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# **Globalization and economic growth: Evidence from two decades of transition in CEE**

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## **Abstract**

This paper examines the role of various aspects of globalization for economic growth in ten CEE economies. In contrary to previous papers, we restrict our analysis solely to the first two decades of transition. Using the globalization indexes published by the Swiss Economic Institute, we found strong and robust evidence of growth-stimulating effect of globalization processes, especially in social and economic dimensions. On the other hand, the role of political dimension of globalization was not found to be statistically significant in any research variant.

The result, which seems to be particularly interesting, is that development of the Internet, television and trade in newspapers (the social dimension of globalization) had at least as strong positive impact on economic development in CEE economies in first two decades of transition as rise in international trade, growth of foreign investment, reduction of import barriers and development of taxes policy (the economic dimension).

**Keywords:** globalization, economic growth, CEE transition economies.

**JEL Classification Codes:** O10, O40.

## **1 Introduction**

Globalization is usually thought of as a process of unification of goods and capital markets across the world in which barriers to international trade and foreign investment are reduced. Globalization can be caused either by technological progress which reduces transport costs and improves information flows or by economic and policy changes focused on reduction of protectionism, liberalization of foreign investment and migration rules.

There are many studies which have been focused on the impact of globalization on the growth of output in the long run. In the economic theory the long-run growth rate is usually identified with so-called *steady state growth rate* (for short SSGR). In general, previous investigations were performed by means of two types of methods. At the very beginning, the growth equations with relatively large cross-sectional dimensions were estimated and interpreted. The second group of methods got popular mainly due to improved software packages, availability of longer time series and development of panel data methods with higher time series dimensions.

It is usually stressed that globalization processes are especially important in case of developing and transition economies. Thus, it is not surprising that discussion on the role of globalization in development of CEE economies in transition has gained considerable attention in recent years. However, the rising interest in conducting research on this particular group of countries has primarily focused on theoretical deliberations, while clearly less attention has been paid to rigorous empirical studies.

In general, the motivation to analyse the dynamic links between globalization and growth in GDP in the case of new EU member countries in transition from CEE region is twofold. First, despite the common opinions one cannot forget that globalization brings not only a chance to develop but it also implies some new challenges and risks. Since integration with global markets leads to increased competition it is not obvious whether an economy will significantly benefit from rapid globalization.<sup>1</sup> The latter is especially important in case of CEE transition economies which are not experienced in dealing with various aspects of globalization. Therefore, detailed empirical analyses are required to precisely assess the growth effects of globalization, which in turn is crucial for further decision-making.

Second, to the best of our knowledge, in the literature there are also no detailed analyses dedicated to the links between economic growth and globalization for the group of CEE economies in transition, which would use most recent and comprehensive data along with carefully selected econometric methods. The available literature has not given a full picture of growth-globalization links in CEE economies in transition so far, as most of previous papers has been based solely on economic aspects of globalization (e.g. trade openness, foreign direct investment) while other dimensions of globalization (e.g. social or political) have been rather marginalized. Moreover, the globalization-growth links in this group of countries with restriction to only the transition period have not been examined in detail so far.<sup>2</sup> It is without question that from the very beginning of the transition the

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<sup>1</sup> Even such famous proponents of globalization like Blinder (2006), Summers (2006) or Krugman (2007) have acknowledged that globalization has also some drawbacks, especially in terms of implying inequality and insecurity.

<sup>2</sup> Some papers examined the nexus between globalization and growth in specific CEE countries (e.g. Mutascu and Fleischer (2011) did this in case of Romania). However, as far as we know, there are no studies which would concentrate solely on the transition period (for example, Mutascu and Fleischer (2011) drew their conclusion based on 1972-2006 sample).

structure of these relationships started to evolve dynamically as the CEE economies began to operate on global markets without hindrance and limitations. This way our paper fills the gap in the existing literature by providing an extensive analysis of the impact of various forms of globalization on economic growth which is focused solely on the period of transition in CEE.

Another important point that distinguishes our paper from other contributions on globalization and economic growth is that we employed a set of comprehensive measures of globalization instead of using only one specific measure. Such an approach allows us to analyse many aspects of globalization processes. Moreover, to test the stability of our empirical results and formulate reliable conclusions we focus on few hundred different specifications of growth models. At this place it is worth to mention that previous studies on globalization often present quite different results concerning the real impact of globalization on economic growth. The contributors stress two main reasons for these differences. The first one underlines the fact that the definition of a relevant measure of globalization is difficult to formulate, because a reliable aggregate indicator should be based on many economic, political and social variables. Secondly, there is not unique view on how the output equation should be formulated to efficiently assess the impact of globalization on the long-run rate of growth of output or the SSGR.

Since globalization is not easy to measure, the definition of an overall index of globalization is the most important step in the process of quantification of its sources and effects. Some comprehensive measures of globalization were developed by means of the weighted average or the principal component methods.<sup>3</sup> In this paper we will focus on detailed analysis of the index of globalization calculated by the KOF Swiss Economic Institute.<sup>4</sup> This measure of globalization, currently considered as the most comprehensive one, was developed by Dreher (2006). It is also based on the principal component method. This index is aimed to combine several variables not only from the economic sphere, but also from the political and social ones. In this indicator the economic part is weighted by around 37%, political dimension by around 26% and social aspect by around 37%. The globalization index is updated annually for 208 countries.<sup>5</sup>

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<sup>3</sup> One of the first examples of such a measure was defined by Sachs and Warner (1995) and currently is recognized as *the binary index of openness*. Kearney (2003) constructed a database and defined a composite globalization index consisted of economic, social, political, and technology-related components. Lockwood (2004) stressed that the ranking of countries was sensitive to the way these indicators were measured, normalized and weighted. Two alternative approaches to the Kearney index were also developed on the basis of the principal component analysis (Heshmati, 2006) and factor analysis (Andersen and Herbertsson, 2005). Lockwood and Redoano (2005) also presented an index of globalization that measures the economic, social and political components of globalization.

<sup>4</sup> The data and description of these indexes can be downloaded from <http://globalization.kof.ethz.ch>.

<sup>5</sup> At this place we should mention that previous empirical studies using KOF indexes have been based either on time series data or on panel data. Time series analyses are usually related to an individual country, thus many country-specific issues are likely to be highlighted (Greiner et al., 2004). On the other hand, panel-based contributions are believed to provide much more robust empirical findings due to considerable number of degrees of freedom (Rao and Vadlamannati, 2011). Therefore, panel methodology is usually recommended when the time dimension of examined dataset is relatively small.

The proper choice of model specification is also important to assess the growth effects of other variables, like education and public expenditure on infrastructure, investment ratio, aid, foreign direct investment, financial reforms, etc. Commenting on the state of literature, Rodriguez and Rodrik (2001) stressed that many measures of openness (often treated as synonyms of globalization) are flawed.<sup>6</sup> This is especially misleading in case of studies which conclude that openness significantly improves growth, nevertheless the fact that the applied econometrics is oversimplified and therefore hardly leads to any reliable conclusions.<sup>7</sup> Therefore, conducting the empirical analysis in as comprehensive way as possible (e.g. by considering multiple variants of the econometric model) is one of the main goals of our research.

The content of this paper is as follows. Next section reviews most important contributions concerning the impact of globalization on economic growth. Special attention is given to CEE economies in transition. Third section is concerned with a presentation of the dataset. Section 4 presents main research hypotheses examined in this paper. In fifth section the discussion of methodological questions in respect to the specification and estimation is showed. Empirical results and their discussion are provided in sixth section. Finally, in the last section we summarize major conclusions and suggest directions for future research.

## **2 Literature overview**

The content of this section may be divided into two main parts. The first part is dedicated to a general and brief overview of previous papers dealing with the role of globalization in stimulating economic growth. In the second part we will focus solely on previous papers on globalization-growth links in case of CEE transition economies.

In recent decades economists have paid much attention to the role of globalization in economic growth. It is worth noting that several distinguished journals have published special issues dedicated solely to the topic of globalization. Woods (1998), Manning (1999), Bata and Bergesen (2002a, 2002b), among others, provided editorial introductions to these special issues. Moreover, a number of books on this topic have also been published. In general, previous papers usually underline the positive effects of globalization in stimulating economic growth.<sup>8</sup>

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<sup>6</sup> In empirical investigations it is difficult to distinguish between “openness”, assessed solely by means of economic variables, and the “level of globalization”, which actually should also take into account some political and social aspects. In spite of these differences, some authors consider “openness” and “globalization” to be synonyms. This is partly justified by the fact that economic variables dominate in many measures of overall globalization.

<sup>7</sup> In turn, Easterly et al. (2004) observed that this literature has the usual limitations of choosing a specification without clear guidance from theory.

<sup>8</sup> In one of the recent papers, Chang and Lee (2010) provided evidence supporting the existence of a long-run unidirectional causality running from the KOF overall index of globalization, economic globalization, and social globalization to growth in 23 OECD countries in period 1970-2006.

As we stressed in the introductory part, an important stream of research identifies globalization as openness, especially the trade openness. However, the interpretation and definition of trade openness differs among authors. In line with this interpretation of globalization, Dollar (1992) found out that outward-orientation of an economy as well as high exports and the sustainability of imported goods and machinery support growth. Barro and Sala-i-Martin (1995), Sachs and Warner (1995), Edwards (1998), Greenaway et al. (1998) and Vamvakidis (1998) demonstrated on a basis of cross-country regressions that trade protection reduces growth rates. Ben-David (1993) and Sachs and Warner (1995) expressed the view that only open economies experience unconditional convergence.

However, Rodriguez and Rodrik (2001) raised some doubts about the robustness of the openness-growth correlations detected in the reviewed contributions as in previous papers the control for other important growth indicators was rather insufficient and therefore the usage of the openness measures was not fully justified. The authors argued that trade and financial openness by itself are implausible to enhance economic growth. Moreover, rise in these variables may be even counterproductive, especially in the absence of institutional and governance regulations and reforms.

Despite the great importance of the globalization process for the world economy, its sources and consequences, at least to some extent, still remain unclear in the light of economic and social literature. The scarcity of reliable empirical evidence is especially visible in case of CEE economies in transition, for which, as far as we know, the relationship between globalization and economic growth has not been analysed in detail so far. Although analysing growth effects of globalization in CEE region has become a hot research topic, most of previous contributions were concentrated only on the economic dimension, while clearly less attention has been paid to other aspects of this process, like the role of social processes, information flows, culture or politics.<sup>9</sup> In general, most of previous papers (based on time series or panel datasets) underline that in case of CEE economies in transition some economic aspects of globalization have been significantly growth-stimulating from the very beginning of transition. The researchers usually underline the positive impact of foreign direct investment (FDI) and trade openness on economic growth in CEE transition economies.<sup>10</sup> For example, Tondl and Vuksic (2007) examined the role of FDI in the catching up process of Eastern Europe. The authors claimed that FDI was a major growth determinant for Eastern Europe during the second half of the 1990s. According to the authors, new technology which is brought to a country by FDI, as well as the skills that are acquired by the workforce might lead to spillovers to locally integrated firms and neighbouring regions. Some researchers suggest that positive effects of the economic dimension of globalization seem to be strongly related with levels of economic freedom in the CEE transition economies (Gurgul and Lach, 2011).

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<sup>9</sup> One may claim that the literature on the role of globalization in the European integration (see e.g. Tausch and Herrmann, 2002; Heshmati and Tausch, 2006) could be significantly extended by empirical examination of the links between globalization and economic growth in CEE transition economies.

<sup>10</sup> See Cernat and Vranceanu (2002), Çetintaş and Barişik (2009), Gurgul and Lach (2010).

Nevertheless, it is important to note that there has been very little rigorous empirical work till date on the effects of globalization on economic growth in the CEE transition countries which would use comprehensive and reliable indexes of globalization and focus solely on the transition period. Moreover, to the best of our knowledge, there are no empirical studies which would apply the overall KOF index to examine globalization-growth linkages in case of the group of CEE economies during the transition period.<sup>11</sup> One of just few studies which focus on the transition period and deal with the analysis of globalization in this group of countries is the paper by Bjørnskov and Potrafke (2011). The authors applied the KOF index to examine whether globalization had an impact on privatization in CEE transition economies in period 1990–2007.<sup>12</sup> The empirical findings, however, did not confirm existence of any statistically significant causal impact of globalization on the scale of privatization. As far as we know, in the literature there are also no papers which would apply economic, social and political KOF sub-indexes to examine the nexus between globalization and growth in case of CEE economies during the transition. Lack of empirical research on globalization-growth links in CEE transition economies is most likely caused by the unavailability of sufficient amount of statistical data on the globalization indexes in the period of transition. It seems that for many years this problem has been the main obstacle for conducting formal econometric analyses.

### **3 The dataset and its properties**

In this paper we used a dataset consisting of a panel of annual observations for ten new EU members in transition from the CEE region<sup>13</sup> in the period 1990-2009 (for some countries the first observation is from later than 1990).<sup>14</sup>

In general, the data used in this paper may be classified into two main categories. The first group includes variables which are related to the measures of economic growth of CEE transition economies and various proxies of main growth factors. Despite years of research, the existing literature has not yet reached a consensus about a typical set of variables that may affect economic growth. Following previous papers which have reviewed the existing literature (Bleaney and Nishiyama, 2002; Levine and Renelt, 1991; Sachs and Warner, 1997, among others) we have selected a relatively small subgroup from hundreds of the control variables, which are usually considered as important for economic growth. The second group of variables describes various aspects of globalization on the basis of KOF indexes of globalization. Table 1 provides details on all variables used in our paper.

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<sup>11</sup> The complete list of papers using KOF indexes is available at <http://globalization.kof.ethz.ch/papers>.

<sup>12</sup> The authors did not examine direct growth effects of globalization. However, the results of their research provide some insights on indirect causal links, since privatization was found to Granger cause economic growth in CEE economies in transition (Berkowitz and DeJong, 2003; Gurgul and Lach, 2011).

<sup>13</sup> In the period 2004-2007 twelve countries joined the EU. These were: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia. However, Malta and Cyprus have not been taken into consideration in this study since they have never been in a transition phase.

<sup>14</sup> Since the most recent KOF Index of Globalization (released on 16 March 2012) covers the period up to 2009, the sample 1990-2009 was the longest available at the time of preparing this paper.

Full name	Abbreviation used	Definition	Unit
ECONOMIC VARIABLES			
Gross domestic product <sup>a</sup>	<i>Y</i>	Gross domestic product at constant 2005 prices in US Dollars.	USD
Gross capital formation <sup>a</sup>	<i>K</i>	Gross capital formation at constant 2005 prices in US Dollars.	USD
Total labour force <sup>b</sup>	<i>L</i>	Total labour force comprises people ages 15 and older who meet the International Labour Organization definition of the economically active population: all people who supply labour for the production of goods and services during a specified period.	-
Average years of schooling over age 25 <sup>c</sup>	<i>EDU</i>	Barro and Lee's (2001) average years of schooling over age 25 years. This specific measure has been often used in previous papers on globalization-GDP links (e.g. Rao and Vadlamannati, 2011).	-
Government consumption <sup>a</sup>	<i>GC</i>	General government final consumption expenditure at constant 2005 prices in US Dollars.	USD
Inflation, consumer prices (annual %) <sup>b</sup>	<i>INFL</i>	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.	%
Foreign direct investment, net inflows (% of GDP) <sup>b</sup>	<i>FDI</i>	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 per cent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.	%
Money and quasi money (M2) as % of GDP <sup>b</sup>	<i>M2</i>	Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.	%
MEASURES OF GLOBALIZATION			
Overall KOF index <sup>d</sup>	<i>G</i>	The overall index covers the economic, social and political dimensions of globalization. Globalization is conceptualized as a process that erodes national boundaries, integrates national economies, cultures, technologies and governance and produces complex relations of mutual interdependence.	-
Economic globalization <sup>d</sup>	<i>G<sub>ECON</sub></i>	Broadly speaking, economic globalization has two dimensions. First, actual economic flows are usually taken to be measures of globalization. Second, the previous literature employs proxies for restrictions to trade and capital.	-
Actual flows <sup>d</sup>	<i>G<sub>ECON_A</sub></i>	The sub-index on actual economic flows includes data on trade, FDI and portfolio investment. More specifically, trade is the sum of a country's exports and imports and portfolio investment is the sum of a country's stock of assets and liabilities (all normalized by GDP). While these variables are straightforward, income payments to foreign nationals and capital are included to proxy for the extent that a country employs foreign people and capital in its production processes.	-
Economic restrictions <sup>d</sup>	<i>G<sub>ECON_R</sub></i>	This index is based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions and includes 13 different types of capital controls.	-
Social globalization <sup>d</sup>	<i>G<sub>SOC</sub></i>	The KOF index classifies social globalization in three categories. The first covers personal contacts, the second includes data on information flows and the third measures cultural proximity.	-
Personal contact <sup>d</sup>	<i>G<sub>SOC_P</sub></i>	This index includes international telecom traffic (traffic in minutes per person) and the degree of tourism (incoming and outgoing) a country's population is exposed to. Government and workers' transfers received and paid (in per cent of GDP) measure whether and to what extent countries interact, while the stock of foreign population is included to capture existing interactions with people from other countries. The number of international letters sent and received also measures direct interaction among people living in different countries.	-
Information flows <sup>d</sup>	<i>G<sub>SOC_I</sub></i>	The sub-index on information flows is meant to measure the potential flow of ideas and images. It includes the number of Internet users (per 100 people), the share of households with a television set, and international newspapers traded (in per cent of GDP).	-
Cultural proximity <sup>d</sup>	<i>G<sub>SOC_C</sub></i>	Imported and exported books (relative to GDP) are used to construct this index. As an additional proxy for cultural proximity the number of McDonald's restaurants located in a country is also used.	-
Political globalization <sup>d</sup>	<i>G<sub>POL</sub></i>	The number of embassies and high commissions in a country and the number of international organizations to which the country is a member and the number of UN peace missions a country participated in is used to proxy the degree of political globalization. In addition, the number of treaties signed between two or more states since 1945 is also taken into account.	-

TABLE 1. Brief description of data used in this paper.

<sup>a</sup> Data gained from National Accounts Main Aggregates Database (<http://unstats.un.org/unsd/snaama/introduction.asp>)

<sup>b</sup> Data gained from World Development Indicators (<http://data.worldbank.org/indicator>)

<sup>c</sup> Data gained from <http://www.barrolee.com>

<sup>d</sup> Data and its description gained from <http://globalization.kof.ethz.ch>

It is important to shed some light on the motivation to use all available globalization sub-indexes (variables  $G_{ECO}$ ,  $G_{ECO_A}$ ,  $G_{ECO_R}$ ,  $G_{SOC}$ ,  $G_{SOC_P}$ ,  $G_{SOC_I}$ ,  $G_{SOC_C}$ ,  $G_{POL}$ ) along with the main index



(variable  $G$ ). While evaluation of econometric models built for the overall index allows answering a general research question about the importance of globalization in stimulating economic growth in countries under study, the examination of sub-indexes-based models may provide more detailed information. What matter most, such an approach may turn to be helpful in assessing which areas of globalization (measured by the sub-indexes) had the most significant growth effect and which were rather negligible. This, in turn, seems to be especially important in terms of policymaking.

In the initial part of our analysis we examine some basic properties of our data. Instead of presenting a large number of descriptive statistics, we have decided to present the data in suitable scatterplots. Figure 1 contains scatterplots for nine indexes of globalization and output for all sample countries.

INSERT FIGURE 1 AROUND HERE

The scatterplots presented in Figure 1 provide some preliminary visual (correlation-based) evidence on the research problems discussed in this paper. In general, one can see some evidence of positive correlation between natural logarithm of GDP and the overall globalization index. Moreover, Figure 1 provides some evidence of existence of correlations between output and some sub-indexes of globalization, especially  $G_{SOC}$ . However, the correlations summarized in the mentioned scatterplots provide no formal evidence on growth effects of different measures of globalization. Moreover, any conclusions based only on analysis of such plots are disconnected from theoretical growth models (capital and other growth-influencing variables are not taken into consideration). Therefore, in order to examine the real growth effect of globalization and select those spheres of globalization, which were most important for economic growth of CEE economies in last two decades, we conducted formal statistical verification based on suitable econometric methods. At this place it is worth to remind that checking the robustness of empirical results was one of the main parts of our empirical investigation.

#### **4 Main research hypotheses**

A mere glance at fluctuations in overall index of globalization across new EU member countries in transition shows that these countries have indeed launched economic and institutional reforms, which in consequence have caused a rise in the aggregate globalization index. At this point an important research question arises: *Was this general rise in globalization a significant and positive causal factor for a dynamic growth in GDP of the new EU members?* Taking into account suggestions formulated in previous papers (see e.g. Mutascu and Fleischer, 2011) and plots presented in Figure 1 (which suggest that the overall progress in globalization could significantly influence economic growth in the CEE region), one could test the following hypothesis:

Hypothesis 1: *Progress in overall globalization significantly stimulated growth in GDP of new EU members from CEE region in first two decades of transition.*

As mentioned in the previous section, the overall KOF index of globalization consists of three main sub-indexes covering economic, social and political aspects of globalization. The first sub-index,

economic globalization, refers to increase in actual flows and reduction of trade barriers. From a theoretical point of view, both these spheres have a straightforward impact on improving level of openness and trade balance, which in turn directly stimulates economic growth. To formally examine the role of economic globalization one should test the following hypothesis, which also seems to follow from the CEE-related papers mentioned in section 2:<sup>15</sup>

*Hypothesis 2: Rise in economic globalization, reflected both in the increase of actual flows and removal of trade restrictions, played an important role in the growth in GDP of new EU members from CEE region in first two decades of transition.*

Taking into account the definition of the social aspect of KOF globalization measure (see Table 1), one may expect this sub-index to potentially have a positive impact on economic growth. Moreover, in the first two decades of transition CEE economies have experienced a significant technological progress. Fast growing sector of internet-based services has clearly improved communication which in turn caused a rise in overall economic activity of CEE societies. The rapid extension of usage of the Internet has also spread new technology and caused an acceleration of information flow which in turn sped up the globalization process (Boockmann and Dreher, 2003). It also supported information exchanges, technology transformations, increased people's interaction, and caused some convergence in cultural trends (Dreher, 2006). Thus, within social globalization index the sphere of information flows could have a dominating role. To summarize, one may formulate the following:

*Hypothesis 3: Rise in social globalization, especially in the sphere of information flows, played an important role in the growth in GDP of new EU members from CEE region in first two decades of transition.*

To the best of our knowledge, in the available literature there are no studies dealing with the role of political globalization (approximated by the KOF sub-index) in supporting economic growth in CEE transition economies. In contrary to economic and social aspects, the definition of KOF political globalization sub-index suggests rather weak impact of this variable on the process of economic growth. In addition, plots presented in Figure 1 provide no clear evidence of any causal impact of political globalization on economic growth. A mere glance at the recent history of CEE countries in transition seems to prove that fluctuations in number of embassies, membership in international organizations or international treaties (components of political globalization) were rather not as dynamic as economic growth in this region. Moreover, in the early 90s the transition from authoritarian system to democracy was conducted very quickly. This causes that the econometric methodology may not detect the impact of political reforms on economic growth in CEE region. To summarize, we may expect the following hypothesis to hold true:

*Hypothesis 4: Political globalization played rather minor role in the growth in GDP of new EU members from CEE region in first two decades of transition.*

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<sup>15</sup> See e.g. Cernat and Vranceanu (2002), Tondl and Vuksic (2007), Çetintaş and Barişik (2009), Gurgul and Lach (2010, 2011).

All the hypotheses listed above will be tested by relevant econometric methods. The details on applied methodology are presented in the next section.

## 5 Methodology

Many economists (Rogers, 2003; Easterly et al., 2004; Durlauf et al., 2005; Rao and Vadlamannati, 2011, among others) underline the unsatisfactory nature of the specifications used in previous empirical works on globalization-growth links. Besides difficulties with choosing the set of necessary control variables which should enter the growth model, some researchers (e.g. Rao and Vadlamannati, 2011) also underline the fact that previous papers do not distinguish between the long- and short-run growth effects. Rao and Vadlamannati (2011) also stress that simple growth rates typically used in empirical studies (i.e. annual, 5-year average, 10-year average etc.) are rather poor proxies for the unobservable SSGR. Besides these limitations one should remember that in case of CEE economies in transition the dataset on economic indicators and measures of globalization is reduced to around two last decades. All these facts prompted us to perform the empirical investigation of globalization-growth links in case of new EU members in transition on a basis of a modified production function in which output is regressed on globalization index and chosen control variables.

In this paper we focus on the Solow growth model. In general, the motivation to perform the research in such a framework is twofold. First, we should note that Solow model is relatively easy to evaluate in comparison to a gamut of endogenous growth models (Bernanke and Gürkaynak, 2002; Greiner et al., 2004; Rao and Vadlamannati, 2011). Secondly, as stated in previous papers (Jones, 1995; Parente, 2001, among others) there is no evidence that endogenous growth models perform better in practical applications than the Solow's one.

Since in the Solow model the SSGR equals total factor productivity, the permanent growth effect of globalization should be measured by estimating its effect on Total Factor Productivity (TFP).<sup>16</sup> Following suggestions of Rao and Vadlamannati (2011) and Rao et al. (2011) we evaluate the extended dynamic production function in which TFP depends on selected growth-influencing variables and a chosen KOF globalization measure.

To summarize, the main empirical part of our study was based on an evaluation of the following log-linear specification of the Cobb-Douglas production function:

$$\ln\left(\frac{Y_t}{L_t}\right) = \ln(A_0) + (c_1 + c_2 X_t)T + \alpha \ln\left(\frac{K_t}{L_t}\right), \quad (1)$$

where  $0 < \alpha < 1$ ,  $\frac{Y_t}{L_t}$  denotes per worker output,  $A_0$  is the initial stock of technology,  $\frac{K_t}{L_t}$  stands for per worker capital,  $X_t = [x_t^i]_{i=1, \dots, k}$  denotes  $k \times 1$  vector of growth-affecting variables,  $c_1$  may be interpreted as the parameter which captures the growth impact of variables not included in the vector  $X_t$ ,  $c_2$  stands

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<sup>16</sup> See e.g. Edwards (1998), Bernanke and Gürkaynak (2002), Dollar and Kraay (2004).

for  $1 \times k$  vector of parameters which captures the growth effect of the vector  $X_t$  and  $T$  is time. Moreover, we assumed that the first element of the vector  $X_t$  is always equal to a chosen measure of globalization while other (optional) elements represent different growth factors, i.e.:

$$x_t^1 \in \{G, G_{ECO}, G_{ECO\_A}, G_{ECO\_R}, G_{SOC}, G_{SOC\_I}, G_{SOC\_P}, G_{SOC\_C}, G_{POLI}\} \quad (2)$$

and

$$x_t^i \in \{EDU, GC, INFL, FDI, M2\} \text{ for } i > 1. \quad (3)$$

One important feature, which distinguishes our approach from previous Solow-model-based papers on globalization-growth links, is that we do not restrict our research to only one combination of elements of the vector  $X_t$ . Instead, we examined all possible subsets of the set  $\{EDU, GC, INFL, FDI, M2\}$ .<sup>17</sup> This way for each of 9 KOF indexes of globalization we evaluated  $2^5=32$  different specifications of Solow growth model.<sup>18</sup> For each specification, we used OLS-, FE- and RE-based estimates to conduct the empirical study in a comprehensive way. Finally, to control for possible impact of heteroscedasticity (autocorrelation) we also applied robust standard errors<sup>19</sup> (panel models with autoregressive disturbances). All these facts are especially important in terms of validity and robustness of empirical findings.

## 6 Empirical results

In this section we present the results of testing the role of globalization in supporting economic growth in CEE economies in first two decades of transition. In the very beginning we should remind a well-known fact that multicollinearity is a serious problem in application of econometric models, especially in case of small samples (like the one analysed in this paper). Among other problems, it violates ceteris paribus reasoning and leads to distortion of standard errors estimates, which in turn lowers reliability of conclusions based on tests of significance.

In order to examine the possibility of multicollinearity between the control variables we calculated all correlation coefficients. Table 2 contains the results.

	<i>EDU</i> × <i>T</i>				
<i>EDU</i> × <i>T</i>	1	<i>GC</i> × <i>T</i>			
<i>GC</i> × <i>T</i>	0.9493	1	<i>INFL</i> × <i>T</i>		
<i>INFL</i> × <i>T</i>	-0.1133	-0.1154	1	<i>M2</i> × <i>T</i>	
<i>M2</i> × <i>T</i>	0.9093	0.8464	-0.1220	1	<i>FDI</i> × <i>T</i>
<i>FDI</i> × <i>T</i>	0.4567	0.4521	-0.0403	0.4833	1

TABLE 2. Correlation coefficients between time-multiplied control variables.

As can be seen in Table 2, during first two decades of transition the levels of government consumption, average number of years of schooling and ratio of money supply to GDP in CEE economies were very strongly correlated. These solid evidences of multicollinearity prompted us to

<sup>17</sup> See Table 1 for a detailed description of the variables appearing in equation (1).

<sup>18</sup> Thus  $k \in \{1, \dots, 6\}$  in case of our dataset.

<sup>19</sup> To be precise, we used the robust Huber/White/sandwich VCE estimator discussed in Wooldridge (2009), Stock and Watson (2008) and Arellano (2003).

present the results of estimating growth models only for those cases in which  $X_t$  did not contain any two elements of the set  $\{EDU, GC, M2\}$ . This way we restricted our analysis to 15 variants of model (1). Statistics for this subgroup of models are presented in Table 3.<sup>20</sup>

Measure of globalization	ORDINARY LEAST SQUARES			FIXED EFFECTS			RANDOM EFFECTS		
	Coefficients ( $\times 10^{-4}$ )		Percentage of coefficients significant at 10, 5 and 1% levels in the growth model	Coefficients ( $\times 10^{-4}$ )		Percentage of coefficients significant at 10, 5 and 1% levels in the growth model	Coefficients ( $\times 10^{-4}$ )		Percentage of coefficients significant at 10, 5 and 1% levels in the growth model
	Average	% positive		Average	% positive		Average	% positive	
Overall KOF index	7.24	100	100, 100, 87 [100, 100, 87]	5.30	100	100, 100, 100 [100, 100, 87]	5.64	100	100, 100, 100 [100, 100, 87]
Economic globalization	1.82	86	46, 33, 0 [46, 40, 13]	3.07	100	100, 100, 73 [100, 67, 48]	3.05	100	86, 86, 73 [100, 86, 26]
Actual flows	0.92	80	13, 6, 0 [26, 13, 0]	2.09	100	86, 73, 73 [67, 46, 0]	1.92	100	73, 73, 73 [73, 73, 0]
Economic restrictions	1.93	100	60, 26, 0 [73, 60, 6]	2.33	100	100, 100, 73 [86, 86, 61]	2.42	100	100, 86, 73 [100, 73, 73]
Social globalization	9.93	100	100, 100, 100 [100, 100, 100]	5.34	100	100, 100, 100 [100, 100, 100]	6.24	100	100, 100, 100 [100, 100, 73]
Personal contacts	5.45	100	100, 100, 100 [100, 100, 100]	2.53	100	73, 73, 73 [0, 0, 0]	3.11	100	73, 73, 73 [0, 0, 0]
Information flows	6.49	100	100, 100, 100 [100, 100, 100]	7.57	100	100, 100, 100 [100, 100, 26]	5.15	100	100, 100, 100 [100, 100, 100]
Cultural proximity	1.69	100	100, 100, 100 [100, 100, 100]	1.32	48	22, 0, 0 [22, 0, 0]	1.58	100	100, 100, 100 [73, 46, 0]
Political globalization	0.61	100	0, 0, 0 [6, 0, 0]	0.92	100	33, 0, 0 [0, 0, 0]	1.1	100	100, 0, 0 [0, 0, 0]

TABLE 3. Results of testing for growth impact of various forms of globalization in multicollinearity-filtered models.<sup>21</sup>

In general, the results presented in Table 3 provide a basis to claim that globalization (measured by the overall KOF index) was an important growth factor in case of CEE economies in first two decades of transition. This phenomenon, which is in favour of Hypothesis 1, was supported by results supplied by all estimation techniques in unadjusted and robust variants. When turning to sub-indexes, one should underline that the lowest  $p$ -values (around  $10^{-3}$ ) and largest (positive) coefficients in the growth models were reported for social globalization, especially in the sphere of information flows. Quite convincing evidence of growth stimulating effects were also found for the economic dimension of globalization, especially in the sphere of reducing economic restrictions.<sup>22</sup> On the other hand, the

<sup>20</sup> We examined growth models in which output was regressed on one of nine globalization indexes and one of the 15 sets of control variables. Since our goal was to examine the growth effects of globalization, we present only those statistics which are related to the estimates of globalization. Complete results of all estimations are available upon request. Numbers in square brackets refer to results obtained by application of heteroscedasticity-robust standards errors.

<sup>21</sup> The signs of statistically significant coefficients of economic globalization, actual flows and cultural proximity were only positive.

<sup>22</sup> For the sake of the comprehensiveness, for each of nine globalization measures we have also performed an analysis of all 32 variants of model (1). In general, the results obtained for all possible choices of the set of control variables (not necessary the multicollinearity-free cases) confirmed positive impact of globalization (especially its social sphere) on economic growth of CEE transition economies (these supplementary results are available from the authors upon request). However, the results supporting the positive impact of economic dimension of globalization were much weaker. This proves that proper econometric modelling, including dealing with multicollinearity issues, has a significant impact on the quality and reliability of obtained outcomes.

political globalization was not found as statistically significant at 5% in any research variant. Both these findings support Hypotheses 2-4.<sup>23</sup>

### 6.1. Extensions of the basic modelling framework

In empirical studies it is a common practise to evaluate growth models with several globalization indexes at the same time (e.g. Rao and Vadlamannati, 2011). Such an approach allows significant improvement of the information gained from the set of explanatory variables and meaningful comparisons between globalization components, which is especially important if different spheres of globalization have different (reverse) impact on growth. However, in case of our dataset, whenever chosen globalization index was found to be statistically significant (at common levels) it also turned out to have a positive impact on growth. Moreover, as can be seen from Table 4, the correlations between different time-multiplied globalization indexes are definitely too high to allow using more than one globalization index in any regression model.

	$G \times T$								
$G \times T$	1	$G_{ECO} \times T$							
$G_{ECO} \times T$	0.9841	1	$G_{ECO A} \times T$						
$G_{ECO A} \times T$	0.9788	0.9922	1	$G_{ECO R} \times T$					
$G_{ECO R} \times T$	0.9736	0.9918	0.9682	1	$G_{SOC} \times T$				
$G_{SOC} \times T$	0.9906	0.9769	0.9628	0.9758	1	$G_{SOC P} \times T$			
$G_{SOC P} \times T$	0.9510	0.9716	0.9518	0.9762	0.9637	1	$G_{SOC I} \times T$		
$G_{SOC I} \times T$	0.9814	0.9817	0.9671	0.9808	0.9830	0.9728	1	$G_{SOC C} \times T$	
$G_{SOC C} \times T$	0.8886	0.8274	0.8213	0.8203	0.9043	0.8724	0.8207	1	$G_{POLI} \times T$
$G_{POLI} \times T$	0.9540	0.8943	0.9038	0.8702	0.9198	0.8334	0.9020	0.8815	1

TABLE 4. Correlations between different time-multiplied globalization indexes.

Finally, to reduce the risk of possible autocorrelation we re-estimated all multicollinearity-filtered models allowing for autoregressive (AR) structures in the disturbances using Baltagi and Wu (1999) approach.<sup>24</sup> In general, the outcomes obtained after application of AR-based models led to analogous conclusions to those formulated in previous subsection. Finally, we re-estimated all growth models for the pre-crisis subsample (1990-2008). In general, only slight differences were found between results obtained for both samples, thus, we do not present pre-crisis results in separate tables. However, it is without question that this issue deserves more attention in the future, when more post-crisis data will be available.

<sup>23</sup> Since the outcomes obtained for different estimation techniques turned out to be slightly varied, we run further diagnostic tests, namely the Breusch-Pagan and Hausman tests. In general, these tests preferred random effects models for our data at 5% level. This provides additional evidence in favour of Hypotheses 1-4, as relatively strongest support was found in random effect models.

<sup>24</sup> We applied Baltagi and Wu (1999) procedure since for some models we found weak evidence of first order autocorrelation in the residuals. Having this in mind, we also performed unit root analysis. We used Levin, Lin and Chu test as it was recommended for application in case of small panels with similar structure to the one analysed in our paper (Levin et al., 2002; Baltagi, 2008). Whenever required, the sample was suitably reduced to meet the assumption of balanced panel in the unit root test. Since we found no evidence of nonstationarity at a 5% level we did not proceed with any panel cointegration techniques.

## 7. Concluding remarks

To the best of our knowledge, this is the first contribution which analyses the role of various aspects of globalization for economic growth in CEE economies in transition. The results of this paper confirmed a positive role of expanding globalization on GDP growth in CEE region. This positive impact was found to be strongest and most robust for social and economic aspects of globalization. On the other hand, the empirical results provided solid evidence against any impact of political globalization on growth of the output in case of examined economies. These results are not surprising if we once again look at the definitions of the globalization indexes examined in this paper and recent history of transition in CEE region. Social aspects of globalization cover personal contacts, cultural proximity and information flows. The latter sphere, which refers to development of the Internet, television and trade in newspapers, turned out to have especially strong impact on economic growth. Similarly, economic globalization, which consists of actual flows of capital and labour and trade restrictions, also occurred to be a statistically significant growth factor. This result is also not surprising as this sub-index covers trade, foreign investment (actual flows) and reduction of import barriers, development of taxes policy (restrictions). On the other hand, insignificance of political globalization may be easily justified by the fact that this sub-index covers number of embassies, membership in international organizations or international treaties. Political transformation in Central and Eastern Europe was rather revolutionary, not evolutionary. The main political reforms in these countries (change from totalitarian system to democracy) were conducted at the very beginning of the transition process within relatively short period of time. This most likely caused that the data could not reflect the impact of political reforms on economic growth in CEE region.

The most important policy implication resulting from our research is that globalization in CEE region led to economic growth during first two decades of transition. This implies that policymakers in this region should facilitate globalization as it clearly does more good than harm to the economic development of CEE economies in transition. Results presented in this paper prove that globalization allowed new EU members in transition to use their potential in a more efficient way, which could not take place during the era of centrally planned economies. The fact, which seems to be particularly interesting, is that the results of our study confirmed that development of the Internet, television and trade in newspapers (the social dimension of globalization) had at least as strong positive impact on economic development in CEE economies in first two decades of transition as rise in international trade, growth of foreign investment, reduction of import barriers and development of taxes policy (the economic dimension). The importance of information flows in stimulating economic growth and convergence of income levels and standards of life among member countries has also been reflected in EU's official documents and budget plans, e.g. the Financial Framework 2014 – 2020.<sup>25</sup> One of the fundamentals of this financial perspective is to provide common and easy access to the Internet, especially in catching-up EU member states in transition. The outcomes of the formal empirical

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<sup>25</sup> For more details see [http://ec.europa.eu/budget/mff/index\\_en.cfm](http://ec.europa.eu/budget/mff/index_en.cfm).

analysis conducted in this paper confirmed the appropriateness of this specific aspect of EU's regional policy.

It is likely that some aspects of globalization-growth linkages were not discovered in our study because of insufficient variation in (small) data sample available. An important issue is related with re-examining the role of globalization when relevant time series become long enough to conduct a detailed analysis individually for each CEE transition economy. This would significantly supplement the results presented in this paper. Secondly, in the light of the discussed topic the impact of globalization on economic growth in the period of financial crises is also an important research avenue. This, however, requires more post-crisis data to be available. To summarize, although many important research problems have already been deeply examined, the link between globalization and economic growth in case of CEE economies in transition still deserves attention of researchers as some questions remain unanswered.

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### Figure captions

**Figure 1.** The scatterplots for output and nine globalization indexes.

### Biography notes



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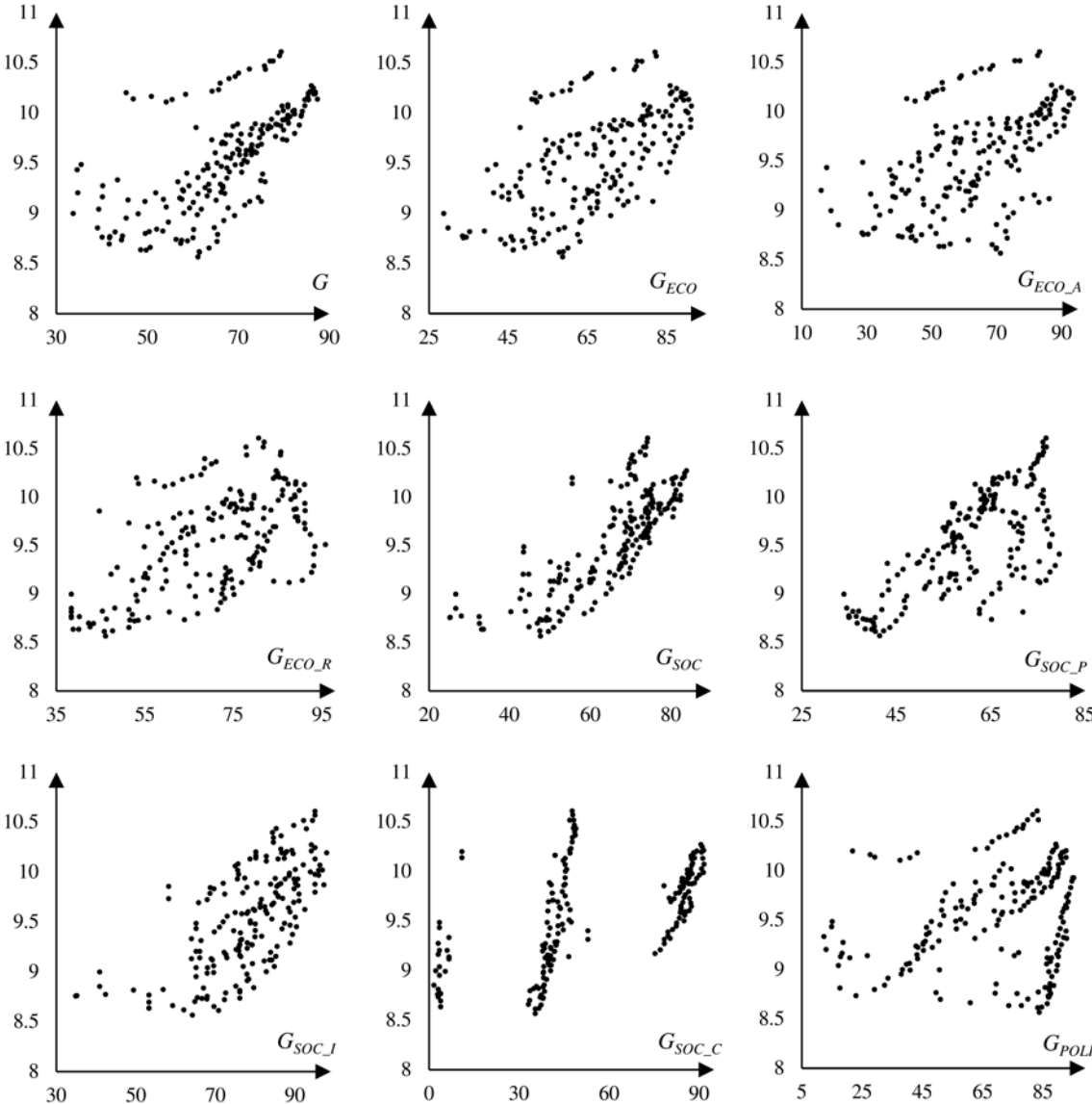


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**Figures:**



**Figure 1:** The scatterplots for output (vertical axis) and nine globalization indexes.