross-sectional data and the time series, it is necessary to apply the panel analysis. Thus, the methods used are the Pooled Regression Model (PRM), the Fixed Effects Model (FEM), or the Random Effects Model (REM). Based on the test of the common significance of the means, Breusch-Pagan Testing Statistics and Hausman Testing Statistics, the preferred model will be one of the three abovementioned models, the transcription of which, based on the variables used, looks as follows:

$$\begin{aligned} \text{PRM: } CA_{tc} &= \alpha + \beta_1 * CA_{(t-1)ci} + \beta_2 * GDP_{(t-1)ci} + \beta_3 * INF_{(t-1)ci} + \beta_4 * BOT_{(t-1)ci} + \beta_5 * UNE_{(t-1)ci} + \varepsilon_{tc} \text{ (Eq. 1),} \\ \text{REM: } CA_{tc} &= \beta_1 * CA_{(t-1)ci} + \beta_2 * GDP_{(t-1)ci} + \beta_3 * INF_{(t-1)ci} + \beta_4 * BOT_{(t-1)ci} + \beta_5 * UNE_{(t-1)ci} + (\alpha + u_c) + \varepsilon_{tc} \\ &\text{(Eq. 2),} \\ \text{FEM: } CA_{tc} &= \alpha_t + \beta_1 * CA_{(t-1)ci} + \beta_2 * GDP_{(t-1)ci} + \beta_3 * INF_{(t-1)ci} + \beta_4 * BOT_{(t-1)ci} + \beta_5 * UNE_{(t-1)ci} + \varepsilon_{tc}; \alpha_c = \alpha_1 * \\ &Z_{c1} + \alpha_2 * Z_{c2} + \dots + \alpha_e * Z_{ce} \text{ (Eq. 3),} \end{aligned}$$

where:

CA – Competitiveness Assessment (i.e. *EFI*, *WCS* and *GCI*),

t – time period (current year),

c – country (cross-section unit),

i – indicator mix vector,

Z_{ce} – variable characterizing the individual effect,

$(\varepsilon_{tc} + u_c)$ – composite residue estimation and specific residues.

Before each regression analysis, by examining the presence of the unit roots by means of the ADF test, we assess the stationarity of the dependent and the independent variables. In addition, we also perform a correlation analysis of the dataset.

3. RESULTS

Only if we consider the time series of the data to be stationary, we can continue with the estimate regression models. Through ADF tests investigating the existence of unit roots, we have confirmed stationarity for all the dependent and independent variables. However, we first subjected the data to a correlation analysis, which shows the statistically significant dependences existing between almost all the observed variables. The only exception is the link with the final assessment of competitiveness (within all three selected methodologies) and the year-on-year change in the size of the aggregate country production. Despite this finding, we continued to predict with this indicator because a relatively strong interdependence (and especially statistically significant) was found with the other independent variables, i.e. with the change in consumer prices (inflation), the percentage of trade balance of the observed economy of the size of GDP and the unemployment rate. All these indicators have a strong link with the resulting rating given to the individual countries within the *EFI*, *WCS* and *GCI* indices. A summary of the results of the correlation analysis is presented in Table 3.

Table 3. Correlation analysis

	EFI	WCS	GCI	GDP	INF	BOT	UNE
EFI	1						
WCS	0.7242 (0.5245) [2.52e-51] ***	1					
GCI	0.6307 (0.3977) [2.38e-031] ***	0.8804 (0.7751) [1.01e-079] ***	1				
GDP	-0.0132 (0.0002) [0.8055]	-0.0544 (0.0030) [0.3412]	0.0438 (0.0019) [0.4736]	1			
INF	-0.2114 (0.0447) [6.57e-05] ***	-0.2795 (0.0781) [6.22e-07] ***	-0.1919 (0.0368) [0.0015] ***	0.1818 (0.0330) [0.0006] ***	1		
BOT	0.3521 (0.1240) [6.87e-011] ***	0.5847 (0.3419) [1.26e-027] ***	0.5284 (0.2792) [8.15e-021] ***	-0.1517 (0.0230) [0.0062] ***	-0.4965 (0.2465) [1.44e-021] ***	1	
UNE	-0.3307 (0.1094) [2.10e-010] ***	-0.4218 (0.1779) [1.03e-014] ***	-0.4044 (0.1635) [4.78e-012] ***	-0.1874 (0.0351) [0.0004] ***	-0.1741 (0.0303) [0.0011] ***	-0.1066 (0.114) [0.0553] *	1

Note 1: the first number represents the correlation coefficient value

Note 2: the value in the round brackets represents the determination coefficient

Note 3: the square brackets include the p-value of the t-test

Source: own processing

Under the so-called "Panel A" examining the impact of the selected indicators on the overall score achieved in the EFI assessment, we have justified, by means of appropriate test statistics, the use of the Fixed Effects Model, the results of which are shown in Table 4.

Table 4. Testing statistics for Panel A

<u>Test of the common significance of the means</u>			
F	4.80844	p-value	5.30E-12
<u>Breutch-Pagan's test statistics</u>			
LM	0.971158	p-value	0.324391
<u>Hausman's test statistics</u>			
H	131.13	p-value	2.23E-27

Source: own processing

Based on the regression analysis of the effects (for causality in the Granger sense) among the selected macroeconomic indicators on the EFI assessment it is evident that the European Union as a whole as well as within the logically selected structures (regions), the year-on-year increase in GDP reaches a weak negative dependence apparently related to the effects of the other factors directly linked to this indicator. This is obviously the reason for not achieving statistical significance in the vast majority of cases. The only exception is the Pooled Regression Model, where a relatively strong direct proportional effect in statistical significance already appears. The analysis also shows that the rise in consumer prices has a negative effect on the overall assessment of the competitiveness of the European countries as a whole. The only exception is the group of the V4 countries and Austria where it has a positive impact, indicating the existence of the potential for the rise in inflation, which increases the aforementioned capital distribution within the countries. On the basis of the data from the monitored period, we can claim that inflation has led to capital accumulation within the economic entities and increased the productivity through appropriate investment.

In other cases, the effect relating to international competition prevailed. Obviously the strongest indirect impact was reached by the indicator in the partial analysis of other European countries including Germany, France, Great Britain and other, which corresponds to the price of the products (also backed by international competition) dependent on the variable costs, especially the labor costs. The second most (negatively) affected group is the Southeastern European countries, where the competitive advantage is built on a low price with a reduced product quality. The impact of the unemployment rate on the overall rating of the EFI index in each case recorded the expected negative correlation. However, in the case of the partial analysis of the European regions, there was no statistical significance in the case of Romanic countries, i.e. the countries of the South, the Benelux countries and the countries of Southeastern Europe. In the case of the partial analysis of the Romanic countries, the turbulent period, especially after 2008, obviously played out during the analysis of the given period of time. This is partly confirmed by the statistical insignificance of the previous assessment of the given indicator (EFI index) in these countries, indicating an increased fluctuation in the achieved score in the countries such as Greece, Spain or Italy. A complete summary of the results of the analysis designed to assess the impact of the year-on-year GDP growth rate, inflation and the unemployment rate on the score achieved in the EFI index is presented in Table 5.

Table 5. Regression analysis for Panel A

	<i>PRM</i> ●	<i>FEM</i> +	<i>REM</i> ●	<i>V4+</i> <i>Austria</i>	<i>NB8</i> °	<i>Romanic</i> <i>countries</i>	<i>BENE-</i> <i>LUX</i>	<i>South-</i> <i>eastern</i> <i>European</i> <i>countries</i>	<i>Other</i> <i>countries</i>
<i>constant</i>	10.4801 [4.87e-08] ***	47.5144 [2.31e-029] ***	41.5020 [1.38e-031] ***	18.6284 [0.0056] ***	34.25 44 [1.52e-05] ***	65.2026 [4.25e-010] ***	33.8632 [0.0079] ***	25.3269 [0.0034] ***	33.503 [6.39e-06] ***
<i>EFI (t-1)</i>	0.86243 5 [1.05e-113] ***	0.35200 6 [4.55e-011] ***	0.43621 6 [2.78e-020] ***	0.74091 7 [5.19e-011] ***	0.560 425 [3.70e-07] ***	0.023080 7 [0.8573]	0.55133 6 [0.0007] ***	0.64773 [1.51e-06] ***	0.592919 [8.97e-09] ***
Δ <i>GDP (t-1)</i>	7.66912 [0.0423] **	-3.9535 0 [0.2800]	-2.3500 5 [0.5125]	-5.4903 3 [0.3957]	0.044 5894 [0.9873]	-3.34192 [0.8598]	-0.8078 8 [0.8891]	-0.066005 [0.9931]	-1.22411 [0.8168]
Δ <i>INF (t-1)</i>	-8.4221 2 [0.2072]	-26.416 0 [0.0002] ***	-24.420 3 [0.0004] ***	18.2906 [0.0901]	-21.1 667 [0.0014] ***	-15.0142 [0.7168]	13.1042 [0.4761]	-24.1997 [0.0851] *	-36.2271 [0.0080] ***
<i>UNE (t-1)</i>	-8.8774 9 [0.0183] **	-23.327 8 [2.56e-06] ***	-21.685 8 [4.38e-06] ***	-13.175 8 [0.0862] *	-17.9 791 [0.0066] ***	-15.7429 [0.2820]	-21.290 2 [0.4789]	-21.9624 [0.2263]	-39.4874 [8.97e-09] ***
<i>Modified R2 / cor (y,y)2</i>	0.83630 2	0.88668 1	0.79928 4	0.88762 5	0.914 691	0.659856	0.86659	0.846257	0.986288

● listed for information only

+ country-specific constants are listed in Table 9 of the Appendix

° within the group of NB8 countries we only include the EU members (i.e. without Norway and Iceland)

*, **, *** – statistical significance at the level of 10%, 5% and 1%

Source: own processing

"Panel B" demonstrates the quantification of impacts of the GDP growth rate, inflation, trade balance and unemployment rate indicators on the country's competitiveness assessment according to the WCS methodology. In this case, based on the results of the test statistics from Table 6, we consider the Fixed Effects Model to be the most appropriate.

Table 6. Testing statistics for Panel B

<u>Test of the common significance of the means</u>			
F	2.15803	p-value	1.95E-03
<u>Breutch-Pagan's test statistics</u>			
LM	4.12871	p-value	0.042162
<u>Hausman's test statistics</u>			
H	52.5174	p-value	4.22E-10

Source: own processing

The results of the regression analysis show that the WCS approach is goal-oriented. Within the European countries as a whole, the most important of the selected factors is the year-on-year growth, or a change in the volume of the domestic aggregate production. In the partial analyses, it is statistically significant only in the NB8 group of the Nordic and Baltic countries. This may be due to the data structure, or the length of recording some of the countries through this assessment. However, except for the V4 countries and Austria, it always has a directly proportional relationship. In the case of V4, this factor has the opposite effect, largely due to the fact that it has been taken into account in the other selected variables as they are interconnected. Another factor influencing the competitiveness assessment is inflation but, also in the case of partial analyses as well as in the case of the Fixed Effects Model, it appears to be statistically insignificant. Otherwise, in all cases it has an indirectly proportional relationship, which corresponds to the ratio of the prices of the European products to the non-European ones. Thus, any increase in higher European prices significantly reduces competitiveness in the foreign non-European markets. The trade balance of the European countries as a whole records the expected positive relation to the scores achieved in the WCS measurement. However, in the case of the Fixed Effects Model, it appears to be statistically insignificant.

As part of the analyses of the selected groups of countries, in some cases they have an indirectly proportional relationship due to the mixed influence of the selected closely interconnected factors, or achieving negative trade balances of small and medium open economies. As these relationships are not statistically significant, we will not consider them further. In the Pan-European dataset, the unemployment rate did not reach statistical significance. As part of the partial analyses of the regions, we are only considering the impact among the Southeastern European countries and the V4 countries together with Austria. A relatively strong, indirectly proportional relationship indicates high unemployment in the regions, or the existence of structural unemployment. This causes significance of the negative impact of unemployment as opposed to the other European regions. The results of the regression analysis showing the relationship of the selected indicators to the score value obtained in the WCS assessment are shown in Table 7.

Table 7. Regression analysis for Panel B

	<i>PRM</i> ●	<i>FEM</i> +	<i>REM</i> ●	<i>V4</i> + <i>Austria</i>	<i>NB8</i> °	<i>Romanic</i> <i>countries</i>	<i>BENE-</i> <i>LUX</i>	<i>South-</i> <i>eastern</i> <i>European</i> <i>countries</i>	<i>Other</i> <i>countries</i>
<i>constant</i>	11.4564 [2.62e-05] ***	37.3439 [9.92e-014] ***	1.2985 [4.00e-011] ***	45.7664 [6.85e-05] ***	42.56 28 [0.0016] ***	32.2537 [0.0046] ***	81.4689 [0.0003] ***	80.0642 [8.58e-05] ***	18.9386 [0.0906] *
<i>WCS (t-1)</i>	0.85757 9 [3.68e-079] ***	0.47346 5 [1.60e-012] ***	0.73295 4 [2.19e-076] ***	0.43564 2 [0.0021] ***	0.435 602 [0.0071] ***	0.364363 [0.0332] **	0.08693 55 [0.6786]	-0.164580 [0.4884]	0.761803 [1.04e-06] ***
<i>GDP (t-1)</i>	31.1164 [0.0003] ***	18.3264 [0.0398] **	0.38148 4 [0.0005] ***	-4.7717 4 [0.8741]	33.01 37 [0.0252] **	32.7466 [0.2557]	9.14760 [0.6819]	22.5522 [0.3684]	1.75278 [0.9436]
<i>INF (t-1)</i>	-31.713 7 [0.0850] *	-27.292 5 [0.1785]	-0.7691 58 [0.0021] ***	-7.3552 2 [0.8933]	30.97 51 [0.4604]	-60.1374 [0.3676]	-3.1732 8 [0.9643]	-64.9959 [0.1039]	-22.8953 [0.7065]
<i>BOT (t-1)</i>	16.6442 [0.0188] **	0.43666 9 [0.9677]	0.43389 3 [0.0008] ***	-5.6432 5 [0.8653]	29.64 02 [0.1720]	-27.9594 [0.4520]	-44.680 6 [0.2829]	22.4224 [0.3919]	-0.15225 6 [0.9971]
<i>UNE (t-1)</i>	-12.007 0 [0.1765]	-15.057 3 [0.2261]	-0.1611 38 [0.3561]	-113.36 2 [0.0054] ***	-10.7 558 [0.7552]	21.7944 [0.4920]	-97.144 1 [0.3401]	-226.494 [0.0116] **	2.44411 [0.9301]
<i>Modified</i> <i>R2 / cor</i> <i>(y,y)2</i>	0.86961	0.89349	0.89024	0.78150 6	0.866 255	0.489568	0.76711 4	0.455672	0.751905

● listed for information only

+ country-specific constants are listed in Table 10 of the Appendix

° within the group of NB8 countries we only include the EU members (i.e. without Norway and Iceland)

*, **, *** – statistical significance at the level of 10%, 5% and 1%

Source: own processing

The dependences between the GCI rating level and the change in GDP, inflation and unemployment is dealt with by "Panel C". Through testing of the common significance of means and the Hausman's test statistics, the Fixed Effects Model was found to be the most appropriate. The summary results of these tests are presented in Table 8.

Table 8. Testing statistics for Panel C

<u>Test of the common significance of the means</u>			
F	2.75502	p-value	3.38E-05
<u>Breutch-Pagan's test statistics</u>			
LM	0.297026	p-value	0.585753
<u>Hausman's test statistics</u>			
H	60.052	p-value	1.19E-11

Source: own processing

Within the observed European countries, based on the results of the analysis, the statistically significant dependence of the change in the level of domestic production, expressed as a GDP indicator, on the overall rating of the global competitiveness index was recorded. In all EU countries, but also for partial regional analyses, we have identified a directly proportional relationship, i.e. the GCI index is designed to take into account the primary performance indicator of the economy. In the case of three regions, V4 with Austria, Southeastern European countries and the Benelux countries, significance does not occur. The impact of inflation in this evaluation also recorded a statistically significant positive relationship, which again confirms the structure of international prices where the European ones rank among the highest. Thus, any further price hikes reduce the demand for the European products. Exceptions are the V4 countries and Southeastern European countries, which direct the majority of their export towards the European Union. This is also the case with the so-called "other countries" where we have included Germany, France and the United Kingdom.

At the same time, however, it is necessary to add that in the context of regional analyses, significance has only been demonstrated in the Nordic and Baltic countries. Trade balance as the next of the independent variables impacting the GCI scores achieved statistical significance in all the model variations applied to the complete dataset of European countries. In all cases, it assumed a directly proportional relationship, as the growth in the trade balance of the economy directly reflects the growth in demand for the products of the given country abroad. Within the partial regression analyses, we only consider it in the case of the V4 countries and the other European countries. The mild impact of unemployment on the competitiveness of economies in Europe is not statistically significant, with the negative correlation with the GCI assessment in most cases. An exception is the Benelux countries, where there is not only a directly proportional relationship, but also significance. This condition should indicate the overheating of these economies and employment above the level of full employment. Thus, the further increase in employment leads to an even greater use of the labor factor at the expense of the growth of the wage costs of companies, while there is exactly the opposite effect in the V4 countries. A complete summary of the analysis results for Panel C is provided in Table 9.

Table 9. Regression analysis for Panel C

	<i>PRM</i> ●	<i>FEM</i> +	<i>REM</i> ●	<i>V4</i> + <i>Austria</i>	<i>NB8</i> °	<i>Romanic</i> <i>countries</i>	<i>BENE-</i> <i>LUX</i>	<i>South-</i> <i>eastern</i> <i>European</i> <i>countries</i>	<i>Other</i> <i>countries</i>
<i>constant</i>	0.24551 7	1.79421	1.2985	1.84599	1.829 95	2.12746	2.49061	0.992681	3.01012
	[0.0001] ***	[1.16e- 012] ***	[4.00e- 011] ***	[0.0013] ***	[0.002 7] ***	[0.0002] ***	[0.0147] **	[0.1786]	[0.0016] ***
<i>GCI (t-1)</i>	0.95156 2	0.62896 1	0.73295 4	0.62301 1	0.644 170	0.520030	0.47864 5	0.790190	0.418373
	[1.63e- 174] ***	[2.18e- 028] ***	[2.19e- 076] ***	[4.52e- 06] ***	[8.06e -07] ***	[8.15e-05] ***	[0.0185] **	[5.43e-05] ***	[0.0143] **
<i>GDP (t-1)</i>	0.25983 1	0.42510 4	0.38148 4	0.18007 7	0.352 200	0.838892	0.08594 10	0.417331	1.08055
	[0.0228] **	[0.0002] ***	[0.0005] ***	[0.5804]	[0.042 5] **	[0.0209] **	[0.7798]	[0.3144]	[0.0114] **
<i>INF (t-1)</i>	-0.5750 41	-0.8777 67	-0.7691 58	0.13763 8	-1.45 526	-0.34029 2	0.15166 4	-1.07382	0.50476
	[0.0187] **	[0.0008] ***	[0.0021] ***	[0.8326]	[0.000 8] ***	[0.6294]	[0.8842]	[0.2662]	[0.6106]
<i>BOT (t-1)</i>	0.39380 4	0.35369 8	0.43389 3	0.87728	0.353 814	0.341458	-1.3980 6	0.0061804	1.33315
	[4.95e- 05] ***	[0.0102] **	[0.0008] ***	[0.0609] *	[0.180 9]	[0.2325]	[0.1233]	[0.9891]	[0.0835] *
<i>UNE (t-1)</i>	0.00510 524	-0.1907 48	-0.1611 38	-1.5660 3	-0.31 5800	-0.09839 30	4.88784	-0.762857	0.035518 1
	[0.9666]	[0.2945]	[0.3561]	[0.0437] **	[0.454 7]	[0.7496]	[0.0090] ***	[0.5914]	[0.9547]
<i>Modified</i> <i>R2 / cor</i> <i>(y,y)2</i>	0.98126 9	0.98601 6	0.98024 2	0.97578 3	0.991 036	0.920233	0.93817 5	0.842616	0.951295

● listed for information only

+ country-specific constants are listed in Table 11 of the Appendix

° within the group of NB8 countries we only include the EU members (i.e. without Norway and Iceland)

*, **, *** – statistical significance at the level of 10%, 5% and 1%

Source: own processing

4. DISCUSSION

In the following section we discuss, in our opinion, the most significant findings from the analyses performed. The ADF test confirmed the stationarity of the entire spectrum of selected dependent (GCI, WCS and EFI indices) and independent (year-on-year GDP growth rate, year-on-year change in price level, unemployment rate and current account balance in the nominal GDP) varia-

bles. With the exception of the year-on-year GDP growth rate, the correlation analysis showed interdependence among all other variables. The gross domestic product does not correlate with only one of the selected competitiveness rating indices, namely the EFI index. The only positive correlation coefficient in this respect was the correlation between GDP and GCI. The value of 0.0438 can be considered to be statistically significant and relatively strong at the standard level of significance $p < 0.05$. The reason for the existence of such a dependence may be, in our opinion, the fact that the GCI index has a specific sub-index in its internal structure to evaluate the so-called macroeconomic freedom.

However, in order to justify the existence of interdependence between GCI and GDP and to confirm our presumption, further specific research will be needed because the WCS index contains a similarly focused sub-indicator, namely the "domestic economy" sub-indicator, whereas the GDP correlates with the WCS index at the negative level of -0.0544, i.e. it is a strongly negative dependence. Thus, in the case of WCS and GCI, the Hypothesis 1 is supported but it is not in the case of the EFI assessment. We assume that since EFI does not contain a sub-index which would be specifically aimed at assessing the macroeconomic environment; that is why the tests did not record an inter-correlation. At the moment, however, this is only an unsubstantiated assumption on our part, which creates a prerequisite for further exploration of the issue.

In the next step, we analyzed each of the competitiveness indices within a separate panel of tests. Panel A focused on the tests of the selected macroeconomic indicators in relation to the EFI index. The analysis has shown that the rise in consumer prices has a considerable negative impact on the economic freedom in the countries of Europe. Therefore, the expected negative correlation between the competitiveness of the economy and the increase in the price level of the economy has been confirmed. However, we also managed to identify an exception to this "rule" which is represented by the V4 countries. The specificities of these countries pointing to such a result may also be the subject of further, more in-depth examination. The impact of the 2008 financial and economic crisis was also confirmed, considerable mainly in Spain, Italy and Greece, not only on the spectrum of macroeconomic indicators but also on the result in the EFI index.

Panel B addressed the impact of the selected macroeconomic variables on the position of the countries in the WCS chart. The applied Fixed Effects Model determined the interrelations of the WCS index and the year-on-year inflation rate as well as the share of the current account balance on the nominal GDP as statistically insignificant. The relationship between the current account balance and the WCS has proved to be positive. The most significant finding is that we have identified the impact of the year-on-year change in domestic aggregate production as significantly affecting the position of the country in the WCS ranking from the point of view of the European countries as a whole, but at partial level this dependence was only confirmed in the Nordic and Baltic countries. The impact of the unemployment rate is statistically significant at regional and local rather than pan-European level. Relatively strong, indirectly proportional relationship indicates high unemployment in the regions of Southeastern Europe, the V4 countries and Austria, or the existence of structural unemployment. This causes the significance of the negative impact of unemployment on the other European regions.

The subject of the analyses of Panel C was the correlation between the GCI index and the macroeconomic quadrilateral. As already indicated by the initial correlation analysis, the statistically significant interdependence of the GCI index and the GDP rate was confirmed both at European Union level and at regional level, with the exception of Southeastern European countries, the V4, Benelux and Austria. The significance of the impact in the case of inflation was again confirmed, which also adversely affects the evaluation of the GCI index. At the regional level, the effect was significant only within the Baltic and Nordic countries. We find this interesting because of the commonly high living standard as well as the salary level, especially with regard to the Nordic region (Denmark, Sweden, Finland), so that the increase in the price level would not be very significant for competitiveness. Exceptions to the otherwise insignificant impact of the unemployment

rate are the Benelux countries, where this result is likely to signal the overheating of their economies.

CONCLUSION

In each of our panel tests, we have confirmed existence of certain differences between the European and the regional level, with deviations from the results at European level being shown in particular by the countries of Southeastern Europe, the V4 group and Austria. At the same time, we found the existence of an indirectly proportional relationship between inflation and three variations of the competitiveness assessment to achieve the significance of the relationship, which confirms Hypothesis 2. The analysis also shows that Hypothesis 3 on the context of competitiveness and unemployment measurement in the country was confirmed only in the case of measurement through the EFI index, but no other indices.

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APPENDICES

Table 10. Fixed Effects Model Constants for Panel A

		<i>Unit constants</i>						
		<i>Whole dataset</i>	<i>V4 countries</i>	<i>NB8 countries</i>	<i>Romanic countries</i>	<i>Countries of BENELUX</i>	<i>South-eastern European countries</i>	<i>Other countries</i>
1	<i>Czech republic</i>	47.12185	18.85830					
2	<i>Hungary</i>	46.06547	17.72483					
3	<i>Poland</i>	44.28406	17.94660					
4	<i>Slovakia</i>	48.75940	19.65382					
5	<i>Austria</i>	47.81719	18.95860					
6	<i>Belgium</i>	48.03771				33.00211		
7	<i>Bulgaria</i>	45.29632					26.29829	
8	<i>Cyprus</i>	48.21926			70.90093			
9	<i>Denmark</i>	51.60150		35.24959				
10	<i>Estonia</i>	52.50116		35.82861				
11	<i>Finland</i>	49.98296		34.10154				
12	<i>France</i>	43.50754						30.02737

13	<i>Germany</i>	48.54493					32.86527
14	<i>Greece</i>	40.11528		57.29647			
15	<i>Ireland</i>	54.09459					36.36385
16	<i>Italy</i>	42.59668		62.13961			
17	<i>Latvia</i>	47.82763	32.86086				
18	<i>Lithuania</i>	50.11037	34.35153				
19	<i>Luxembourg</i>	50.47872				34.16465	
20	<i>Malta</i>	45.47968		66.43489			
21	<i>Netherlands</i>	50.16027				34.42270	
22	<i>Portugal</i>	44.47199		64.40951			
23	<i>Romania</i>	43.70935					25.57142
24	<i>Slovenia</i>	42.51603					24.11107
25	<i>Spain</i>	48.91552		70.03439			
26	<i>Sweden</i>	48.51186	33.13432				
27	<i>United Kingdom</i>	52.16046					34.7554

Source: own processing

Table 11. Fixed Effects Model Constants for Panel B

Unit constants		Whole dataset	V4 countries	NB8 countries	Romanic countries	Countries of BENELUX	South-eastern European countries	Other countries
1	<i>Czech republic</i>	34.59363	43.48451					
2	<i>Hungary</i>	31.73071	41.78876					
3	<i>Poland</i>	32.31182	45.59532					
4	<i>Slovakia</i>	32.14714	47.84981					
5	<i>Austria</i>	42.05238	50.11347					
6	<i>Belgium</i>	39.41937				73.59963		
7	<i>Bulgaria</i>	28.64132					83.92172	
8	<i>Cyprus</i>							

9	<i>Denmark</i>	46.66729	47.19187 0		
10	<i>Estonia</i>	37.48292	38.29682 0		
11	<i>Finland</i>	42.84766	43.90949 0		
12	<i>France</i>	38.24795			17.24730
13	<i>Germany</i>	44.47589			20.31438
14	<i>Greece</i>	29.62316		27.99618	
15	<i>Ireland</i>	43.21974			19.07187
16	<i>Italy</i>	30.44286		33.33462	
17	<i>Latvia</i>	33.60148	35.47787		
18	<i>Lithuania</i>	35.91690	36.13355		
19	<i>Luxembourg</i>	46.13013			86.21042
20	<i>Malta</i>				
21	<i>Netherlands</i>	44.98603			84.59655
22	<i>Portugal</i>	32.85752		33.49314	
23	<i>Romania</i>	28.18950			76.94180
24	<i>Slovenia</i>	29.83010			80.03059
25	<i>Spain</i>	34.37991		34.19086	
26	<i>Sweden</i>	46.82023	46.81715		
27	<i>United Kingdom</i>	41.94876			19.12095

Source: own processing

Table 12. Fixed Effects Model Constants for Panel C

		<i>Unit constants</i>						
		<i>Whole dataset</i>	<i>V4 countries</i>	<i>NB8 countries</i>	<i>Romanic countries</i>	<i>Countries of BENELUX</i>	<i>South-eastern European countries</i>	<i>Other countries</i>
1	<i>Czech republic</i>	1.727810	1.834717					
2	<i>Hungary</i>	1.629984	1.750067					
3	<i>Poland</i>	1.686023	1.851714					

4	<i>Slovakia</i>	1.595010	1.800949		
5	<i>Austria</i>	1.925936	1.992478		
6	<i>Belgium</i>	1.942045		2.304188	
7	<i>Bulgaria</i>	1.637870			1.013542
8	<i>Cyprus</i>	1.674266		2.130448	
9	<i>Denmark</i>	1.987433	1.923341		
10	<i>Estonia</i>	1.783445	1.749607		
11	<i>Finland</i>	2.057940	1.997473		
12	<i>France</i>	1.928596			2.969622
13	<i>Germany</i>	2.029230			3.068368
14	<i>Greece</i>	1.566676		1.985613	
15	<i>Ireland</i>	1.862341			2.879364
16	<i>Italy</i>	1.678115		2.139452	
17	<i>Latvia</i>	1.676309	1.654025		
18	<i>Lithuania</i>	1.706872	1.677592		
19	<i>Luxembourg</i>	1.879716		2.487141	
20	<i>Malta</i>	1.652181		2.097044	
21	<i>Netherlands</i>	2.013474		2.680504	
22	<i>Portugal</i>	1.714453		2.178167	
23	<i>Romania</i>	1.622605			0.987049
24	<i>Slovenia</i>	1.638595			0.977453
25	<i>Spain</i>	1.761968		2.234063	
26	<i>Sweden</i>	2.042401	1.977649		
27	<i>United Kingdom</i>	2.022303			3.123110

(Source: own processing)

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