

IS GLOBAL COMPETITIVENESS SPEEDING UP THE GROWTH IN THE EU? A PANEL DATA ANALYSIS

Associate Profesor Olimpia NEAGU, Ph.D
"Vasile Goldis" Western University of Arad
E-mail: olimpian2005@yahoo.com

(Received: July 2018; Accepted: September 2018)

Abstract: The paper documents the impact of global competitiveness on economic growth in the EU Member States. In a panel data approach, for a time span of 10 years (2008-2017), a validated influence of Global Competitiveness Index on annual rate of GDP in the EU countries was found. The impact is higher in the group of Eastern and Central European countries (ECE) than in the Western European (well developed) countries, as well as at European economy level.

Keywords: competitiveness, economic growth, panel data models

JEL Codes: O40, O57, C23

1. Introduction

The notions of competitiveness and economic environment have continuously evolved, as well as the context in which the policy makers decide to foster economic growth.

In a macroeconomic approach, the World Economic Forum defines competitiveness as „the set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the economy can achieve” (WEF, 2018).

The concept of competitiveness includes static and dynamic components: the productivity of a country enhances its capacity to sustain a high level of income and also, it is a main determinant of its returns to investment, explaining in this way an economy's growth potential.

At microeconomic level, competitiveness is the ability of firms to mobilise and efficiently employ the productive resources required to successfully offer their goods and services in a global economic environment (EIB, 2016).

A country's economic growth is related to many endogenous and exogenous factors, inside or outside of controls of policymakers, companies or individuals. Its competitiveness could be among these factors.

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

The present study investigates the influence of global competitiveness measured by Global Competitiveness Index (GCI) on economic growth in the EU countries in a panel data analysis.

The paper is organised as follows: after a short literature review on competitiveness, data and methodology of the research are exposed; Main findings are described in the fourth section, followed by Conclusions sections.

2. Literature review

There is a large spectrum of competitiveness definitions. We resume in the following lines their main components, characteristics and dimensions of competitiveness:

1. Definitions of national competitiveness as productivity and highlighting its consequences:

- Competitiveness is expressed by national productivity (Porter 1990; Krugman, 1990, 1994) or the expected level of output per working-age individual (Delgado, 2012). Competitiveness can generate wealth for nations and is supporting high wages (Bobba et al., 1971) and generates improved living standard and high employment on a sustainable basis (Porter, 1990) as well as expanding and maintaining the real incomes of population on long term (Barker, Köhler, 1998) or providing for citizens a standard of living that is both rising and sustainable (Tyson D'Andrea, 1992), or the capacity of an economy to support a higher standard of living than other comparable economies (Boltho, 1996).

2. Definitions of country / sector / industry / firm competitiveness showing its relation with business, sales, goods, market share and national or international competitors:

- Competitiveness is the ability to produce and sell products and services of superior quality and lower costs than its domestic and international competitors (Buckley et al., 1988), or the degree to which it can produce goods or services meeting the test of international markets (Barker, Köhler, 1998; Tyson D'Andrea, 1992), as well as the firm's economic strengths against its rivals in the global marketplace where products, services, people and innovations move freely despite the geographical boundaries (Chao-Hung, Li-Chang, 2001). Competitiveness is a country's share of world markets for its products (Porter et al., 2008).

The European Commission proposed in 2010 the Europe 2020 strategy with the goal to transform the EU into "a smart, sustainable and inclusive economy". The experts of World Economic Forum assessed the Europe's progress in enhancing competitiveness based on this strategy and they conceived the *EU 2020 competitiveness index*. It is built upon 7 pillars: Enterprise environment (competition, clusters, entrepreneurship, availability of financing) digital agenda

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

(ICT readiness, usage and impact), innovative Europe (R&D expenditures, researchers, patents, universities, capacity for innovation), education and training, labour market and employment, social inclusion (access to health care services, Gini coefficient, efficiency in reducing poverty, social safety net protection), environmental sustainability (share of renewable energy production, environmental treaty ratification, quality of natural environment, CO2 intensity). In its 2012 and 2014 EU 2020 Competitiveness reports, the World Economic Forum provides analysis and ranking of European countries, according to the scores of this Index.

In the European Investment Bank's (2016) view, the EU's competitiveness needs to be understood at three levels: the enabling environment (institutions&markets, human capital, strategic infrastructure, financial sector), the capacity for change (within firms and across economy), and economic wellbeing (productivity, trade, employment, growth, convergence). At EU level, all these can be supported by appropriate structural reforms and removal of barriers to investments and EU Single Market integration.

The Global Competitiveness Index (GCI) was developed by Xavier Sala-i-Martin since 2005 in collaboration with the Forum, as a continuation of building on Klaus Schwab's work (1979) (WEF, 2018) and defining country's competitiveness is a set of macroeconomic and microeconomic factors that determine its productivity and economic growth. The GCI is a composite index combining 114 indicators grouped in 12 pillars: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. These pillars are organized into three subindexes: basic requirements, efficiency enhancers, and innovation and sophistication factors. In the present paper, this definition of competitiveness is used.

The quality of a country's institutions has been proven as a factor of economic growth (Acemoglu et al., 2002; North, 1989, Miller & Holmes, 2014).

The impact of infrastructure on economic growth is highlighted in studies such as: Canning and Pedroni (1999) and Calderon and Servén (2004).

There are evidences of the impact of macroeconomic stability on growth: inflation (Goodfriend, 2007; Temple, 2000), public debt levels (Reinhart and Rogoff, 2010), fiscal policies (Johansson et al., 2008).

Endogenous growth theory generally assumes that economic growth is at least partly a function of stocks of knowledge in the form of human capital or the outcomes of research and development (R&D) activities.

The role of human capital (education and health) was put in light in endogenous growth models as well as the outcomes of research and development activities.

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

There are a huge number of studies highlighting the positive influence of human capital on productivity and economic growth (Barro, 1991; Mankiw et al., 1992; Bassanini and Scarpeta, 1996; Barro and Lee, 2000; Bils and Klenow, 2000; de la Fuente and Domenech, 2000; Krueger and Lindahl, 2001; Cohen și Soto, 2001; Simionescu, 2018).

Trade openness and openness to international competition could improve a country's productivity, expanding the productive local industries and widening the acces to advanced technology and knowledge from abroad (Delgado et al., 2012). Trade openness has a positive impact on prosperity (Alesina et al., 2005; Baldwin, 2003) and economic growth (Yanikkaya, 2003).

Efficient access to capital and financial development is important for economic growth (Panicos and Hussein, 1996; Khan, 2001; Arestis et al., 2001; Hassan et al., 2011).

Business sophistication can raise productivity and create greater opportunities for innovation in processes and products (i.e. Delgado et al., 2010).

Starting with the assertions of Romer (1990) regarding the role of integrating and adapting exogenous technologies in the national productivity improvement, the positive impact of technological innovation on productivity was proven by Grossman and Helpman (1991) and Furman et al. (2002).

Korez-Vide, R. & Tominc, P. (2016) found that the growth of a national economy's GDP per capita and the growth of a national economy's competitiveness are positively related in a sample of Central and Eastern EU countries

3. Data and econometric approach

The sets of values of Global Competitiveness Index (GCI) were extracted from World Economic Forum Reports for the period of 2008-2017 and the annual growth rate of GDP for the 28 EU countries from the World Development Indicators data base.

We analyse the impact competitiveness on economic growth through a panel regression equation, as follows:

$$GDPR_{it} = \alpha + \beta \cdot GCI_{it} + \varepsilon_{it}$$

(1)

where: i denotes the country, t denotes the time and ε_{it} is the error term.

$GDPR_{it}$ is the annual growth rate of GDP in the country i in year t and GCI_{it} is the Global Competitiveness Index in the country i in year t .

$$\varepsilon_{it} = \mu_i + v_{it}$$

(2)

where: μ_i means unobservable individual specific effect which is time invariant and v_{it} is the remainder disturbance, which varies across time and panels.

There are two main econometric models in the panel data analysis: fixed effect model (FE) and random effects model (RE). In the fixed effects model, characteristics of each individual unit may impact the dependent variable and the effects of time-invariant characteristics are not taken into consideration. In the random effects model, the variation across countries is random and uncorrelated with the independent variable (see Hsiao, 2002).

We can select the appropriate model by using the Hausman test (see Clark and Linzer, 2012):

$$H = (\hat{\beta}_{RE} - \hat{\beta}_{FE})' [Var(\hat{\beta}_{FE}) - Var(\hat{\beta}_{RE})]^{-1} (\hat{\beta}_{RE} - \hat{\beta}_{FE}) \quad (2)$$

where: H denotes the chi-square distribution with degree of freedom equals to the number of regressors in the model.

In the case of no correlation between independent variable and country effects, the estimates of β in fixed effects model ($\hat{\beta}_{FE}$) should be similar to the estimation of β in random effects model ($\hat{\beta}_{RE}$). The null hypothesis presumes that the random effects model is appropriate.

When p is less than 0.05 (the conventional level of significance), the null hypothesis is rejected in the favour of the fixed effects model. When $p > 0.05$, the null hypothesis is accepted meaning that the random effects model is appropriate (see Clark and Linzer, 2012).

Before performing the panel regression analysis we check the stationarity of all variables by using the Hadri Lagrange Multiplier test in Stata. The Hadri (2000) LM test for stationarity assumes the null hypothesis that all panels are stationary versus the alternative that at least some of the panels contain unit roots. In a panel specific time regression we have:

$$y_{it} = r_{it} + \beta_i \cdot t + \varepsilon_{it} \quad (3)$$

where: r_{it} is a random walk:

$$r_{it} = r_{it-1} + u_{it} \quad (4)$$

If u_{it} is zero, r_{it} would be constant and y_{it} would be trend stationary. In this logic, the Hadri LM tests the null hypothesis H_0 versus alternative H_a :

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

$$H_0: \lambda = \frac{\sigma_u^2}{\sigma_\varepsilon^2} = 0 \qquad H_a: \lambda > 0$$

In order to carry out the econometric analysis the STATA 13.1 software was used.

4. Main findings

4.1. The global competitiveness level in the European Union in 2017

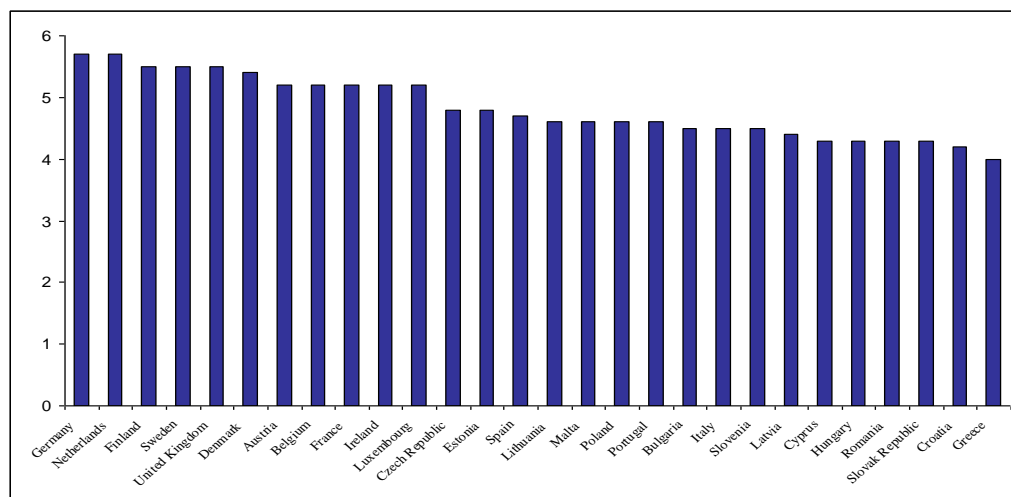


Figure 1 GCI scores in 2017 in EU countries
 Source: author's computation based on WEF data

In 2017, the best performers as competitiveness are Germany and Netherlands followed by Finland, Sweden and United Kingdom. There are 11 countries with GCI score above the average of 4.83 (Germany, Netherlands, Sweden, United Kingdom, Denmark, Austria, Belgium, France, Ireland, Luxembourg and Czech Republic). We notice that a country from Central Europe (Czech Republic) belongs to this group. In the second group of countries, with GCI scores under the average, we find all the other developing countries from Eastern and Central Europe, as well as Spain, Malta, Portugal, Cyprus and Greece. The worst performer regarding global competitiveness is Greece (Figure 1).

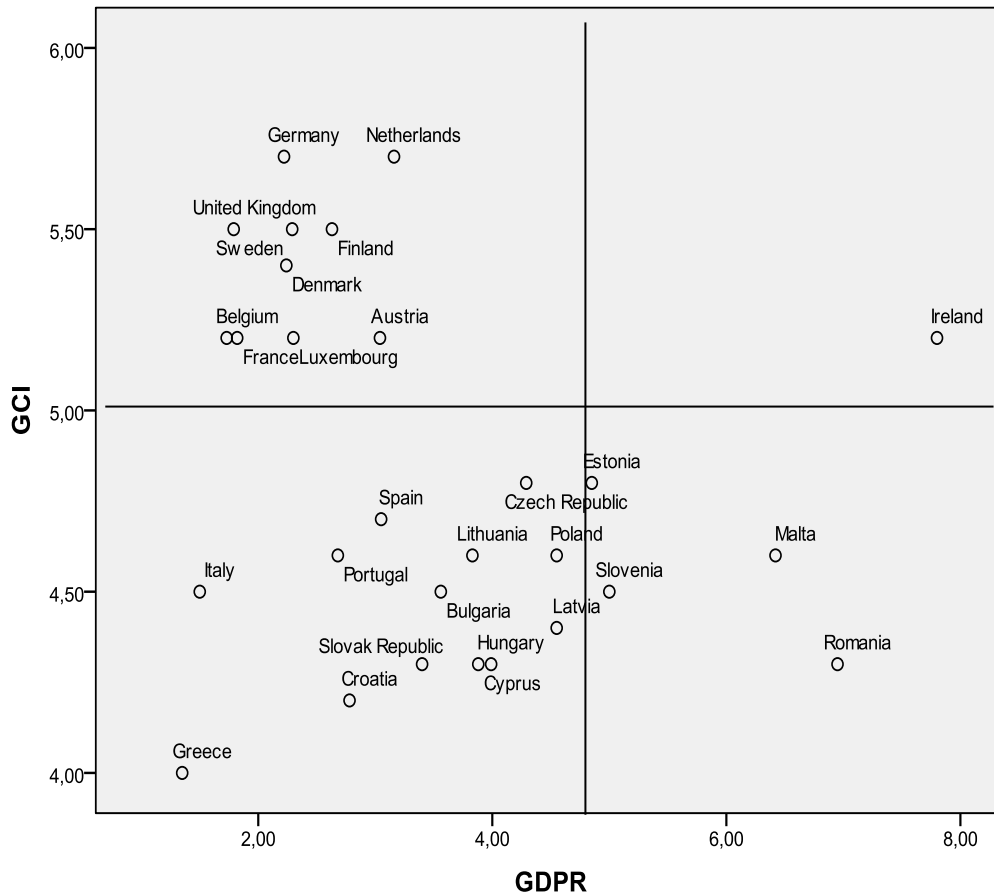


Figure 2 Global Competitiveness Index and growth rate of GDP in 2017, in the EU countries

Source: author's computation based on WEF and WDI data

We notice in the Figure 2 that developed countries in the EU (Germany, Netherlands, United Kingdom, Sweden, Finland, Denmark, Austria, Belgium, France and Luxembourg) registered in 2017 a low rate of growth and high scores for GCI.

In the right top quadrant is located only Ireland with high score of GCI and growth rate.

In the left bottom quadrant we see a mixture of advanced (Italy, Portugal, Greece and Cyprus) and developing (ECE) economies (Czech Republic, Croatia, Slovak

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

Republic, Bulgaria, Lithuania, Poland, Latvia, and Hungary). In the right bottom quadrant we find Estonia, Slovenia, Romania and Malta. Romania has the highest growth rate in this group.

The best performers as GDP growth in 2017 are: Ireland, Malta and Romania. Only Ireland correlates this performance with competitiveness, Malta and Romania experience under the EU average scores of GCI.

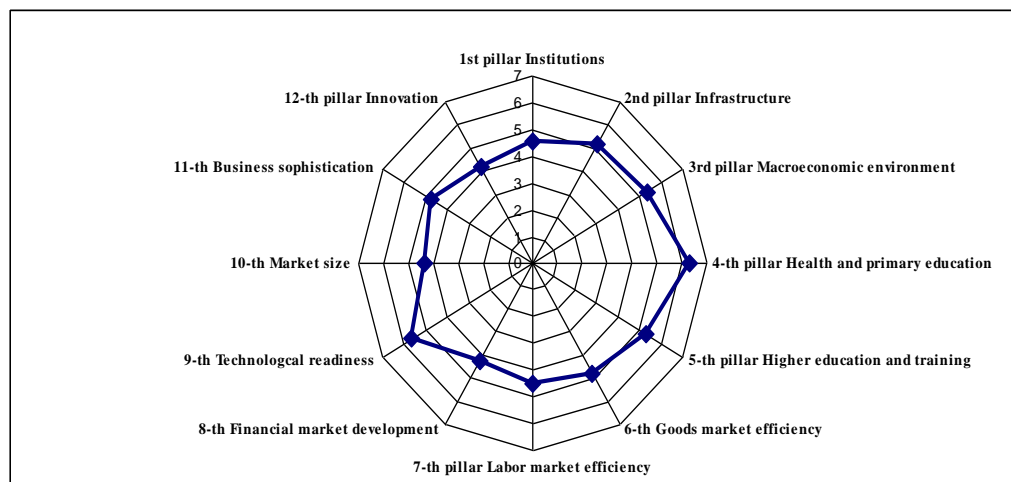


Figure 3 The mean scores of the 12 pillars of GCI at EU level, 2017
 Source: author's computation based on WEF data

We notice that the figure 3 is almost similar with figure 4, indicating that the average scores for the components of GCI at EU level and in the group of advanced economies (Western countries) are close to each other.

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

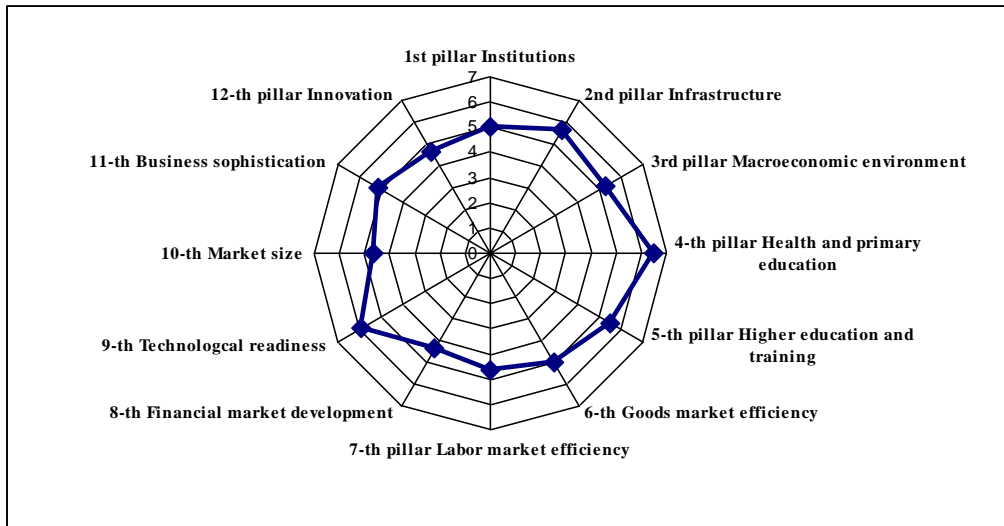


Figure 4 The mean scores of the 12 pillars of GCI in the group of Western European countries, 2017

Source: author's computation based on WEF data

In both groups of countries as well as at EU level, the highest mean score is registered for the component of Health and primary education.

By comparing the performance of the group of ECE countries with the group of Western countries, we notice that Financial development and Labor market efficiency have higher scores in ECE countries, as well as Macroeconomic environment. Technological readiness is slightly less scored in these countries, as well as Business sophistication (Figure 4 and Figure 5).

Institutions, Innovation and Market size as components of global competitiveness have the lowest scores in the group of ECE countries. The best scores of the GCI components in the group are registered for Health and primary education and for Tehnological readiness (Figure 5), but the last one is lower than in the Western countries group.

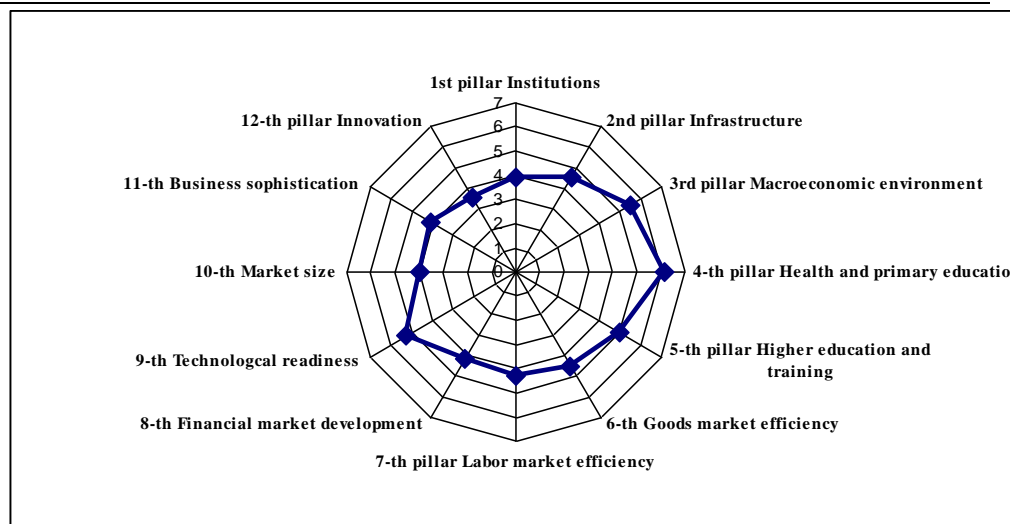


Figure 5 The mean scores of the 12 pillars of GCI in the group of Eastern-Central European countries, 2017

Source: author's computation based on WEF data

4.2. Results of regression estimation

4.2.1. European Union level

The results of unit root tests for our variables (GDPR and GCI) at EU level are displayed in Table 1a (Appendix). For both variables, the p-value is 0.000, indicating the stationarity of the variables series.

After running the commands in STATA for FE and RE models (Table 1b, Table 1c), we selected the appropriate model, by using the Hausman test (Table 1d). The value of Prob chi2 is 0.000 < 0.005 indicating that the FE model is appropriate, for a significance level of 0.01.

For FE model, we run the test for robustness of standard errors (Table 1e). The value of Prob is 0.0006, suggesting robustness of standard errors.

The estimation of equation 1 at EU level is:

$$GDPR = -56,49 + 12.19 \cdot GCI$$

(10.33) (2.18)
 (0.000) (0.000)

The model is statistically validated for a significance level of 0.01, due to the fact that the value of Prob is 0.000 for the model as a whole, as well as for each coefficient.

For an increase of one unit of GCI, the GDP rate can increase with 12.19 units, under caeteris paribus condition.

4.2.2 Western European countries

The results of performing unit root tests for GCI and GDPR show stationarity (Appendix, Table 2a) for these variables in the 17 Western European economies.

The estimation of FE and RE models (Table 2b and Table 2c) is followed by running the Hausman test. The value of Prob chi2 is 0.0004, indicating the FE model as appropriate (Table 2d). The robustness of standard errors (Table 2 e) is proved: the value of Prob is $0.0189 < 0.05$.

The estimation of equation 1 for the group of Western countries is:

$$GDPR = -53,32 + 10,92 \cdot GCI$$

$$\begin{matrix} (13,2) & (2,6) \\ (0.000) & (0.000) \end{matrix}$$

The model is statistically validated for a significance level of 0.01, due to the fact that the value of Prob is 0.000 for the model as a whole, as well as for each coefficient.

For an increase of one unit of GCI, the GDP rate can increase with 10.92 units, under caeteris paribus condition. In proportion of 3% the variation of GDPR is due to the variation of GCI (the value of R-sq is 0.034).

4.2.3. Eastern and Central European countries

The results unit root tests for GCI and GDPR, displayed in Table 3a (Appendix) show stationarity (Appendix, Table 3a) for these variables in the 11 Eastern and Central European economies.

After the estimation of FE and RE models (Table 3b and Table 3c) is followed by running the Hausman test. The value of Prob chi2 is 0.0016, indicating the FE model as appropriate (Table 3d). The robustness of standard errors (Table 3e) is proved: the value of Prob is $0.0182 < 0.05$.

The estimation of equation 1 for the group of ECE countries is:

$$GDPR = -58,57 + 13,76 \cdot GCI$$

$$\begin{matrix} (16,8) & (3,7) \\ (0.000) & (0.000) \end{matrix}$$

The model is statistically validated for a significance level of 0.01, due to the fact that the value of Prob is 0.000 for the model as a whole, as well as for each coefficient.

For an increase of one unit of GCI, the GDP rate can increase with 13.76 units, under caeteris paribus condition. In proportion of 3% the variation of GDPR is due to the variation of GCI (the value of R-sq is 0.034).

5. Conclusions

The aim of the paper was to explore the influence of global competitiveness on growth rate at the European economy level. Due to the fact the economic growth has different rates in advanced economies than in developing Member States, a separate panel data analysis for each group is performed.

In each group we found a positive validated (for a significance threshold of 0.01) influence of global competitiveness on annual growth rate of economies and a proportion of 3% explanation of dependent variable's variation of 3%. At EU level the influence is stronger than in the group of Western countries and lower than in ECE countries. The strongest influence of global competitiveness on growth rate is identified among ECE countries. This suggests that for these countries competitiveness (trade openness, innovation, technology diffusion, market efficiency, and financial development) represents a valuable and critical resource for growth and appropriate public policies are needed in order to enhance it, as well as, adequate institutions to implement and monitor them. EU emerging economies (ECE) should to use this resource in order to narrow the gap with advanced economies, to speed their convergence process and benefit from international trade and mobility of labour and capital or latest development in technology.

For advanced economies of the EU, with high scores of global competitiveness and low growth rates of GDP, competitiveness is needed to sustain their higher living standards and support their reforms in a very challenging socio-economic context, in order to ensure future prosperity for Europe.

The conclusions of the present research are similar with the findings of Dobrinsky and Havlik (2014) and Korez-Vide and Tominc (2016) regarding competitiveness and growth in ECE countries.

It is also, found in the panel regression analysis that we can explain the variation of dependent variable only in a proportion of 3%. This suggests that there are several other factors than global competitiveness driving the economic growth, which were not considered in this research, therefore, we mentioned the condition of *caeteris paribus*.

Possible other limitations of the present research are related to the relative short period of time taken into analysis and to the fact that the Global Competitiveness Index is a composite indicator, built on other proxy indicators, which cannot capture the mechanisms and channels of other growth resources and factors.

Further studies might go deeper into analysis of the drivers of a country's competitiveness and their impact on economic growth or, other metrics for competitiveness can be considered.

References

1. Acemoglu, D., Johnson, S., & Robinson, J. (2002). Reversal of fortune: Geography and institutions in the making of the modern world distribution of income. *Quarterly Journal of Economics*, 117(4), pp.1231–1294.
2. Alesina, A., Spolaore, E., & Enrico, R. (2005). Trade, growth and the size of countries. In P. Aghion & S. Durlauf (Eds.), *Handbook of economic growth* (1st ed., pp. 1499–1542). Amsterdam: Elsevier.
3. Arestis, Ph., Panicos, D., Luintel, K.b.(2001). Financial Development and Economic Growth: the Role of Stock Markets. *Journal of Money, Credit and Banking*, Vol.33, No.1, pp.16-41.
4. Baldwin, R. (2003). Openness and growth: What's the empirical relationship. *NBER Working Paper No. 9578*. Cambridge, NY: National Bureau of Economic Research.
5. Barker T., Köhler J. (1998). Environmental Policy and Competitiveness. *Environmental Policy Research Briefs* 6, pp.1–12.
6. Barro, R. J. (1991). Human Capital and Growth. *American Economic Review, Papers and Proceedings* 91 (2), pp. 12-17.
7. Barro, R.J., Lee, J.-W. (2000). *International Data on Educational Attainment: Updates and Implications*. Center for International Development at Harvard University, Working Paper 42.
8. Bassanini, A., Scarpeta, S. (2002). Does human capital matter for growth in OECD countries? A pooled mean-group approach. *Economics Letters*. 74, pp.399-405.
9. Bils, M. and Klenow, P. (2000). Does Schooling cause Growth ?. *American Economic Review*, Vol.90, No 5, pp.1160-1180.
10. Bobba F., Langer W., Pous J.W. (1971). Bericht über die Wettbewerbsfähigkeit der Europäischen Gemeinschaft, Brussels.
11. Boltho, A. (1996). The assessment: International competitiveness. *Oxford Review of Economic Policy*, 12(3), pp.1–16.
12. Buckley P.J., Pass C.L., Prescott K. (1988). Measures of International Competitiveness: A Critical Survey. *Journal of Marketing Management* 4(2), 175–200.
13. Calderon, C., & Serven, L. (2004). The effects of infrastructure development on growth and income distribution. *World Bank Policy Research Working Paper No. 3400*, Washington, DC: World Bank.
14. Canning, D., & Pedroni, P. (1999). *Infrastructure and long run economic growth*. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.489.6497&rep=1&type=pdf> (Accessed June 10, 2018)
15. Chao-Hung W., Li-Chang H. (2010). The Influence of Dynamic Capability on Performance in the High Technology Industry: The Moderating Roles of Governance and Competitive Posture. *African Journal of Business Management* 4(5), 562–577.
16. Clark, T.S. and Linzer, D.A. (2012) *Should I use fixed or random effects?*. <http://polmeth.wustl.edu/files/polmeth/clarklinzerrefemar2012.pdf> > Accessed 27 February 2018.

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

17. Cohen, D., Soto, M.(2001). *Growth and human capital: Data good results*. Technical Paper No 57, OECD.
18. de la Fuente, A., Doménech, R., 2000.Human Capital in Growth Regressions: How Much Difference Does Data Quality Make?. *OECD Economics Department Working Papers*, No. 262, 2 pp. 2-68.
19. Delgado, M., Ketels, Ch., Porter, M.E., Stern, S. (2012). The determinants of national competitiveness.*NBER Working Paper Series*, Working Paper 18249, National Bureau of Economic Research. <http://www.nber.org/papers/w18249>.
20. Dobrinsky, R., & Havlik, P. (2014). *Economic convergence and structural change: The role of transition and EU accession*. Vienna: The Vienna Institute for International Economic Studies.
21. European Commission (EC) (2010). *Europe 2020: A strategy for smart, sustainable and inclusive growth*. Brussels: EC.
22. EIB (European Investment Bank) (2016). *Restoring EU Competitiveness: 2016 Updated Version*. Luxembourg: European Investment Bank.
Available at http://www.eib.org/attachments/efs/restoring_eu_competitiveness_en.pdf.
23. Furman, J., Porter, M., & Stern, S. (2002). The x. *Research Policy*, 31(6), pp.899–933.
24. Goodfriend, M. (2007). How the world achieved consensus on monetary policy. *Journal of Economic Perspectives*, 21(4), pp.47–68.
25. Grossman, G. M., & Helpman, E. (1991). Quality ladders in the theory of growth. *The Review of Economic Studies*, 58(1), pp.43–61.
26. Hadri, K.(2000).Testing for stationarity in heterogenous panel data. *Econometrics Journal* 3, pp.148-161.
27. Hassan, M.K., Sanchez, B., Yu, J-S.,(2011).Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, Vol.51, Issue 1, pp.88-104.
28. Hsiao, Cheng (2002) *Analysis of Panel Data*, New York: Cambridge University Press
29. Johansson, A., Heady, C., Arnold, J., Brys, B., & Vartia, L. (2008). Tax and economic growth. *Economics Department Working Paper No. 620*, Paris: OECD.
30. Khan, O.(2001).Financial development and economic growth. *Macroeconomic Dynamics*, Vol 5 Issue 3, pp.413-433.
31. Korez-Vide, R., &Tominc, P. (2016). Competitiveness, Entrepreneurship and Economic growth. In: Trapczynsky, P. et al. (eds.).*Competitiveness of CEE Economies and Businessess*. Switzerland: Springer International Publishing.
32. Krueger, A. B., Lindahl, M. (2001).Education for Growth: Why and For Whom?.*Journal of Economic Literature* 39 (4), pp. 1101-1136.
33. Krugman P. (1990). *The Age of Diminished Expectations*. The MIT Press, Cambridge.
34. Krugman P. (1994). Competitiveness: A Dangerous Obsession. *Foreign Affairs* 73(2), 28–44.
35. Krugman, P., Obstfeld M. (2000). *International Economics Theory and Policy*. 5th ed. New York: Addison-Wesley.
36. Mankiw, N. G., Romer, D., &Weil, D. (1992). A Contribution on the empirics of economic growth. *Quarterly Journal of Economics*, 106, pp.407–437.

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

37. Miller, T., Kim, A., & Holmes, K. R. (2014). 2014 *Index of economic freedom*. Washington, DC: The Heritage Foundation.
38. North, D. C. (1989). Institutions and economic growth: An historical introduction. *World Development*, 17(9), pp.1319–1332.
39. Panicos, D., Hussein, K. (1996). Does financial development cause economic growth? Time series evidence from 16 countries. *Journal of Development Economics*, Vol.51 Issue 2, pp.387–411.
40. Porter M.E.(1990). *The Competitive Advantage of Nations*. The Free Press, New York.
41. Porter M., Ketels C., Delgado M.(2008). The Microeconomic Foundations of Prosperity: Findings from the Business Competitiveness Index. In: WEF, *The Global Competitiveness Report 2007–2008* WEF, Geneva.
42. Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a time of debt. *American Economic Review: Paper and Proceedings*, 100, pp.573–578.
43. Romer, P. (1990). Endogenous technological change. *Journal of Political Economy*, 98, pp.S71–S102.
44. Simionescu, M. (2018). What drives economic growth in some CEE countries?. *Studia Universitatis "Vasile Goldis" Arad Economic Series*, Vol.28 Issue 1, pp.46-56.
45. Tyson D'Andrea L.(1992). *Who's Bashing Whom: Trade Conflict in High Technology Industries*. Institute for International Economics, Washington, D.C.
46. Yanikkaya, H. (2003). Trade openness and economic growth: a cross-country empirical investigation. *Journal of Development Economics*, Vol.72, Issue 1, pp.57-89.
47. World Economic Forum (2009). *The global competitiveness report 2008–2009*. Geneva: World Economic Forum.
48. World Economic Forum (2010). *The global competitiveness report 2009–2010*. Geneva: World Economic Forum.
49. World Economic Forum (2011). *The global competitiveness report 2010–2011*. Geneva: World Economic Forum.
50. World Economic Forum (2012). *The global competitiveness report 2011–2012*. Geneva: World Economic Forum.
51. World Economic Forum (2013). *The global competitiveness report 2012–2013*. Geneva: World Economic Forum.
52. World Economic Forum (2014). *The global competitiveness report 2013–2014*. Geneva: World Economic Forum.
53. World Economic Forum (2015). *The global competitiveness report 2014–2015*. Geneva: World Economic Forum.
54. World Economic Forum (2016). *The global competitiveness report 2015–2016*. Geneva: World Economic Forum.
55. World Economic Forum (2017). *The global competitiveness report 2016–2017*. Geneva: World Economic Forum.
56. World Economic Forum (2018). *The global competitiveness report 2017–2018*. Geneva: World Economic Forum.
57. <https://data.worldbank.org/products/wdi>

Appendix

Estimation results of regression model at EU level

Table 1a

Unit root tests

Hadri LM test for GCI

 Ho: All panels are stationary Number of panels = 28
 Ha: Some panels contain unit roots Number of periods = 10
 Time trend: Not included Asymptotics: T, N → Infinity
 Heteroskedasticity: Not robust sequentially
 LR variance: (not used)

	Statistic	p-value
z	14.4744	0.0000

Hadri LM test for GDPR

 Ho: All panels are stationary Number of panels = 28
 Ha: Some panels contain unit roots Number of periods = 10
 Time trend: Not included Asymptotics: T, N → Infinity
 Heteroskedasticity: Not robust sequentially
 LR variance: (not used)

	Statistic	p-value
z	6.0739	0.0000

Table 1b

Regression results at EU level- Fixed-effects model

Fixed-effects (within) regression	Number of obs = 280
Group variable: Country	Number of groups = 28
R-sq: within = 0.1103	Obs per group: min = 10
between = 0.0100	avg = 10.0
overall = 0.0092	max = 10
	F (1,251) = 31.12
corr (u _i , X _b) = -0.9532	Prob > F = 0.0000

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

GDPR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GCI	12.1909	2.185422	5.58	0.000	7.8868	16.495
_cons	-56.49848	10.33302	-5.47	0.000	-76.84895	-36.14801

sigma_u	6.0603262					
sigma_e	3.4560907					
rho	.75459125 (fraction of variance due to u_i)					

F test that all u_i=0:			F(27, 251) =	2.81	Prob > F = 0.0000	

Table 1c

Regression results at EU level - Random-effects model

Random-effects GLS regression	Number of obs =	280
Group variable: Country	Number of groups =	28
R-sq: within = 0.1103	Obs per group: min =	10
between = 0.0100	avg =	10.0
overall = 0.0092	max =	10
	Wald chi2(1) =	3.34
corr(u_i, X) = 0 (assumed)	Prob > chi2 =	0.0678

GDPR	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
GCI	1.060723	.580825	1.83	0.068	-.0776732	2.199119
_cons	-3.883741	2.761136	-1.41	0.160	-9.295467	1.527986

sigma_u	.98948804					
sigma_e	3.4560907					
rho	.07575929 (fraction of variance due to u_i)					

Table 1d

Hausman test for the regression model at EU level

---- Coefficients ----

	(b) fe	(B) re	(b-B) Difference	sqrt (diag(V_b-V_B)) S.E.
GCI	12.1909	1.060723	11.13018	2.106825

$$\text{chi2}(1) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 27.91$$

$$\text{Prob}>\text{chi2} = 0.0000$$

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

Table 1e

Robustness of standard errors

Fixed-effects (within) regression	Number of obs = 280
Group variable: Country	Number of groups = 28
R-sq: within = 0.1103	Obs per group: min = 10
between = 0.0100	avg = 10.0
overall = 0.0092	max = 10
	F(1,27) = 15.25
corr(u_i, Xb) = -0.9532	Prob > F = 0.0006

	Coef.	Std. Err.	t	Robust P> t	[95% Conf. Interval]	
GDPR						
GCI	12.1909	3.121263	3.91	0.001	5.786598	18.5952
_cons	-56.49848	14.75488	-3.83	0.001	-86.77299	-26.22397

sigma_u	6.0603262
sigma_e	3.4560907
rho	.75459125 (fraction of variance due to u_i)

Estimation results of regression model in Western countries

Table 2a

Unit root tests

Hadri LM test for GDPR

Ho: All panels are stationary	Number of panels = 17
Ha: Some panels contain unit roots	Number of periods = 10
Time trend: Not included	Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust	sequentially
LR variance: (not used)	

	Statistic	p-value
z	5.7071	0.0000

Hadri LM test for GCI

Ho: All panels are stationary	Number of panels = 17
Ha: Some panels contain unit roots	Number of periods = 10
Time trend: Not included	Asymptotics: T, N -> Infinity

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

Heteroskedasticity: Not robust sequentially
 LR variance: (not used)

	Statistic	p-value
z	11.0389	0.0000

Table 2b

Estimation results in Western countries-FE model

Fixed-effects (within) regression Number of obs = 170
 Group variable: Country Number of groups = 17
 R-sq: within = 0.1000 Obs per group: min = 10
 between = 0.0884 avg = 10.0
 overall = 0.0347 max = 10
 F(1,152) = 16.89
 corr(u_i, Xb) = -0.9343 Prob > F = 0.0001

GDPR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GCI	10.92895	2.658971	4.11	0.000	5.675633	16.18226
_cons	-53.32185	13.20194	-4.04	0.000	-79.40484	-27.23885

sigma_u	5.1301839					
sigma_e	3.1307053					
rho	.72864651 (fraction of variance due to u_i)					

Table 2c

Estimation results in Western countries- RE model

Random-effects GLS regression Number of obs = 170
 Group variable: Country Number of groups = 17
 R-sq: within = 0.1000 Obs per group: min = 10
 between = 0.0884 avg = 10.0
 overall = 0.0347 max = 10
 Wald chi2(1) = 5.30
 corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0214

GDPR	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
GCI	1.893883	.8228337	2.30	0.021	.2811586	3.506607

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

_cons		-8.46967	4.105392	-2.06	0.039	-16.51609	-4.232498
-------	--	----------	----------	-------	-------	-----------	-----------

sigma_u		1.3070158	
sigma_e		3.1307053	
rho		.14842301	(fraction of variance due to u_i)

Table 2d

Hausman test for the regression model in Western countries

---- Coefficients ----

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
GCI	10.92895	1.893883	9.035063	2.528452

chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 12.77
 Prob>chi2 = 0.0004

Table 2e

Robustness of standard errors

Fixed-effects (within) regression	Number of obs	=	170
Group variable: Country	Number of groups	=	17
R-sq: within = 0.1000	Obs per group: min	=	10
between = 0.0884	avg	=	10.0
overall = 0.0347	max	=	10
	F(1,16)	=	6.81
corr (u_i, Xb) = -0.9343	Prob > F	=	0.0189

	Robust				
GDPR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
GCI	10.92895	4.186865	2.61	0.019	2.053188 19.8047
_cons	-53.32185	20.78458	-2.57	0.021	-97.3832 -9.260496

sigma_u		5.1301839	
sigma_e		3.1307053	
rho		.72864651	(fraction of variance due to u_i)

Neagu, O., (2018)
Is global competitiveness speeding up the growth in the EU? A panel data analysis

Estimation results of regression model in the ECE countries

Table 3a

Unit root tests
Hadri LM test for GCI

Ho: All panels are stationary Number of panels = 11
Ha: Some panels contain unit roots Number of periods = 10
Time trend: Not included Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust sequentially
LR variance: (not used)

	Statistic	p-value
z	9.3118	0.0000

Hadri LM test for GDP

Ho: All panels are stationary Number of panels = 11
Ha: Some panels contain unit roots Number of periods = 10
Time trend: Not included Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust sequentially
LR variance: (not used)

	Statistic	p-value
z	3.0502	0.0011

Table 3b

Estimation results in ECE countries-FE model

Fixed-effects (within) regression Number of obs = 110
Group variable: Country Number of groups = 11
R-sq: within = 0.1231 Obs per group: min = 10
 between = 0.0024 avg = 10.0
 overall = 0.0344 max = 10
 F(1,98) = 13.76
corr(u_i, Xb) = -0.7833 Prob > F = 0.0003

GDPR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
------	-------	-----------	---	------	----------------------

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

GCI | 13.76045 3.709804 3.71 0.000 6.398464 21.12243
_cons | -58.57075 16.18243 -3.62 0.000 -90.68425 -26.45725

sigma_u | 2.5926543
sigma_e | 3.9166466
rho | .3046806 (fraction of variance due to u_i)

F test that all u_i=0: F(10, 98) = 1.69 Prob > F = 0.0930

Table 3c

Estimation results in ECE countries- RE model

Random-effects GLS regression	Number of obs =	110
Group variable: Country	Number of groups =	11
R-sq: within = 0.1231	Obs per group: min =	10
between = 0.0024	avg =	10.0
overall = 0.0344	max =	10
	Wald chi2(1) =	3.85
corr(u_i, X) = 0 (assumed)	Prob > chi2 =	0.0499

GDPR	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
GCI	3.861705	1.969266	1.96	0.050	.0020134 7.721396
_cons	-15.40323	8.596428	-1.79	0.073	-32.25192 1.445462

sigma_u | 0
sigma_e | 3.9166466
rho | 0 (fraction of variance due to u_i)

Table 3d

Hausman test for the regression model in ECE countries

---- Coefficients ----				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
GCI	13.76045	3.861705	9.898744	3.143984

chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 9.91
Prob>chi2 = 0.0016

Neagu, O., (2018)

Is global competitiveness speeding up the growth in the EU? A panel data analysis

Table 3e

Robustness of standard errors

Fixed-effects (within) regression	Number of obs =	110
Group variable: Country	Number of groups =	11
R-sq: within = 0.1231	Obs per group: min =	10
between = 0.0024	avg =	10.0
overall = 0.0344	max =	10
	F(1,10) =	7.94
corr(u_i, Xb) = -0.7833	Prob > F =	0.0182

	Robust					
GDPR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GCI	13.76045	4.882953	2.82	0.018	2.880552	24.64035
_cons	-58.57075	21.29411	-2.75	0.020	-106.017	-11.12451

sigma_u	2.5926543
sigma_e	3.9166466
rho	.3046806 (fraction of variance due to u_i)
