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FDI and Growth in Central and Southern Eastern Europe

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Abstract

This paper examines the role of FDI in promoting growth in 25 Central and Southern Eastern Europe (CSEE) using a dynamic panel approach that includes lags of involved variables to mitigate the problem of serial correlation. It adopts also a 'general-to-specific' approach to deal with the problem of the omitted variable and uses different estimation methods to control for heterogeneity and autocorrelation. The main finding is that FDI has a positive and significant impact on economic growth in accordance with theory.

Keywords: Foreign Direct Investment, economic growth, transition economies.

JEL Classification: F15, F21, C33, P27.

I. Introduction

The argument that FDI¹ plays a significant role in promoting growth has provided support for the policy stance emerged since the end of the 80s, when the majority of developing and transition countries started to introduce measures to liberalise trade and to create a favourable climate for FDI, adopting in many cases frameworks designed to attract foreign investors. FDI, in fact, is considered an important source of growth and financing for developing and transition economies as it supplements inadequate domestic resources to finance both ownership change and capital formation and helps to replace large amounts of obsolete capital accumulated during years of central planning. Moreover FDI, as stable long-term² capital inflows, is also perceived as a catalyst of growth since it could bring technology, managerial know-how and skills necessary for restructuring firms and help local enterprises to expand into foreign markets. The role of FDI in transition countries has been emphasized by the new growth theory suggesting that it may enhance economic growth not only

¹ In its Balance of Payments Manual, the IMF defines Foreign Direct Investment as the category of international investment that reflects the objective of obtaining a lasting interest by a resident entity in one economy (direct investor) in an enterprise resident in another economy (direct investment enterprise). A direct investor is defined by its ownership of 10% or more of the ordinary shares or voting power in direct investment enterprise.

² In this sense it is preferable to short-term flows since it permits to avoid an increase in macroeconomic instability. See Krkoska (2001) for evidence of a strong relation between the lack of FDI, current account deficits and economic crises in central European countries.

through capital accumulation but, also, by promoting technological change and human capital spillovers.

In this paper, following an extension of growth theory that includes trade and FDI as additional determinants of growth, we empirically examine the role of FDI in the process of economic growth in 25³ transition economies of the CSEE region using fixed effects panel data from 1990 to 2005. This aggregate includes the 10 new EU members, Balkans states and former Soviet Union republics⁴. This paper builds upon some previous work, first of all, including lags of involved variables (both dependent and independent) to mitigate the problem of serial correlation. Secondly, a ‘general-to-specific’ approach is implemented and formal F-tests are conducted selecting the most parsimonious specification to deal with the problem of the omitted variable.

The paper is organised as follows. The next section presents a picture of the FDI and exports trends in the region, focusing on the changes in the economic and political environment. Section III briefly surveys the theoretical and empirical literature on the topic providing motivation for our empirical results. Section IV presents the data set and the methodology adopted. Section V illustrates and discusses the main econometric results. Section VI summarises and draws conclusions.

II. FDI and exports trends in Central and Southern Eastern Europe

In the years 1989 and 1990, most of the countries in Central and Southern Eastern Europe started the transition from communist states to market economies and democratic governments. They set out to implement economic and political reforms, applying different strategies: increasing openness to trade, privatization of previously government-owned production, liberalizing markets and lowering the barriers to FDI to varying degrees. For the most part, they had not been FDI recipients to any important degree before 1990 but the collapse of the socialist system created several investment opportunities, especially because these economies were industrialized and could count on a relatively cheap yet highly educated workforce.

Evidence from CSEE countries’ data shows that the volume of trade appears to have a clear ascendant trend; total exports from and imports into these countries have doubled between 1990 and 2005. FDI inflows into these 25 countries steadily increased from about 3.3 billion USD in 1990 to

³ The countries sample includes: Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Tajikistan, Turkey, Ukraine, Uzbekistan. Bosnia and Herzegovina, Serbia and Montenegro and Turkmenistan, originally considered in a sample of 28 countries, have been removed since their time series lack data, especially in the first years of the period considered.

⁴ Although Turkey is not a transition country it is also included in this group for two reasons: first of all, because it belongs to the same geographic area and secondly because it will become an EU member.

about 74 billion USD in 2005, from 0.9 percent to 3.5 percent of GDP during this period. In 1990, however, the total amount of FDI inflows to CSEE countries appeared smaller compared to other developing countries aggregates; in fact, CSEE economies received only 1.6 percent of the global FDI inflows, while Latin America received 4.6 percent (WDI, 2007). However, by 2005, FDI inflows to CSEE increased to 7.5 percent of the global FDI inflows while Latin America still received the same percentage (WDI, 2007).

If we examine (Figure 1.1) trends in growth of per capita real GDP, FDI/GDP ratio, and growth of exports - (all averaged across the cross-section of 25 CSEE countries and expressed in percentages) between 1990 and 2005, it appears that average growth rate was negative until 1995, showing an ascendant up to 5% in the 2005. The growth of export had initially a similar trend appearing negative although ascendant until 1993. Then, it fluctuated widely around 10%. Generally, starting from 1995, the FDI and the GDP per capita growth showed a similar behaviour. More in detail, apart from the sharp increase in 1992, the FDI share to GDP grows around 4% from 1994 to 2002 slowing down from 2003 onwards. One of the reasons could be that export oriented investments were delayed due to the downturn of the European business cycle. Uncertainties related to elections in some of the target countries like the Czech Republic and Hungary also made investors delay new investments and acquisitions.

It appeared clearly, looking at the data (Figure 1.2 and 1.3), that a large proportion of the total FDI inflows is concentrated in a small group of Central and Southern Eastern European countries (CSEE) whereas most other countries in the region received very limited amounts of Foreign Direct Investment (FDI) inflows. There is, in fact, wide variation across the recipient countries. For example, the Czech Republic, Hungary and Poland received, in 1994, the 50 percent of total FDI inflows in the whole area, while Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovak Republic and Slovenia received all together about the 12% of the total. In 2005, there is an improvement in the area in terms of FDI distribution since the 40% of total FDI inflows is registered by a larger group of countries: Czech Republic, Hungary, Poland, Bulgaria and Romania. Among the other CSEE economies (non EU members), a considerable percentage of the total FDI (about 22%) was recorded, in 1994, by Kazakhstan, Russian Federation and Turkey; in 2005, the percentage of Russian Federation and Turkey doubled and tripled that of Ukraine. This wide variation across the recipient countries can be explained, as many other studies have shown, by the fact that the size of the FDI inflows depends on the country characteristics (Brenton et al., 1999).

FDI is not only strictly related to macroeconomic factors (economic fundamentals, market size, natural resources endowment), as pointed out by the literature (Lankes and Venables, 1996; Bevan and Estrin, 2000; Resmini, 2000; and Kinoshita and Campos, 2001, among others) but also

to political determinants (such as the degree of progress in transition reforms, political stability), and gravity factors (for example proximity to the European Union). FDI inflows to these countries, generally low during the first half of the '90s, have been increasing in line with improvements in all the measures of governance, particularly political stability and progress in transformation. When considering the six governance measures calculated by the World Bank⁵ (Kaufmann, Kraay, and Mastruzzi, 2006), the average score for the 10 new EU members countries, in 1996, was only 0.15 to reach 0.29 in the 2005 (Table 1.1)⁶. The improvement has been limited for the other CSEE countries. But in general. We can say there is an enhancement all across the region although, still the overall amount of FDI, in 2005, is modest compared to the size of the countries.

Most of the progress in the governance ratings for CSEE countries took place between 1996 and 2003. This improvement, intended to permit EU accession; in fact, many of these countries applied for EU membership between 1994 and 1996 and most of them entered the EU in 2004. There was, in sum, a clear positive relationship between countries' average governance scores and FDI inflows, in the second half of the 1990s. Economies with the highest governance scores, such as the Czech Republic, Hungary, and Estonia had also the highest inflows while, by contrast, Bulgaria and Romania had the lowest governance scores and the lowest FDI inflows. Slovenia was an outlier, with high governance score but only average FDI inflows because still the general investment environment is considered risky. Countries such as Albania and Macedonia have recently gained more stability but the transformation into a market economy is still incomplete and investors rarely take the risk to access these countries.

Inward FDI into the region was also encouraged by a general enhanced economic environment. This improvement is measured by the competitiveness rankings of the Global Competitiveness Reports (World Economic Forum, 2006) (Table 1.1). For 2005, the average ranking among the EU-15 was 18, where 1 represented the highest rank, while the average of the CSEE countries was 59. Estonia, Czech Republic and Slovenia, were the leaders among the new EU members countries, not far behind the EU average, but the other economies ranked much lower⁷. This improvement in governance and in the general climate may have helped to attract FDI inflows but it could also be that the hope of attracting FDI led to the improvements in governance.

⁵ The World Bank issued governance indicators, covering almost a decade until now.

⁶ Czech Republic and Slovenia scored higher than Italy and Greece not only in 1996 but also in the 2005, while Estonia, had scored higher than Greece in 1996 and higher than both in 2005.

⁷ In this ranking, Estonia, the Czech Republic and Slovenia outranked both Greece and Italy, and were close to Portugal and Spain.

Apart from the difference in terms of political environment, another distinction among countries groups in the area, can be operated on the basis of the FDI inflows character: *market-seeking*,⁸ *resource seeking*,⁹ and *efficiency-seeking*¹⁰. The first group is composed, for example, of Poland and Russia with large domestic markets and by growing economies such as Croatia, Romania and Bulgaria with local markets that attract greenfield investments in the consumer goods sector. In Albania and Macedonia investments come in, through the privatisation process only to serve the local market. The second group comprises countries that attract resource seeking FDI because of their large natural resource endowment such as Russia, Kazakhstan, Azerbaijan, Uzbekistan (oil, natural gas), Tajikistan (aluminium), Kirghizstan and Ukraine (uranium), or because of their abundant low wages labour such as Romania and Bulgaria. Countries such as the Czech Republic, Hungary, Poland, Slovak Republic and Slovenia constituted the third group, where many efficiency seeking FDI entered because of the gravity factors, in the prospective membership of the European Union, especially after the initial announcement of the progress of EU accession. Among the main investors in these countries there are the EU/15 members, whose share is bigger compared to the rest of the region. Over the last few years, the EU/15 members have also increased their investments share in Albania, Bulgaria, Croatia, Moldova and Romania. An exception is constituted by the Albania where Italy and Greece are responsible for almost all the investments. In the case of Italy, neighbourhood relations have also generated higher FDI shares in Poland, Romania and Slovak Republic while Germany is investing significant amounts in Croatia and Romania.

III. Review of Theoretical and Empirical Literature

The importance of trade and FDI for economic growth of transition and developing countries has been emphasized in both theoretical and empirical literature. On the one hand, apart from the traditional Ricardian argument of efficiency gain from specialization, there have been several other hypotheses put forward to argue how trade may affect growth in developing countries. In early works (e.g. Rosenstein-Rodan 1943, Nurkse 1953, Scitovsky 1954, Fleming 1955, Hirschman (1958), exports are deemed to provide the big push to break away from the vicious circle of low level equilibrium in which developing countries are often caught. Later, it is argued that exports fills in the foreign exchange gap that thwarts imports of high tech machinery needed to be competitive in the market. The endogenous growth theory emphasized the role played by exports in enhancing long-run growth by allowing a higher rate of technological innovation and dynamic

⁸ Called also *horizontal* FDI, as it involves replication of production facilities in the host country, it aims to serve local and regional markets and its main drivers are host market size and host market growth.

⁹ Called also *vertical* or export-oriented FDI, as it involves a relocation of parts of the production chain abroad, it aims to acquire resources (low-cost labour, natural resources, raw materials) not available in the home country.

¹⁰ This type of FDI aims to gain from the common governance of geographically dispersed activities in the presence of economies of scale and scope.

learning from abroad (Lucas, 88, Romer 86, 89, Grossman and Helpman , 91 Edwards, 92). More recently, Coe and Helpman (1995) argue that trade enhances the spillover effects of foreign R&D on domestic productivity.

On the other hand, the role of FDI, as a composite bundle of capital stocks, know-how, and technology, has been widely recognized as a growth-enhancing factor in developing and transition countries. FDI enables host countries not only to boost capital formation but also to enhance the quality of the capital stock transferring modern technology and innovation. In fact, multinationals are assumed to use best practice technology and management which, allow them to compete successfully with local firms raising the level of competition in the host economy. However, since knowledge possesses the characteristics of public goods, the use of a new technology by one subject does not preclude others from using it, giving rise to R&D and human capital spillovers (Grossman and Helpman, 1991).¹¹ Therefore, through labour turnover or through backward and forward linkages with TNC, indigenous firms can absorb some element of this knowledge and adopt innovative products/processes. Thus, by attracting FDI, host countries hope to “close the gap”, acquiring product, process and distribution technologies, as well as, management skills and market access. The theoretical ground to support the idea that FDI may enhance economic growth is offered by the Endogenous growth framework. This theory, taking into account a variety of factors enabling innovation, such as human capital accumulation and technological externalities in the development process, provides a very useful tool to analyse how the introduction of new inputs and technologies (Romer, 93)¹² influences the production function of a given economy and how external factors affect the research efforts of economic agents and the diffusion of knowledge. Thus, FDI has not a limited role, as in the Solow (57) model, where it was considered only as additional capital with respect to the domestic capital level. As a vehicle of technology and cumulative R&D

¹¹ Spillover is defined as the external effects of R&D that a firm puts in place for enhancing its own productivity compared to the other firms. Spillovers can occur both with the country and across the country (Sjoholm, 1997).

¹² Romer (1993) underlined that “a developing nation apart from suffers from an object gap due to the lack of valuable objects such as roads, factories, raw materials, can also suffer from an idea gap due to the fact that it has not access to the ideas used in the developed economies to generate economic value. The notion of an idea gap include something broader than a simple technology gap, some kind of economic activity that does not take place in the factories but outside. Ideas include the innumerable insights about packaging, marketing, distribution, inventory, control, payments and, information system, transaction processing, quality control and worker motivation that are all use in the creation of economic value in an economy”. In these ideas-based endogenous growth models, "ideas" (in the form of blueprints for new products or new processes) generated by investment in R&D lead to new processes and products that are used as inputs in the production of final goods, raising productivity (Romer 90). More importantly, R&D-based innovation is a crucial determinant of the competitiveness of firms since it does not exclusively affect the performance of those undertaking these activities but gives rise to important external effects ("R&D spillovers"). An important element of these external effects is "knowledge spillovers", which take place if new knowledge generated by the R&D activities of one agent stimulates the development of new knowledge by others, or enhances their technological capabilities. Thus, “an idea gap can be reduced at relatively low cost by transmitting ideas and generating gains from trade and FDI shared by the supplier who already possesses the knowledge and the recipient”. Since the notion of an idea gap focuses on the pattern of interaction and communication between a developing country and the rest of the world, it suggests that TNCs can play a special role as conduits of productive ideas flow across national borders (more than arms length transactions).

experience transfer, FDI, on the one hand, contributes to the stock of knowledge (innovations) enhancing the productive capacity of the economy and stimulating economic growth and, on the other hand, adds to the domain of social knowledge, generating spillovers thereby promoting further growth.

However, as Romer writes in his 1990 paper,¹³ for endogenous growth to happen some important preconditions are necessary among which there is openness to trade. Governments can make the recipient economies more appealing to foreign investment not only by offering an adequate reward to TNCs but, also, by favouring freer trade that may be supportive of growth and technological development. In fact, as Romer et al.(1991) stated, when barriers to trade are too high, and new inventions can't cross national lines, the incentive to innovate decreases suggesting a role for trade policy.

There are two dimensions of the hypothesis that FDI interacts with trade having positive effect on growth. First a more liberal trade environment with export-orientation attracts higher level of FDI inflows because it not only allows foreign capital to take advantage of low cost labour in the host country but also provides access to a larger market. This, also, leads to the output expansion in internationally competitive and export oriented product lines. Moreover, the production of firms in a liberal trade regime is not limited by the size of the domestic market and has the potential to reap economies of scale through international market penetration (Kohpaiboon, 2004; Nath, 2004). Second, the neutrality of incentives,¹⁴ associated with export orientation allows exploitation of scale economies, better capacity utilization and lower capital-output ratio, making foreign capital more productive and permitting to the market mechanism effectively indicate the country's comparative advantage (Edwards, 1993; Salvatore and Hatcher, 1991; Feder, 1983). Moreover, exports promote technical innovation and dynamic learning from abroad and thereby create a more favourable environment for externalities and learning from technology spillovers associated with FDI (Kohpaiboon, 2004; Worth, 2004; Nath, 2005). Thus, inward FDI attracted by a liberal trade environment may conform to existing or potential comparative advantages in trade.

Following the new growth theory paradigm, there have been many attempts, over the years, to test the impact of FDI on host country economic growth. A strand of literature, echoing an earlier suggestion by Bhagwati (1978), explores the connection between the benefits from inward FDI and the trade policy of the host country. Bhagwati (1985 and 1994), Brecher and Diaz-Alejandro

¹³ Romer, P. (90) "Endogenous Technological Change" in *Journal of Political Economy*, Vol.98.

¹⁴ A neutral trade regime may be defined as a situation with equal incentives to domestic sales and exports. Bhagwati (78) defined it as a regime where the effective exchange rate for exports equals the effective exchange rate for imports: $EER_x = EER_m$.

(1977), Brecher and Findlay (1983), Balasubramanyam et al (1996), De Mello (1999), Kohpaiboon (2004) find a positive growth effects of FDI associated with a liberal environment because a major degree of openness is likely to provide an appropriate environment conducive to learning that must go along with the human capital and new technology infused by FDI. Melitz (2005) notes that vertical FDI implies trade, and that both are determined by country policy toward trade and investment. By contrast, Carkovic and Levine (2002) concluded that there is no reliable cross-country empirical evidence supporting the claim that FDI per se accelerates economic growth.

Another strand of literature focuses on the productivity impact of FDI. Among these studies, Borensztein et al.(1998) find a positive impact of FDI on growth only for those countries that have accumulated a minimum threshold stock of human capital. Lensink and Morrissey (2001) also find a positive impact but caution that this result is not “entirely robust.” Blomstron, Lipsey and Zejan (1994) find that FDI has a positive impact on growth mostly in what they define as “low-quality data” countries. Focusing exclusively on OECD countries, de Mello (1999) finds that FDI is growth-enhancing only for countries in which domestic and foreign capital are complements. Yet Lipsey (2000) reports that there is little evidence on the impact of FDI on domestic capital formation. The evidence on technology spillover from foreign ownership is inconclusive, with Aitken, Harrison, and Lipsey (1996) finding positive spillovers while Aitken and Harrison (1999) do not. Saltz (1992) even finds that FDI has a negative impact on growth.

With specific reference to transition economies, Rodrik, Subramanian, and Trebbi (2004) find that non-economic factors such institutions matter for economic growth in these countries like Bevan and Estrin (2000) who find that political and legal issues influence foreign investment while Venables (1996) and Lankes and Venables (1996) show that foreign investment is attracted by local market potential and production cost advantages. Campos and Kinoshita (2002) find positive impacts of foreign investment in 27 central Eastern countries over the period 1990-98 and also Sohinger (2005) shows that FDI with its growth-enhancing effects, has played a significant role in transition economies. Hartarska (2005) suggests, using a neoclassical growth model, that foreign direct investment positively contribute to growth and Krkoska (2001) shows that capital formation is positively associated with FDI. Nath (2005) panel data analysis for 13 transition countries finds that the interaction between trade and FDI seems important for growth while Konings (2001) finds that foreign investment lowers firm productivity in Bulgaria and Romania but has no effect in Poland.

Despite the numerous alleged benefits of FDI to the host economy, the empirical literature has not succeeded in establishing always a clear significant positive impact of FDI on economic growth rates of host countries.

IV. Data and Methodology

Data collection

We collected time series data, for the period 1990-2005, from the World Development Indicators (WDI) of the World Bank. The use of a unique data source, in our opinion, should guarantee greater data homogeneity although we are aware that the World Bank dataset presents many limits in terms of data accuracy. Using the data we constructed the following variables for the empirical analysis. The growth rate of per capita real GDP¹⁵ is used as the dependent variable (*GDPCG*) in the growth equation¹⁶. The explanatory variables are: the growth rate of exports¹⁷ (*EXPG*), used as measure of openness, the FDI inflows ratio to GDP¹⁸ (*FDI*) and the Gross Fixed Capital Formation share of GDP¹⁹ (*GFCF*), used respectively as measures of the foreign and the domestic investments. The summary descriptive statistics of the variables of interest (*GDPCG*, *GFCF*, *FDI*, *EXPG*) are presented in Table 1.2 which shows a large heterogeneity in the data. For example, in Armenia, FDI has a minimum value of 0.06 and a maximum value of 348, while in Belarus the values are 0.04 and 3.66 respectively; for the same countries the GDP per capita growth minimum and maximum values are -40.76, 14.4 and -11.59, 12.01.

The methodology

The general model we use to investigate the role of FDI and exports on economic growth is derived from a production function framework:

$$Y = g(F, K, X) \quad (1)$$

¹⁵ The World Development Indicators definition of GDP per capita growth (annual %) is: Annual percentage growth rate of GDP per capita, based on constant local currency. GDP per capita is gross domestic product divided by midyear population.

¹⁶ There have been studies that use per capita real GDP (mostly in logarithms) as the dependent variable, see Berg et al (1999) and Cernat and Vranceanu (2002). Since our study is primarily motivated by a variant of the growth theory, the dependent variable is definitely the growth rate of per capita real GDP.

¹⁷ The WDI definition of Exports of goods and services (annual % growth) is as follows: Annual growth rate of exports of goods and services based on constant local currency. Aggregates are based on constant 2000 U.S. dollars.

¹⁸ The WDI definition of Foreign Direct Investment, net inflows (% of GDP) is as follows: Foreign direct investment is the net inflow of investment to acquire a lasting management interest (10 percent 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. This series shows net inflows in the reporting economy and is divided by GDP.

¹⁹ The WDI definition of Gross fixed capital formation (% of GDP) is: Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements; plant, machinery, and equipment purchases; construction of roads, railways, schools and hospitals.

where Y is GDP per capita growth and g is a linear function of domestic investment (K), Foreign Direct Investment (F) and exports growth (X). FDI is included in the production function in order to capture externalities, learning by watching and spillover effects since it influences the growth process directly, by increasing the stock of physical capital in the recipient economy, and indirectly, by promoting technological change and inducing human capital development. Domestic investment is included as explanatory variable since the role of capital accumulation in the growth process has been stressed in early works (Harrod, 39) but also in the neoclassical growth model out of the steady state (and also in the steady state if there is a link between capital accumulation and technical progress) Exports is also introduced, as an additional factor input, into the production function, following a large number of empirical studies which investigate the export-led growth hypothesis (Feder, 83, Balassa, 85, Salvatore and Hatcher 91, Greenaway and Sapsford 94, Thirlwall, 99) since export orientation leads to higher factor productivity because of the exploitation of scale economies and better utilisation of capacity; furthermore, it provides access to international market and determines a higher rate of innovations. In sum, considering a large empirical literature, we can say that, in the broadest sense, these are key variables.

We use panel data estimation techniques (Baltagi 2002) with country-specific fixed effects for our empirical analysis although time invariant initial conditions have been shown to be important for growth in general (Barro, 1991) and for transition economies in particular (de Mello et al. 1997, Berg et al. 1999).²⁰ However, given the fact that the determinants of growth in our model may take more than one year to fully exert their impact on growth, we use a dynamic specification, which includes r lags for each explanatory variable, plus possible effects of previous growth on actual growth. We proceeded from a general dynamic specification to a more parsimonious one by using appropriate tests on the degree of significance of each explanatory variable.

Then the general form of the model is represented by the following equation:

$$y_{it} = \alpha_i + \sum_{j=0}^r \gamma_j k_{it-j} + \sum_{j=0}^r \psi_j f_{it-j} + \sum_{j=0}^r \zeta_j x_{it-j} + \sum_{j=1}^r \lambda_j y_{it-j} + \varepsilon_{it} \quad (2)$$

where α_i are the individual (country) effects, ε_{it} are idiosyncratic errors, γ , ψ , ζ are the parameter of interest, $r=2$ and $i=1,2,\dots,25$, $t=1990,\dots,2005$.

Among various issues and concerns about this model, the following have been formally addressed. *First*, although country fixed effects take care of time invariant country-specific factors, the model

²⁰ However, previous studies (Berg, 99) have argued that the effects of these initial conditions taper off as time passes. This could be another reason why they may be excluded in investigating long run growth.

may still suffer from omitted variable problems if some important ‘time-variant’ control variables are not included. Moreover, some of these variables may be mutually correlated. Thus, while the exclusion of relevant variables may lead to the omitted variables problem, inclusion of them may give rise to the problem of collinearity. Besides, geographic contiguity and similarity in terms of political systems make it likely that some common factors can affect these countries. The obvious drawback of including many variables, given the small dimension of the time sample, is the weakness of the estimates. This is the main reason that leads us to select a parsimonious model. *Second*, given the differences in terms of growth experiences among the selected economies, one would expect, as appears in the descriptive statistics reported in table 1.2, that a remarkable variance both in time and across countries will affect the reliability of the results. This heterogeneity across country is also confirmed by the Burtlett test.

V. Results

First of all, we estimate for the whole country and time sample a dynamic model, with two lags for both the dependent and independent variables. The model has been estimated using 3 different methods. The ‘general-to-specific’ approach of model selection (Hendry 1995) leads to the elimination of the second lag, leading to results in Table 1.3. Columns include coefficient estimates, standard errors, t-statistics and relevant diagnostics statistics obtained from the three estimation methods used. Column 1 includes estimates obtained from a Generalized Least Squares (GLS) estimation method that corrects for cross-sectional heterogeneity by using estimated cross-section residual variances as weights. In column 2, we present the Seemingly Unrelated Regression (SUR) estimates²¹ that corrects for both cross-sectional heterogeneity and cross-sectional correlation by using estimated cross-section residual variance-covariance weights. Column 3 contains weighted 2SLS estimates to take into account the possibility that some of the right-hand side variables could be correlated with the error terms and also to consider the presence of heteroskedasticity.

The results appear analogous under alternative estimation methods; apart the domestic investment (GFCF) coefficient that is significant only in SUR and 2SLS estimates, the other coefficients are significant even if some of them not always have the expected sign. It should be noted that the presence of heteroskedasticity is confirmed by the White test on GLS residuals (not reported here). Furthermore, the Hausman test we conduct identifies endogeneity (not reported here) suggesting to use the 2SLS method.

²¹ Although we find little evidence of cross-sectional correlation, we present the SUR results for comparison.

We observe that previous GDP growth exerts always a positive influence on actual GDP growth. About FDI, the lagged coefficient is significant and positive while the current one is significant but negative. This could be accounted for the spillover effects from FDI in terms of know-how and technology, which require time to arise. Once the FDI enters a host country, the first effect could be a crowding out of the local firms with a consequent negative effect on growth. Moreover, the negative sign of FDI can also depend on the nature of the data. In fact, GDP growth can take both positive and negative values, while FDI, measured as ratio to GDP, is a variable with only positive values, then a negative correlation can arise between the two variables, especially with reference to the first years of the dataset. A further reason could be the low data quality that affects particularly the initial part of the time sample as shown in Figure 1.1. The current domestic investment variable (GFCF) appears to exercise a positive effect in the SUR and 2SLS estimates while the lagged one shows a negative sign indicating the presence of some problem. What we said for FDI about data quality applies also to this case. Regarding the current and lagged export growth variable, this plays a positive and significant role in the growth of GDP, in all estimation methods (except the lagged coefficient in GLS and 2SLS estimates), confirming what suggested by the theoretical literature. In other words, the growth of export determines an increase in total factor productivity due to the exploitation of scale economies, and also an improvement in the trade balance providing access to international market.

Among several diagnostic statistics on the residuals, we just report the R^2 and the Durbin-Watson test. These show similar values across the estimation methods employed, suggesting the robustness of the estimates and accepting the null hypothesis of no first order autocorrelation in the residuals, even if the inclusion of the lagged dependent variable requires a careful interpretation of this test. In fact, since we introduced lagged dependent variables in the relation to be estimated, the DW statistic could be distorted towards 2. To check this problem we use the H Durbin test.

As we argued, a considerable heterogeneity in terms of country size, degree of openness, political stability, macroeconomic development, natural resource endowment, and so on, characterises our CSEE countries sample. This diversity also appears when we look at the trend of the economic variables in different countries respectively. For example, figure.1.4 and figure 1.5 refer to Belarus and Czech Republic; GDP growth in Belarus was negative (about -10%) until 1995, then it sharply grew in the following two years (+10%) and it rested around the 8% for the remaining years. In the Czech Republic instead, the GDP increased from -10% to +5% between 1991 and 1995, then it sharply dropped to zero and from 1998 onwards it slowly started to raise to +5% for the rest of the period. In Belarus, the FDI is practically null for the whole period considered, while in the Czech Republic it slowly grows from zero to +10% until 1998, to fall, after 2002, around +5% for the rest of the period. Since this great heterogeneity can affect the results in terms of the expected signs of the parameters (especially of FDI), to verify this hypothesis we

estimate the model for a sample composed only by the 10 new EU members. These countries seem more homogeneous because they experienced the same accession procedures and the related convergence policies. The results are shown in table 1.4 where lagged GDP growth and exports appear clearly to influence actual GDP. Current and lagged FDI coefficients are significant only in the SUR estimate while the domestic investment (GFCF) is always significant and positive although the lagged coefficient continues to appear significant but negative. This unexpected result may be due not only to the poor quality of the data that particularly affects the beginning of the time sample but, also, to the decrease in the degree of freedom due to the unit sample reduction.

Another estimation of the model is performed using a sample that includes the 15 CSEE countries not members of the EU (Table 1.5). Again in these estimates, lagged GDP and current and lagged exports coefficients are in general positive and significant. The lagged FDI appears also highly significant and positive while the current FDI coefficient although it is highly significant has not the expected sign probably because, as we said before, it takes time to see spillover effects from a FDI activity. Regarding domestic investment the current coefficient appears significant only in 2SLS estimates while the lagged one is always negative and significant (except in 2SLS estimates). The previous comments on the nature of the data and country heterogeneity apply also to this case.

A further hypothesis we verified is whether the lack of data, particularly relevant in the first years of the period considered, can affect our results. In order to test it, we estimated the model considering a shorter period 1993-2005. When we considered the full countries sample (Table 1.6), no significant improvement in the estimates appears. Lagged FDI are always positive and significant as export and the lagged GDP; current domestic investment is significant and positive in SUR and 2SLS estimates while the lagged coefficient is significant but negative as current FDI (that continue to show the wrong sign). The estimates 1993-2005 (not reported here) relative to the “10 new EU members sample” and also those relative to the “other CSEE sample” are also not significantly improved.

VI. Conclusions

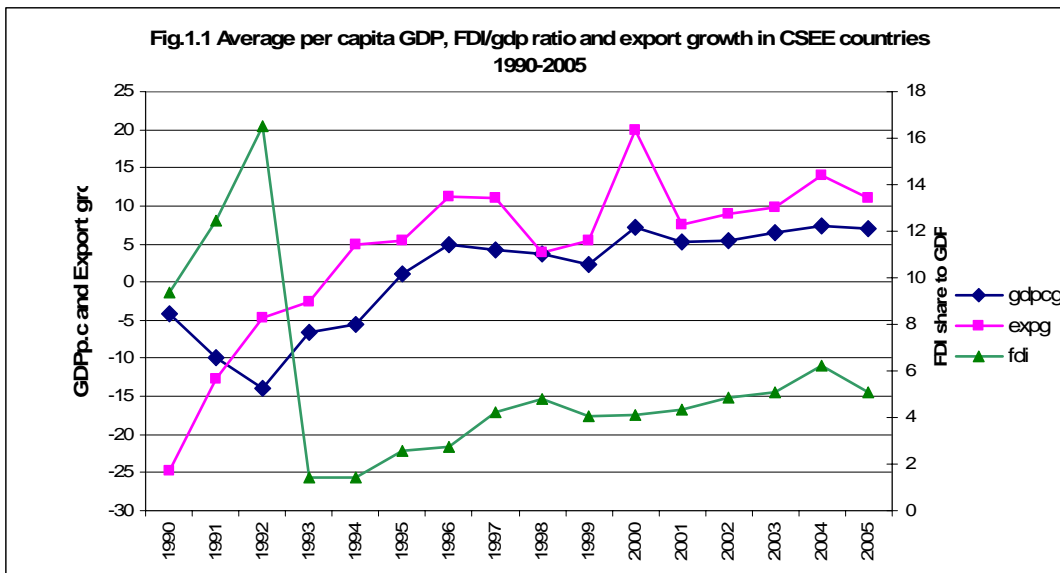
The objective of this paper was, following an extension of growth theory, to evaluate empirically the impact of FDI on the rates of economic growth of 25 transition economies (CSEE) for the period 1990-2005. The basic motivation for this study is that the empirical literature has had difficulties in establishing the result predicted by economic theory, namely that the effect of FDI on host country growth is positive and statistically significant. These countries have witnessed substantial increase in trade and FDI during the period examined. Applying a fixed effects dynamic panel estimation method to a data set that ranges from 1990 to 2005, this paper finds that lagged

FDI has a significant positive effect on country' economic growth while this effect is a negative one for current FDI. This could be explained with the fact that spillovers effects from FDI in terms of know-how and technology, require time to arise but could also be determined by the great heterogeneity that affect the data set. As expected, lagged GDP growth exert a strong influence on current GDP growth; the estimates show also a significant positive effect of exports. The same can be said for current domestic investment, although, the lagged coefficient shows in most estimates a negative unexpected sign suggesting the presence of some problems in the data.

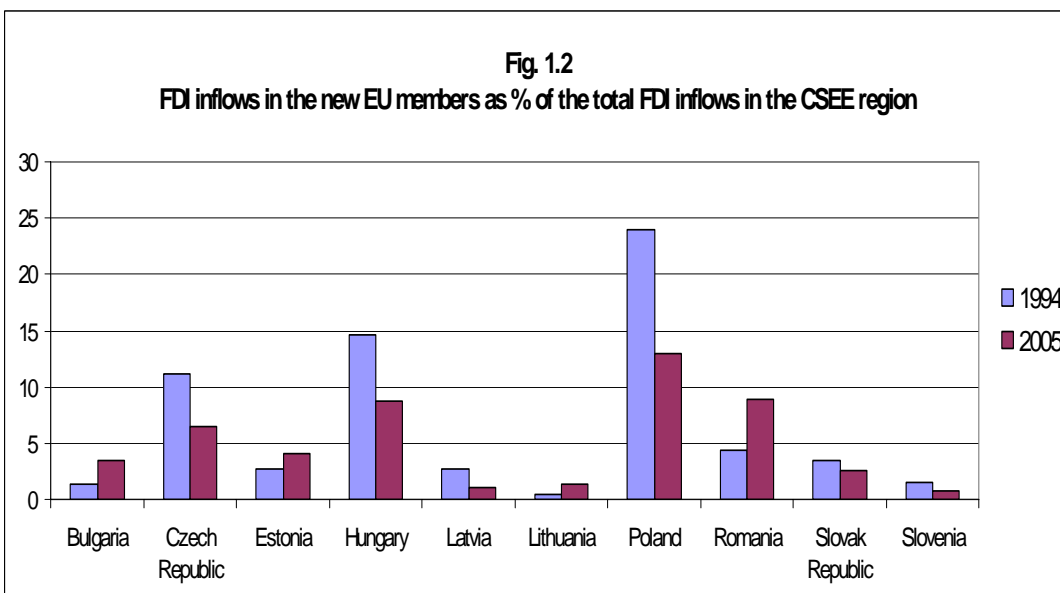
When considering sub-samples as: the "10 new EU members" and the "others CSEE non EU members", so as to reduce the great heterogeneity of the data, the results do not appear improved in terms of the expected signs of the parameters but rather (as in the case of the "10 new EU members") the FDI variable becomes not significant. The same can be said in the case of the "shorter period sample" we estimated.

In sum, our results show that lagged FDI is a crucially important explanatory variable for growth in transition economies together with previous GDP growth, domestic investment and export growth.. These estimates seem robust after correcting for endogeneity and omitted variable bias in all estimation methods (GLS, SUR, 2SLS) although the great data heterogeneity suggests some caution.

Further researches can investigate different country samples and different causal linkages. From an econometric point of view, it is a promising approach to employ, in the 2SLS, a different set of instrumental variables compared to those used in this paper in order to check the endogeneity of explanatory variables. In addition, the analysis of Granger causality shall contribute to a better interpretation of potential bi-directional interference between FDI and economic growth.

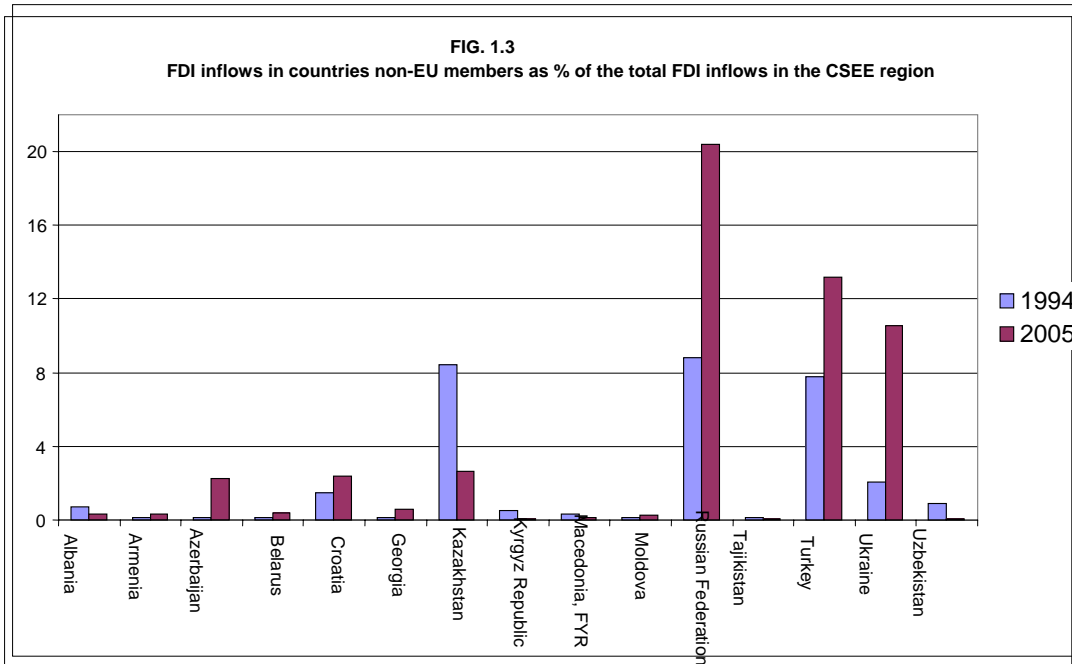


Source: WDI 2007, World Bank.

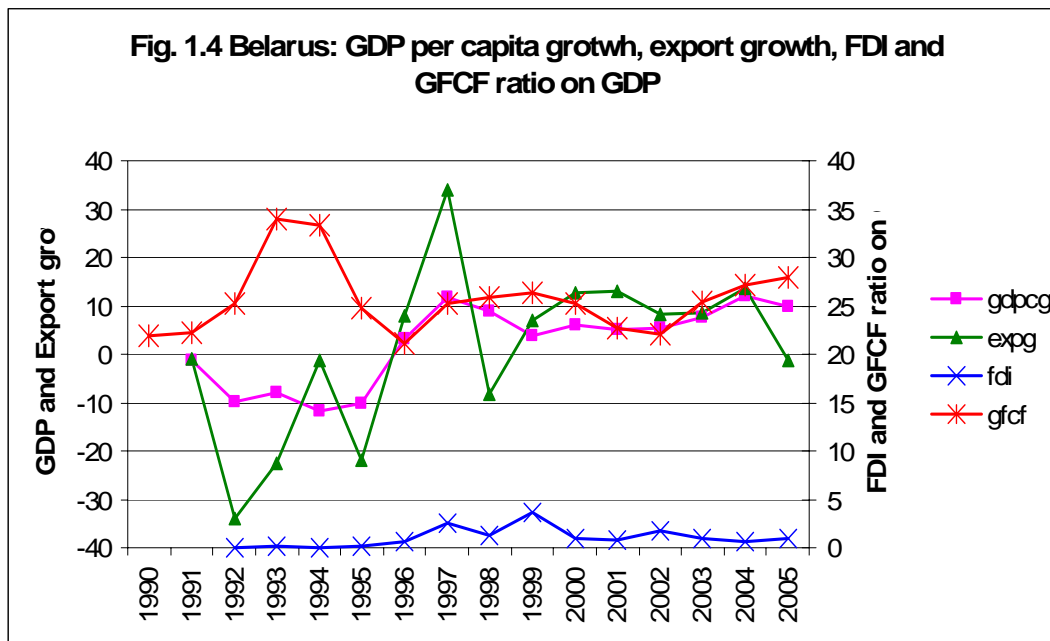


Source: WDI 2007, World Bank.

Formattato: Allineato a sinistra, Tabulazioni: 4,39 cm, Allineato a sinistra + Non a 1,69 cm



Source: WDI 2007, World Bank..



Source: WDI 2007, World Bank.

Fig. 1.5 The Czech Rep: GDP per capita growth, export growth, FDI and GFCF ratio to GDP

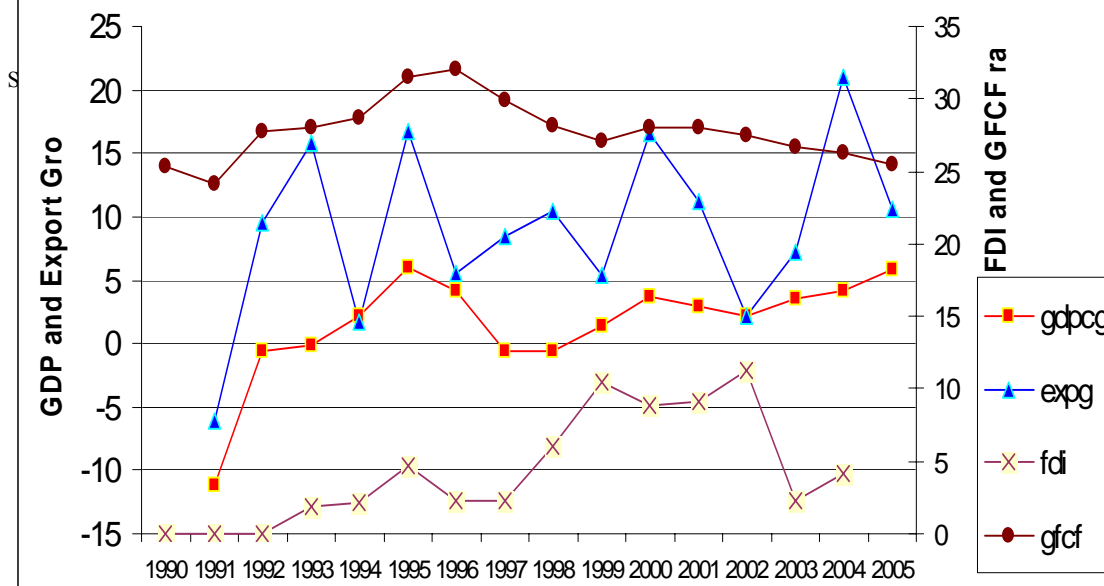


Table 1.1: World Bank Average of Governance Ratings, 1996 and 2005 and Global Competitiveness Rankings, 2005

Countries	Governance Scores		Global Competitiveness Rankings
	1996	2005	2005
Albania	-0.12	-0.50	100
Armenia	-0.68	-0.28	81
Azerbaijan	-0.93	-0.88	62
Belarus	-1.10	-1.05	
Bosnia	-0.52	-0.42	88
Bulgaria	-0.29	0.24	61
Croatia	-0.23	0.34	64
Czech Rep	0.86	0.82	29
Estonia	0.66	0.99	26
Georgia	-0.80	-0.51	86
Hungary	0.76	0.85	35
Kazakhstan	-0.72	-0.62	51
Kyrgyzstan	-0.43	-0.94	104
Latvia	0.19	0.69	39
Lithuania	0.30	0.77	34
Macedonia	-0.27	-0.40	75
Moldova	-0.13	-0.62	89
Poland	0.66	0.52	43
Romania	0.02	-0.13	67
Russia Fed	-0.67	-0.67	53
Serbia	-1.04	0.54	85
Slovak	0.41	0.79	36
Slovenia	0.96	0.92	30
Tajikistan	-1.90	-1.12	92
Turkey	-0.24	-0.04	71
Turkmenistan	-1.44	-1.44	
Ukraine	-0.51	-0.44	68
Uzbekistan	-1.09	-1.55	
new EU members	0.15	0.29	39
Other CSEE	-0.86	-0.84	76
CSEE			59
EU 15	1.40	1.39	18
Austria	1.61	1.57	15
Belgium	1.35	1.34	20
Denmark	1.70	1.80	3
Finland	1.68	1.91	2
France	1.24	1.20	12
Germany	1.58	1.48	6
Greece	0.66	0.69	47
Ireland	1.49	1.55	21
Italy	0.76	0.63	38
Luxembourg	1.60	1.76	24
Netherlands	1.72	1.66	11
Norway	1.73	1.73	17
Portugal	1.21	1.14	31
Spain	1.08	1.11	28
Sweden	1.67	1.66	7
UK	1.60	1.44	9

Sources: Kaufmann, Kraay, and Mastruzzi (2006). World Economic Forum (2006).

Table1.2 Summary Statistics of the variables: 1990-2005

		GDP per capita	Export growth	FDI/gdp ratio	GFCF/gdp ratio	
		Growth rate				
1	Albania	mean	2.75	24.4	3.14	20.96
		Stand Dev.	10.94	30.87	1.12	7.92
		(Max-Min)	(13.17; -27.50)	(87.92; -33.41)	(5.06; 1.19)	(32.17; 5.2)
		Available data	1990-2005	1992-2005	1992-2005	1990-2005
2	Armenia	mean	3.52	0.77	37.59	21.17
		Stand Dev.	14.17	30.45	89.25	7.6
		(Max-Min)	(14.47; -40.76)	(35.80; -85.80)	(348.19; 0.06)	(44.34; 12.45)
		Available data	1991-2005	1991-2005	1990-2005	1990-2005
3	Azerbaijan	mean	0.68	13.15	13.85	29.29
		Stand Dev.	14.61	21.04	14.82	11.81
		(Max-Min)	(24.97; -24.25)	(58.48; -18.52)	(45.15; 0.02)	(53.19; 11.44)
		Available data	1991-2005	1995-2005	1990-2005	1990-2005
4	Belarus	mean	2.22	0.98	1.04	25.63
		Stand Dev.	8.27006	17.1521	1.0196	3.69255
		(Max-Min)	(12.01; -11.59)	(33.9; -34.00)	(3.66; 0.041)	(33.89; 21.07)
		Available data	1991-2005	1991-2005	1992-2005	1990-2005
6	Bulgaria	mean	0.84	-0.46	4.41	16.65
		Stand Dev.	5.86	24.17	3.93	3.52
		(Max-Min)	(7.33; -8.92)	(22.76; -71.35)	(10.91; 0.01)	(23.77; 10.97)
		Available data	1990-2005	1990-2005	1990-2005	1990-2005
7	Croatia	mean	1.28	6.46	3.98	20.5
		Stand Dev.	7.82	3.98	2.34	5.96
		(Max-Min)	(10.19; -16.36)	(12.00; 0.67)	(7.32; 0.60)	(28.59; 10.47)
		Available data	1991-2005	1996-2005	1993-2005	1990-2005
8	Czech Republic	mean	1.53	9.07	5.43	27.78
		Stand Dev.	4.15	6.93	3.58	2.12
		(Max-Min)	(5.99; -11.14)	(21.05; -6.04)	(11.28; 1.90)	(32.10; 24.09)
		Available data	1991-2005	1991-2005	1993-2005	1990-2005
9	Estonia	mean	2.64	10.48	7.32	26.12
		Stand Dev.	8.36	10.78	5.16	2.73
		(Max-Min)	(12.36; -19.72)	(29.18; -0.16)	(22.87; 2.06)	(29.94; 20.93)
		Available data	1990-2005	1994-2005	1992-2005	1990-2005
10	Georgia	mean	-2.02	9.06	4.41	17.9
		Stand Dev.	16.58	14.81	3.3	7.78
		(Max-Min)	(12.97; -44.06)	(41.59; -9.24)	(9.73; 0.0003)	(27.45; 2.64)
		Available data	1990-2005	1995-2005	1993-2005	1990-2005
11	Hungary	mean	1.89	8.16	5.7	21.77
		Stand Dev.	4.66	10.64	2.39	1.7
		(Max-Min)	(6.27; -11.88)	(22.34; -13.87)	(10.75; 1.88)	(23.91; 18.88)
		Available data	1990-2005	1990-2005	1990-2005	1990-2005
12	Kazakhstan	mean	1.71	1.45	6.41	22.17
		Stand Dev.	8.49	10.92	3.27	4.78
		(Max-Min)	(13.69; -11.55)	(26.20; -11.90)	(12.79; 0.40)	(30.43; 15.71)
		Available data	1991-2005	1991-2005	1992-2005	1992-2005
13	Kyrgyz Republic	mean	-1.7	1.75	2.96	16.3
		Stand Dev.	8.84	13.81	2.61	3.4
		(Max-Min)	(8.33; -20.03)	(23.88; -18.97)	(7.91; -0.17)	(23.14; 12.41)
		Available data	1990-2005	1993-2005	1993-2005	1990-2005
14	Latvia	mean	1.76	6.35	4.02	19.97
		Stand Dev.	11.03	11.22	2.2	6.65
		(Max-Min)	(10.83; -31.34)	(20.68; -23.00)	(8.49; 0.60)	(29.81; 6.16)
		Available data	1990-2005	1992-2005	1992-2005	1990-2005
15	Lithuania	mean	1.19	10.19	2.9	22.22
		Stand Dev.	9.76	11.47	2.28	1.98
		(Max-Min)	(10.97; -21.17)	(21.21; -16.78)	(8.34; 0.11)	(27.61; 18.68)
		Available data	1991-2005	1996-2005	1992-2005	1990-2005
16	Macedonia, FYR	mean	-0.48	2.96	2.17	17.09
		Stand Dev.	4.35	14.69	3.3	1.22
		(Max-Min)	(4.14; -7.94)	(29.30; -25.10)	(12.84; 0.0002)	(19.44; 12.84)
		Available data	1991-2005	1991-2005	1991-2005	1990-2005
17	Moldova	mean	-3.37	6.96	3.51	18.34
		Stand Dev.	12.19	21.15	2.61	2.93
		(Max-Min)	(8.17; -30.72)	(29.20; -45.83)	(9.89; 0.59)	(24.36; 13.51)
		Available data	1990-2005	1993-2005	1992-2005	1990-2005
18	Poland	mean	3.57	10.11	2.67	19.83
		Stand Dev.	3.45	7.68	1.52	2.64
		(Max-Min)	(6.99; -7.30)	(23.21; -2.51)	(5.45; 0.15)	(24.38; 15.88)
		Available data	1991-2005	1990-2005	1990-2005	1990-2005

Table1.2 (Continue)Summary Statistics of the variables: 1990-2005

		GDP per capita Growth rate	Export growth	FDI/gdp ratio	GFCF/gdp ratio	
19	Romania	mean	0,91	8,67	2,59	19,99
		Stand Dev.	6,38	10,42	2,43	2,23
		(Max-Min)	(8,68; -12,81)	(23,43; -17,91)	(8,53; 2,61)	(23,10; 14,38)
		Available data	1990-2005	1991-2005	1990-2005	1990-2005
20	Russian Federation	mean	-0,31	2,56	1,08	19,78
		Stand Dev.	7,77	13,65	0,72	3,45
		(Max-Min)	(10,00; -14,56)	(12,57; -29,97)	(2,62; 0,17)	(28,70; 14,38)
		Available data	1990-2005	1991-2005	1992-2005	1990-2005
22	Slovak Republic	mean	1,59	10,33	3,56	29,06
		Stand Dev.	5,81	6,55	4,43	3,46
		(Max-Min)	(5,94; -14,97)	(22,51; -1,12)	(16,93; 0,60)	(36,05; 24,68)
		Available data	1990-2005	1994-2005	1990-2005	1990-2005
23	Slovenia	mean	2,43	3,03	1,66	22,32
		Stand Dev.	4,02	11	1,78	2,53
		(Max-Min)	(5,26; -9,06)	(13,23; -23,49)	(7,44; 0,49)	(26,36; 18,41)
		Available data	1991-2005	1991-2005	1992-2005	1990-2005
24	Tajikistan	mean	-3,67	4,06	2,35	14,63
		Stand Dev.	13	12,07	3,2	4,5
		(Max-Min)	(9,38; -30,28)	(30,65; -18,58)	(13,10; 0,47)	(23,79; 9,10)
		Available data	1990-2005	1993-2005	1992-2005	1990-2005
25	Turkey	mean	2,54	10,55	0,77	22,07
		Stand Dev.	5,45	7,23	0,69	3,49
		(Max-Min)	(8,26; -8,99)	(21,95; -7,04)	(2,70; 0,35)	(26,51; 15,46)
		Available data	1990-2005	1990-2005	1990-2005	1990-2005
27	Ukraine	mean	-2,17	-0,46	2,1	21,18
		Stand Dev.	10,18	17,01	2,33	2,35
		(Max-Min)	(12,97; -22,55)	(21,50; -47,30)	(9,42; 0,27)	(27,13; 18,97)
		Available data	1990-2005	1991-2005	1992-2005	1990-2005
28	Uzbekistan	mean	0,07	4,24	0,51	27,23
		Stand Dev.	5,11	8,72	0,36	4,5
		(Max-Min)	(6,46; -13,25)	(21,76; -10,40)	(1,13; -0,17)	(36,80; 21,00)
		Available data	1990-2005	1995-2005	1992-2005	1990-2005

Table 1.3 GDP per capita, export growth rate and FDI share to gdp: fixed effects panel estimates for 25 CSEE countries. Sample period: 1990-2005, est. param. (std.err) and t-stat

Dependent variable: Growth rate of per capita real GDP

independent variables	GLS	SUR	2SLS
C	5.12*** (0.96) 5.28		2.03** (0.76) 2.67
GDP per capita growth rate (-1)	0.42*** (0.03) 13.2	0.39*** (0.01) 27.04	0.47*** (0.03) 15.1
FDI to GDP ratio	-0.10*** (0.01) -9.21	-0.10*** (0.00) -32.6	-0.08*** (0.01) -6.68
FDI to GDP ratio (-1)	0.03*** (0.01) 2.96	0.04*** (0.00) 10.0	0.05*** (0.01) 4.29
GFCF to GDP ratio		0.04** (0.02) 2.14	0.14** (0.06) 2.36
GFCF to GDP ratio (-1)	-0.15*** (0.04) -3.42	-0.15*** (0.01) -7.99	-0.17*** (0.06) -2.87
Export growth rate	0.12*** (0.01) 7.71	0.13*** (0.00) 27.7	0.12*** 0.01 7.82
Export growth rate (-1)		0.03*** (0.004) 7.62	
R2	0.73	0.60	0.66
Adjusted R2	0.70	0.56	0.65
DW statistics	2.14	1.97	2.06
H Durbin	0.13	0.05	0.11

Table1.4 GDP per capita, export growth rate and FDI share to gdp: fixed effects panel estimates for 10 CSEE countries. Sample period: 1990-2005, est. param. (std.err) and t-stat
Dependent variable: Growth rate of per capita real GDP

independent variables	GLS	SUR	2SLS
C	2.25 (2.23) 1.01		-1.94 (1.71) -1.13
GDP per capita growth rate (-1)	0.32*** (0.05) 5.56	0.18*** (0.03) 5.02	0.45*** (0.06) 6.61
FDI to GDP ratio		0.08** (0.04) 2.00	
FDI to GDP ratio (-1)		0.12** (0.04) 2.60	
GFCF to GDP ratio	0.33** (0.12) 2.62	5.60** (0.07) 2.14	0.14** (0.07) 1.93
GFCF to GDP ratio (-1)	-0.37*** (0.11) -3.22	-0.37*** (0.07) -5.28	
Export growth rate	0.14*** (0.02) 6.13	0.13*** (0.01) 8.00	0.10*** 0.03 2.92
Export growth rate (-1)			
R2	0.69	0.64	0.45
Adjusted R2	0.65	0.59	0.44
DW statistics	1.94	1.49	2.19
H Durbin	0.39	0.99	0.07

Table 1.5 GDP per capita, export growth rate and FDI share to gdp: fixed effects panel estimates for 15 CSEE countries. Sample period: 1990-2005, est. param. (std.err) and t-stat

Dependent variable: Growth rate of per capita real GDP

independent variables	GLS	SUR	2SLS
C	4.41*** (1.18) 3.71		1.54*** (0.46) 3.33
GDP per capita growth rate (-1)	0.55*** (0.04) 13.60	0.45*** (0.02) 15.65	0.51*** (0.04) 10.9
FDI to GDP ratio	-0.10*** (0.01) -9.39	-0.10*** (0.00) -17.76	-0.09*** (0.01) -5.67
FDI to GDP ratio (-1)	0.05*** (0.01) 4.29	0.04*** (0.00) 6.12	0.06*** (0.01) 3.69
GFCF to GDP ratio			0.14*** (0.06) 2.36
GFCF to GDP ratio (-1)	-0.13** (0.05) -2.39	-0.14** (0.03) -4.46	
Export growth rate	0.11** (0.02) 5.40	0.13*** (0.00) 14.32	0.12*** (0.02) 4.87
Export growth rate (-1)		0.04*** (0.01) 4.20	
R2	0.76	0.62	0.56
Adjusted R2	0.73	0.58	0.55
DW statistics	2.47	2.12	2.70
H Durbin	0.89	0.06	1.37

Table1.6 GDP per capita, export growth rate and FDI share to gdp:
fixed effects panel estimates for 25 CSEE countries. Sample period:
1993-2005, est. param. (std.err) and t-stat
Dependent variable: Growth rate of per capita real GDP

independent variables	GLS	SUR	2SLS
C	5.17*** (0.93) 5.53		2.04*** (0.70) 2.88
GDP per capita growth rate (-1)	0.41*** (0.03) 12.00	0.40*** (0.01) 30.22	0.45*** (0.03) 13.8
FDI to GDP ratio		-0.10*** (0.00) -35.51	
FDI to GDP ratio (-1)	0.03** (0.01) 2.64	0.04*** (0.00) 11.47	0.04*** (0.01) 3.80
GFCF to GDP ratio		0.05*** (0.01) 2.79	0.13** (0.05) 2.28
GFCF to GDP ratio (-1)	-0.16** (0.04) -3.79	-0.16*** (0.01) -9.12	-0.16*** (0.05) -2.92
Export growth rate	0.11*** (0.01) 7.43	0.13*** (0.00) 31.49	0.10*** 0.01 7.00
Export growth rate (-1)		0.03** (0.00) 2.79	
R2	0.70	0.60	0.64
Adjusted R2	0.67	0.56	0.64
DW statistics	1.97	1.97	1.92
H Durbin	0.05	0.03	0.15

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