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Keywords: Transition economies; FDI; GDI; Fixed effects, Groupwise heteroscedasticity; Cross-sectional correlation

JEL Classification: F15, O52

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1. Introduction

The experiences of economic transition from a centrally-planned to a market based system in Central and Eastern Europe (CEE) and the former Soviet Union (FSU) raise two pertinent questions. First, what triggered growth that ended the 'transitionary recession' experienced by these transition economies in the early 1990s? Second, what would sustain growth in subsequent periods? This paper is primarily concerned with the second question and examines the role of trade and foreign direct investment (FDI) in growth in transition economies of Central and Eastern Europe, and the Baltic Region (CEEB). [1] Because these countries have substantially liberalized international trade and have attracted large FDI in last few years, it is important to examine the significance of their role in the long-run growth of these economies.

The volume of trade in these countries has increased: total exports from and imports into these countries have doubled between 1990 and 2002. FDI inflows into these thirteen countries steadily increased from less than half a billion USD in 1990 to about 26 billion USD in 2002, from 0.13 percent to 5.25 percent of GDP during the period. There is wide variation across the recipient countries. For example, Czech Republic, Hungary and Poland received 70 percent of total FDI inflows into the region. Six countries - Albania, Estonia, Latvia, Lithuania, Macedonia and Slovenia – together received less than 10 percent.

[1] There are 13 countries in CEEB region. They are: Albania, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia FYR, Poland, Romania, Slovak Republic and Slovenia.

Figure 1 displays trends in growth of per capita real GDP, FDI-GDP ratio, and volume of trade (exports *plus* imports) as a share of real GDP – also used as a measure of openness or trade liberalization- (all averaged across the cross-section of thirteen transition economies, and expressed in percentages) between 1990 and 2003. As we can see, average growth rate was negative until 1994. Then it fluctuated, and has been steady around 4 percent since 2000. The volume of trade appears to have clear upward trend. The FDI share has steadily been increasing and has slowed down only in 2003.

The transition economies of CEE and FSU experienced substantial decline in output in the initial phase of transition (a phenomenon often referred to as 'transitionary recession'). As Fischer et al (1996a) argue, restrictive macroeconomic policies and restructuring of the economy caused such decline in economic activities. However, the extent and the speed of recovery varied across countries. There has been a substantial literature that addresses various aspects of the transitionary recession, and attempts to identify the factors that triggered the recovery. Some notable works include de Melo, Denizer and Gelb (1996); Fischer, Sahay and Vegh (1996 a, b); Sachs (1996); de Melo, Denizer, Gelb and Tenev (1997); Hernandez-Cata (1998); Havrylyshyn, Izvorski and Rooden (1998); Berg, Borensztein, Sahay and Zettelmeyer (1999). These studies examine one or more of four different sets of variables to understand the growth experiences of early transition years. These four categories of factors are: macroeconomic variables, structural reform variables, initial conditions and institutional factors.

The recovery and growth since the transitionary recession was over leave us with only a few data points – not enough to conduct any meaningful time series analysis of the growth experiences in transition countries. Pooling time series and cross section may,

however, provide a useful way of studying growth in those countries.[2] There have been a few attempts in recent years to use panel data approach to evaluate the contribution of various factors to growth in transition economies. In a study very similar in spirit to the current research, Cernat and Vranceanu (2002) use a panel data analysis of 10 CEE countries to asses the impact of globalization on output performance. Their results indicate that increased EU integration and trade liberalization are conducive to development. Furthermore, increased FDI inflows seem to be associated with better output performance.[3]

In this paper we examine empirically the role of FDI and trade in the process of economic growth in 13 transition economies of the CEE region. The empirical work is primarily motivated by an extension of growth theory that includes trade and FDI as additional determinants of growth. Using fixed effects panel data estimation methods applied to a data set that ranges for a period from 1990 to 2003, this paper examines the effects of trade and FDI on growth after controlling for gross domestic investment (GDI) and some important macroeconomic variables such as inflation, fiscal balance and size of the government. This paper improves upon some previous work on growth in transition economies by explicitly addressing three methodological issues. First. we formally test for groupwise heteroscedasticity and cross-sectional correlation. Second, by including lagged dependent variable (LDV), we estimate a dynamic version of the model to mitigate the problem of serial correlation. Third, in order to deal with the problem of

[2] To our knowledge, Islam (1995) is the first study to implement panel data approach to cross-country growth data.

[3] In a related study, drawing on the insights provided by a production function with a low elasticity of substitution between capital and labor, for short-run growth dynamics in the transition economies, Lee and Tcha (2004) empirically show that the marginal contribution of FDI to growth is greater than that of domestic investment. In another study, Sohinger (2005) shows - in a less formal way - that FDI with its growth-enhancing effects, has played a significant role in setting the transition economies in the CEEB region onto the path of convergence with their more affluent neighbors.

omitted variables, a very general specification of the model including largest possible number of variables is estimated and formal F-tests are conducted to implement a 'general-to-specific' approach of selecting the most parsimonious specification.

Our analysis suggests that significant positive effect of trade on growth is a robust result for transition economies of the CEEB region. Additionally, domestic investment appears to be an important determinant of growth. However, in the presence of trade, FDI does not have any significant effect on growth. The estimation of the growth equation without trade renders FDI highly significant suggesting collinearity between trade and FDI. Furthermore, interaction between trade and FDI seems to be important for growth in transition economies. Among other findings, macroeconomic stability as reflected in the rate of inflation and fiscal balance plays significant role. Our results have important policy implications.

The rest of the paper is organized as follows. Section 2 discusses theoretical background of the linkages between trade, FDI and growth. In section 3, we describe the data and the methodology. Section 4 presents the empirical results and analysis. In the next section, we summarize and include a few concluding remarks.

2. Linkages between trade, FDI and growth: a theoretical background

The importance of trade and FDI for growth of developing countries has been emphasized in both theoretical and empirical literature. 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 fill in the foreign exchange gap that prevents imports of high tech machinery needed to be competitive in the market.[4] More recently, Coe and Helpman (1995) argue that trade enhances the spillover effects of foreign R&D on domestic productivity. Another strand of recent literature uses new growth theory framework to link trade policy to growth. Externalities associated with liberal trade policies are seen as leading to higher levels of GDP or higher growth.[5]

The importance of FDI for growth is emphasized for its role in augmenting domestic capital stock and as a conduit for technology transfer[6] - two most essential elements in modern growth literature. Studies that use new growth theory paradigm to examine the effects of FDI on growth take two different routes. For example, extending a hypothesis advanced by Jagdish Bhagwati (1973), Balasubramanyam et al (1996) were able to show that the growth enhancing effects of FDI would be stronger in countries with more liberal trade regime. They argue that a liberal trade regime is likely to provide an appropriate environment conducive to learning that must go along with the human capital and new technology infused by FDI. Others (e.g., Borensztein et al.1998) rely on 'absorptive capability' of the recipient country in the form of stock of human capital for technological progress that is assumed to take place through a process of 'capital deepening' in the form of new varieties of capital goods introduced by FDI.

[4] See McKinnon (1964)
[5] See Grossman and Helpman (1992) for a comprehensive discussion of a class of such models.
[6] In the literature, the role of FDI in transferring technology has received much attention and spurred intense debate. For a recent survey, see Saggi (2002)

There are two dimensions to the hypothesis that FDI interacts with trade to have 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 of labor in the host country but also provides access to a larger market. *Second*, the neutrality of incentives associated with export orientation allows exploitation of economies of scale, better capacity utilization and lower capital-output ratio thus making foreign capital more productive. Moreover, exports also promote technical innovation and dynamic learning from abroad and thereby create a more favorable environment for externalities and learning from technology spill-over associated with FDI.

For the purpose of our empirical study, the theoretical expositions of the linkages between trade, FDI and growth translate into an extended growth equation with trade and FDI as the additional (extended) variables alongside domestic investment.

3. Data and Methodology

Data

The main sources of data for this study are the United Nations' *Statistical Database*, the Statistics on *Foreign Direct Investment* and *World Investment Report 2004* compiled by the United Nations Conference on Trade and Development (UNCTAD) and the *Transition Reports* for various years prepared by the European Bank for Reconstruction and Development (EBRD).

We obtain national accounts data on GDP per capita, gross fixed investment, government consumption expenditures, exports and imports of goods and services from

the *UN Statistical Database*. These data are available both in national currency and in US dollars; and both at current prices and at 1990 constant prices. We use constant 1990 USD data. We calculate nominal exchange rate from GDP in national currencies and in USD at current prices. Although our sample covers a period from 1989 to 2003 there are differences in the coverage of data across countries depending on availability. Appendix Table – Table A.1 - describes the sample periods for different series by countries.

It may be noted that the national accounts data on the transition economies have serious problems which have been emphasized by Fischer et al (1996a) and others. The GDP data are likely to overstate the decline of output and the increases in prices because the pre-transition prices were used to measure output, which was of extremely poor quality. Moreover, government agencies were formerly responsible for collecting and publishing data on output mainly from the state sector and, therefore, may have underreported the expansion of the private sector during the initial years of transition.

We obtain the data on net FDI inflows for these countries from the UNCTAD. [7] CPI inflation data are obtained from the EBRD's *Transition Reports* and IMF's *World Economic Outlook 2005*. Data on 'share of private sector', and 'tariff revenues' are compiled from various issues of the *Transition Reports*. These data are mainly used for various experiments that we conduct in this study.

Using the data we construct the following variables for the empirical analysis. The growth rate of per capita real GDP is calculated as 100 *times* first log differences of per capita real GDP and is used as the dependent variable (*GROWTH*) in the growth

[7] FDI inflows in the recipient economy 'comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to an enterprise resident in the economy.' 'FDI flows are recorded on a net basis (capital account credits less debits between direct investors and their foreign affiliates) in a particular year.' (see UNCTAD: Sources and Notes)

equation.[8] Percentage share of real exports *plus* imports in real GDP is taken as a measure of the trade variable (*TRADE*). FDI inflow as a percentage share of GDP (in constant 1990 USD) is taken as the FDI variable (*FDI*). Note that FDI current price series has been converted into constant 1990 USD by using an implicit deflator calculated from the series on gross fixed investment. FDI inflows are subtracted from gross fixed investment to calculate Gross Domestic Investment. Percentage share of GDI in GDP is taken as the domestic investment variable (*GDI*).

The summary statistics of the variables of interest (*GROWTH, GDI, FDI* and *TRADE*) are presented in Table 1. The per capita real GDP in the CEEB countries grew at an average rate of 0.59 percent during 1990-2003. However, average growth rate varies widely across countries and so does its variance over time. Among the CEEB countries, Poland has recorded the highest average annual rate of per capita real GDP growth (1.91 %) during this period, followed by Slovenia (1.81%). In Former Yugoslav Republic (FYR) of Macedonia, the average annual growth rate has been negative. On an average, these countries have invested 20 percent of their GDP in building domestic stock of fixed capital during this period. Seven countries - Czech Republic, Estonia, Lithuania, Poland, Romania, Slovak Republic and Slovenia, have exceeded this average. FDI inflows have accounted for slightly above 4 percent of real GDP, on an average. This share is above 6 percent, on an average, in Czech Republic, Estonia and Hungary. Average trade volume among these countries has surpassed GDP at 102 percent, with only 4 countries having this ratio below 100 percent. In most countries, increase in this ratio over the sample period has been substantial.

[8] There have been studies that use per capita real GDP (mostly in logarithms) as the dependent variable. For example, 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 decidedly the growth rate of per capita real GDP.

Methodology

We use panel data estimation techniques for our empirical analysis. As discussed above, extension of basic growth theory suggests that alongside domestic investment, trade and FDI are important determinants of growth. We, therefore, consider *GDI, FDI* and *TRADE* to be the main right-hand side variables in our growth equation. Although time invariant initial conditions have been shown to be important for subsequent growth in general (see, for example, Barro 1991) and for transition economies in particular (see de Melo et al 1997, and Berg et al 1999), we leave them out in favor of country-specific fixed effects primarily for two reasons. *First*, previous studies (for example, Berg et al 1999) have shown that more than one initial condition may be important for growth and macroeconomic performance in transition economies.[9] Inclusion of too many initial conditions may lead to imprecise estimation of the coefficients. Moreover, there may be country-specific factors - other than initial conditions - that contribute to variations in growth experiences in transition economies. Therefore, our choice of a fixed effects model is dictated by a desire for parsimonious specification and a concern for omitted variable problem. *Second*, the objective of the study is to examine the contribution of trade and FDI to growth in transition economies, and the role of initial condition or relative importance of different initial conditions for growth is not of particular interest.

While growth theory provides some guidance, growth in countries that are going through economic and political transition could just be a black box. Therefore, choosing appropriate control variables is a difficult task. As shown in previous works, growth in transition economies may well be affected by – in addition to initial conditions - macro

[9] However, they 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.

variables, structural reform variables, and institutional factors. Based on suggestions from previous works and data availability, we choose two categories of variables: *macroeconomic variables* and *structural reform variables*. The first category includes CPI inflation (*INF*), fiscal balance as percentage of GDP (*FBAL*), size of the government as measured by the percentage share of government consumption expenditures in GDP (*GOV*) and nominal exchange rate (*X*). These variables are assumed to reflect the effects of macroeconomic stabilization policies. Like Berg et al. (1999), inflation is our main stabilization proxy. Fiscal balance is expected to affect growth through crowding out and government consumption expenditures through a short run aggregate demand stimulus.[10] Inclusion of nominal exchange rate is expected to reflect the effect of exchange rate targeting of stabilization policies.

The category of structural variables includes the share of private sector in GDP (*PVT*) and tariff revenue as a percentage of total imports (*TARIFF*). [11] The first variable is an indicator of the speed and extent of structural reform and is expected to have a positive effect on growth through increased efficiency. *TARIFF* measures the extent of trade liberalization.[12] Country-specific fixed effects will capture some of the important differences in institutions that are inherent or evolved - across the transition economies.[13]

[10] One might expect these two variables to be correlated and therefore, may prefer to use one instead of both. However, it turns out that the contemporaneous correlation between *FBAL* and *GOV* is 0.16. It is not difficult to see that they may have completely unrelated time patterns and may reflect different policy orientation.

[11] Berg et al (1999) use three liberalization indices under this category. These indices measure extent of price liberalization, external liberalization and the progress in privatization. Although EBRD's *Transition Report*s provide such indices, in many cases they are invariant over a number of years, are not available for almost half of the sample period considered here and, therefore, we are not using them.

[12] Note that one of the variables of interest – *TRADE,* is also used as a measure of trade liberalization and one would expect it to be correlated with *TARIFF*. It turns out that the correlation coefficient between these two variables is -0.71 which is significantly high.

[13] Grogan and Moers (2001) present a cross-section analysis of 25 transition economies to show that institutions are important for growth and FDI.

We estimate a pooled time-series cross-section regression of the following form:

$$g_{it} = \mu_i + \beta' X_{it} + \gamma' Z_{it} + \varepsilon_{it}$$

where g_{it} is the annual growth rate of per capita real GDP for state i in year t; μ_i is the country-specific fixed effect; X_{it} is a vector of variables of interest: *GDI, FDI* and *TRADE*; and Z_{it} is a vector of control variables; i = 1, 2,…….N indexes country and t =1, 2, ……T indexes time.

Among various issues and concerns about this empirical methodology, the following have been formally addressed. *First*, although country fixed effects take care of time invariant country-specific factors, the model may still suffer from omitted variable problem if some important 'time-variant' control variables are not included. Moreover, some of these variables may be correlated with each other. Thus, while exclusion of relevant variables may lead to the omitted variables problem, inclusion of them may give rise to the problem of collinearity. To address these problems, we first estimate a general model including all control variables listed above. The obvious drawback of including many variables is that due to lack of degrees of freedom the coefficients are imprecisely estimated. If some variables have negligible effects, excluding them would lead to more precise estimates. Moreover, multicollinerity may show up in terms of statistically insignificant individual coefficient with high R^2. Remedies of this problem include exclusion of variables that are collinear with others. We therefore adopt a loose application of David Hendry's "general-to-specific" approach. We then apply a sequence of F-tests to reduce the model to more parsimonious specifications admissible under our data set. We start with excluding single variable under each category of control variables, and then we test for exclusion of an entire category of variables. This 'general-to-

specific' approach would help us find the most parsimonious specification of our model.[14]

Second, given the differences in growth experiences among transition economies, one would expect tremendous variation of variables in the model. Moreover, geographic contiguity, and similarity and links between erstwhile political systems make it likely that there are some common factors that affect these countries. We, therefore, formally test for groupwise heteroscedasticity and cross-sectional correlation. Following Greene (1997), we conduct simple Lagrange Multiplier (LM) Tests. For serial autocorrelation, however, we rely on pooled Durbin-Watson (DW) test statistics.

4. Empirical Results

The test results for 'general-to-specific' approach of model selection are presented in Table 2. Based on these results we include *INF*, *FBAL* and *GOV* as control variables in our pooled regression model. Test results for groupwise heteroscedasticity and cross-sectional correlation are reported in Table 3. While the test strongly rejects the null hypothesis of no heteroscedasticity across countries there is little evidence of cross-sectional correlation.

In Table 4, we present the regression results. The first three columns include coefficient estimates, the standard errors and other relevant statistics estimates obtained from three different estimation methods. Column 1 includes estimates from simple pooled least square (PLS) method that assigns equal weights to all observations. Note that the standard errors are estimated using White's heteroskedasticity consistent variance-

[14] Note that we do not apply the 'general-to-specific' approach to our variables of interest. Therefore, even in the most parsimonious specification, multicollinearity problem may arise if two or more of these variables are collinear. As we will see, that may in fact be the case with *TRADE* and *FDI.*

covariance estimates that are robust to general heteroskedasticity. Column 2 includes estimates obtained from a feasible generalized least square (GLS) estimation method that corrects for cross-sectional heterogeneity by using estimated cross-section residual variances as weights. In column 3, we present the seemingly unrelated regression (SUR) estimates.[15] SUR estimation method – a version of feasible GLS - corrects for both cross-sectional heterogeneity and cross-sectional correlation by using estimated cross-section residual variance-covariance weights.

The results indicate that among the variables of interest, trade has significant positive effect on per capita real GDP growth, and this result is robust under alternative estimation methods. A one percent point increase in trade-GDP ratio increases per capita real GDP growth rate by about 0.07 percent point. Domestic investment has significant positive effect on the per capita growth rate under GLS and SUR. A one percent point increase in GDI-GDP ratio leads to about 0.20 percentage point increase in per capita GDP growth rate. Although the effect of FDI on per capita growth is positive it is statistically significant only under SUR estimation method. Among the control variables, highly significant negative effects of inflation and fiscal balance are robust to any estimation method. The latter results accord well with previous studies by Berg et al (1999) and highlight the importance of macroeconomic stabilization for growth of the transition economies of the CEEB region. Size of the government has mostly significant positive effect on growth. It seems to have affected growth by stimulating aggregate demand.

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

We report the pooled Durbin-Watson test statistics for all three methods and they indicate that the null of no serial correlation is rejected at 5 percent significance level. We, therefore, include the lagged dependent variable (LDV) in next three sets of results reported in column 4 through 6. Since LDV is correlated with country-specific fixed factors it renders estimates of the coefficients biased and inconsistent. Note that only if $T \rightarrow \infty$, the LS estimates will be consistent for dynamic error panel model. However, some researchers (for example, Islam 1995) favor LS estimates for moderate size T if N is relatively large arguing that the bias may not be large in those cases.[16]

The trade coefficient is statistically significant at least under GLS and SUR. *GDI* is now statistically significant only under SUR. *FDI* is no longer significant and, in fact, has negative sign under GLS. Even long-run effects of these variables (calculated by multiplying the estimated coefficients by $\frac{1}{(1-\hat{\rho})}$ where $\hat{\rho}$ is the estimated coefficient of the LDV) are smaller in magnitude than those in the static model. Note that the earlier results about the effects of the control variables are robust to this dynamic specification of the model. The D-W statistics in the LDV models suggest that the issue of autocorrelation is now mitigated.

Sensitivity Analysis

We conduct three different sensitivity exercises. *First*, we exclude those years when most transition economies in the CEEB region experienced negative growth. By 1995 the transitionary recession largely ended in the region except in Macedonia.

[16] See Baltagi (2002) pp. 129-30 for a discussion. Many alternatives to get around the problems associated with dynamic specification of fixed effects model have been suggested. Notable works include Anderson and Hsiao (1981), Arellano (1989) and Arellano and Bond (1991).

Therefore, we re-estimate the model for the period 1995-2003. The PLS estimates are presented in the first column of Table 5. As we can see, the effects of the macro variables are still significant and have the expected signs. Among the variables of interest, *TRADE* is still significant though the magnitude of its effect is much smaller. *FDI* has negative – though statistically insignificant - effect on growth. Adding LDV (results not reported in the table) does not change the result and, in fact, the AR coefficient is negative and statistically insignificant. An examination of the D-W test statistics reveals that it is in the 'no decision zone' and LDV does not seem to alter the result. It may be noted that this result may be due to the fact that Albania, Bulgaria, Croatia, Czech Republic, Lithuania and Romania experienced decline in per capita real GDP for one or more years during this period.

Second, we multiply the investment variables (both *GDI* and *FDI*) by the shares of private sector (*PVT*). As has been discussed in other studies (for example, Berg et al 1999), the government sector is inefficient, and under the socialist regimes the CEEB countries are known to have over-capitalization which means excess capacity and inefficiency. By multiplying with private sector shares we are implicitly assuming that both *GDI* and *FDI* contribute to growth only to the extent that the new capital is fully and efficiently utilized in the private sector. The results are shown under column 2. Although *GDI* is highly significant, both *FDI* and *TRADE* are now statistically insignificant.

Third, the fact that FDI is found to have statistically insignificant effect on growth – which does not accord well with the insights provided by the growth theory framework - while trade has significant positive effect, makes us suspect the possibility of a linear

relationship between *FDI* and *TRADE*.[17] We, therefore, estimate the model without the trade variable. Both *GDI* and *FDI* are now highly statistically significant, and *FDI* is now significant even under the dynamic specification of the model. The results are shown in column 3 and 4. Moreover, as discussed in section 2, theory suggests that trade and FDI interact to enhance growth. We, therefore, conduct an additional experiment in which instead of including *FDI* and *TRADE* separately, we include an interaction term between these two variables which appears to be positive and highly significant under both static and dynamic specifications.

To summarize, our results indicate that significant positive effect of trade on growth is a robust empirical result for transition economies of the CEEB region. Domestic investment, too, appears to be an important determinant of growth. However, in the presence of trade in the growth equation, FDI does not have any significant effect on growth. The estimation of the growth equation without trade renders FDI highly significant suggesting collinearity between trade and FDI. Furthermore, interaction between trade and FDI seems to be important for growth in transition economies. Among other findings, macroeconomic stability as reflected in the rate of inflation and fiscal balance plays a significant role.

These results have important policy implications for the transition economies of the CEEB region. They are even more significant as most of these countries (so far 8 countries have joined the EU) have recently joined the European Union. With free mobility of factors of production and liberal trade policies these countries are expected to achieve high growth.

[17] The contemporaneous correlation coefficient between these two variables is 0.433. Although in general collinerity is less of a problem in pooled regression models, inclusion of country specific fixed effects may aggravate the problem. See Baltagi (2002)

5. Concluding Remarks

This paper examines the effects of trade and FDI on growth using data for 13 transition economies in the CEEB region. An extension of traditional growth theory that includes trade and FDI as additional determinants of growth provides the motivation for this study which tries to understand growth and its sustainability in the transition economies. The transition countries of the CEEB region have witnessed substantial increase in trade and FDI during the first decade of their transition from plan to market based system. Applying fixed effects panel estimation methods to a data set that ranges for a period from 1989 to 2003, this paper finds that significant positive effect of trade on growth is a robust result for these transition economies. Domestic investment appears to be an important determinant of growth. However, in the presence of trade in the growth equation, FDI does not have any significant effect on growth. The estimation of the growth equation without trade renders FDI highly significant suggesting collinearity between trade and FDI. Furthermore, interaction between trade and FDI seems to be important for growth in transition economies. Among other findings, macroeconomic stability as reflected in the rate of inflation and fiscal balance plays significant role.

One important shortcoming in this version of the paper is that it has not addressed the problem of endogeneity. It has been suggested in the literature (for example, Jensen 2002) that growth significantly affects FDI flows into the transition economies. If that is the case, it will be worthwhile to estimate the growth equation with appropriate instruments. In the absence of suitable data for such an instrument(s), for now we leave it as a future exercise which will hopefully improve our result. Besides, the future research

agenda includes re-estimating the dynamic models using one of the alternatives suggested in the literature (e.g. Anderson and Hsiao 1981, or Arellano and Bond 1991).

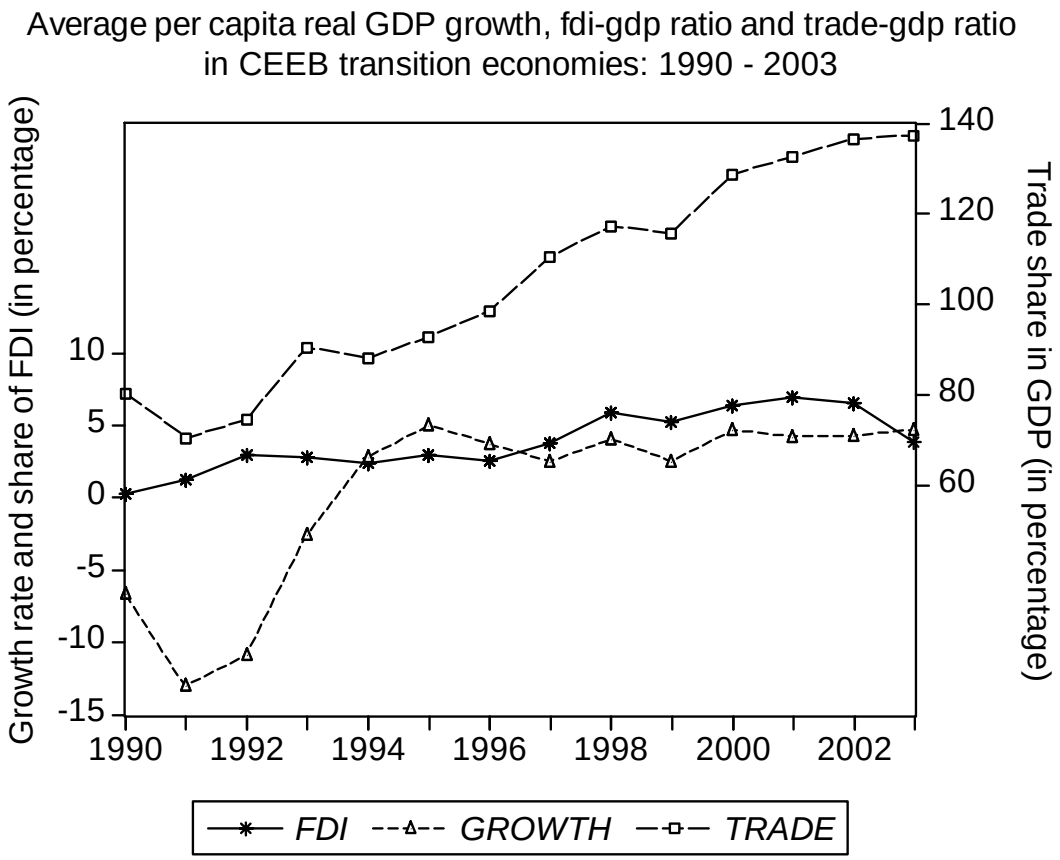
Average per capita real GDP growth, fdi-gdp ratio and trade-gdp ratio
in CEEB transition economies: 1990 - 2003
Growth rate and share of FDI (in percentage)
Trade share in GDP (in percentage)
10
5
0
-5
-10
-15
140
120
100
80
60
1990
1992
1994
1996
1998
2000
2002
FDI
GROWTH
TRADE

Figure 1

Table 1. Summary Statistics of the Variables: 1990-2003

		Per Capita GDP Growth Rate	GDI-GDP Ratio	FDI-GDP Ratio	Trade- GDP Ratio
		1	2	3	4
Albania	Mean	1.82	16.53	3.71	11.48
	Standard dev	12.95	7.68	3.36	6.75
	(Max , Min)	(13.51,-33.14)	(34.56,10.18)	(13.78,1.15)	(15.99,-7.37)
Bulgaria	Mean	-0.36	15.28	4.87	103.21
	Standard dev	6.24	3.87	4.17	27.11
	(Max , Min)	(6.03,-10.22)	(21.25,7.22)	(11.03,0.45)	(141.10, 70.60)
Croatia	Mean	0.53	16.23	4.06	107.59
	Standard dev	9.01	2.98	2.67	22.95
	(Max , Min)	(8.20,-23.01)	(21.55, 12.83)	(8.15,0.62)	(158.82,87.42)
Czech Republic	Mean	0.61	22.59	6.00	143.02
	Standard dev	4.32	3.36	4.37	48.94
	(Max , Min)	(5.77,-12.40)	(27.36,16.59)	(13.30,1.48)	(217.37,74.36)
Estonia	Mean	1.52	22.20	8.57	141.44
	Standard dev	8.95	5.27	3.03	49.64
	(Max , Min)	(10.55, -22.06)	(31.55, 10.00)	(13.37, 4.05)	(204.44,53.42)
Hungary	Mean	1.39	19.49	6.21	113.39
	Standard dev	4.83	3.17	3.02	47.01
	(Max , Min)	(5.50,-12.33)	(24.64, 11.82)	(12.04,0.86)	(181.71,55.95)
Latvia	Mean	-0.61	12.72	3.74	102.32
	Standard dev	14.15	5.87	1.59	14.20
	(Max , Min)	(9.17,-41.32)	(23.06,6.09)	(7.15, 1.51)	(117.65,66.80)
Lithuania	Mean	-0.34	23.41	3.98	127.42
	Standard dev	10.24	1.73	3.46	40.59
	(Max , Min)	(9.15,-22.99)	(27.59, 21.81)	(11.57, 0.52)	(172.91,43.28)
Macedonia, FYR	Mean	-1.33	14.96	2.94	79.15
	Standard dev	4.34	4.37	4.26	18.47
	(Max , Min)	(3.82,-8.27)	(18.87,2.19)	(14.20, 0.21)	(106.47,46.65)
Poland	Mean	1.91	22.58	3.35	83.77
	Standard dev	5.47	3.31	2.18	23.91
	(Max , Min)	(6.56,-12.63)	(27.29,17.94)	(7.84, 0.14)	(114.09,48.17)
Romania	Mean	-0.30	20.71	2.51	61.90
	Standard dev	6.44	2.28	1.98	21.46
	(Max , Min)	(7.37,-13.64)	(23.82,15.39)	(6.76, 0.15)	(102.90, 36.92)
Slovak Republic	Mean	1.11	22.62	3.76	127.79
	Standard dev	6.14	5.83	4.35	33.94
	(Max , Min)	(5.76, -16.16)	(29.68, 8.89)	(14.62, 0.89)	(185.21, 59.80)
Slovenia	Mean	1.81	22.94	1.80	147.56
	Standard dev	4.62	5.15	2.51	16.04
	(Max , Min)	(5.87, -10.04)	(30.95, 16.00)	(9.58, 0.60)	(169.29, 118.95)
Full sample	Mean	0.59	19.59	4.20	102.12
	Standard dev	7.77	5.81	3.47	46.68
	(Max , Min)	(13.51,-41.32)	(34.56, 2.19)	(14.62, 0.14)	(217.37, -7.37)

Table 2: F-test results for exclusion of control variables

Category of variables	Variable	F-statistics	Degrees of freedom	p-value
	1	2	3	4
Macroeconomic variables	Inflation	27.71	(1,105)	0.00
	Fiscal Balance	26.08	(1,105)	0.00
	Size of the Government	4.44	(1,105)	0.04
	Exchange Rate	0.12	(1,105)	0.73
	All macro variables	14.20	(4,105)	0.00
Structural variables	Tariff revenue as % share of imports	0.72	(1,105)	0.40
	Private sector share in GDP	0.03	(1,105)	0.87
	All structural variables	0.36	(2,105)	0.70

Table 3. *LM* Tests for groupwise heteroscedasticity and cross-sectional correlation

Null Hypothesis	Estimated test statistic	Degrees of freedom	5 % Critical Value
There is no cross-sectional heteroscedasticity	56.86	12	21.03
There is no cross-sectional correlation	57.70	78	99.62

Note: The first test result is based on the variance-covariance matrix of the estimated residuals obtained from the pooled LS estimation. The second test result is based on the correlation matrix of the estimated residuals obtained from a feasible GLS estimation that uses estimated cross-section variances as weights for various observations.

Table 4. Trade, FDI and per capita GDP growth: fixed effects panel estimates for 13 CEEB transition economies. Sample period: 1990-2003

Dependent variable: Growth rate of per capita real GDP

Independent variables	PLS	GLS	SUR	PLS	GLS	SUR
Lagged per capita real GDP growth rate				0.228**	0.255***	0.202***
				(0.087)	(0.053)	(0.024)
Gross Domestic Investment-to –GDP Ratio (G*DI*)	0.166	0.192**	0.209***	0.072	0.065	0.091***
	(0.119)	(0.079)	(0.035)	(0.115)	(0.083)	(0.032)
FDI-to-GDP Ratio (*FDI*)	0.089	0.037	0.140***	0.053	-0.062	0.055
	(0.218)	(0.135)	(0.050)	(0.195)	(0.133)	(0.042)
(Exports+Imports)-to-GDP Ratio (*TRADE*)	0.067**	0.067***	0.068***	0.039	0.046***	0.041***
	(0.026)	(0.017)	(0.008)	(0.024)	(0.016)	(0.004)
Inflation (*INF*)	-0.012***	-0.011***	-0.012***	-0.007***	-0.007***	-0.007***
	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)	(0.000)
Fiscal Balance (*FBAL*)	0.719***	0.749***	0.763***	0.563***	0.573***	0.590***
	(0.161)	(0.118)	(0.055)	(0.183)	(0.127)	(0.050)
Size of the government (*GOV*)	0.180***	0.182	0.169***	0.153**	0.266**	0.188***
	(0.060)	(0.122)	(0.054)	(0.062)	(0.130)	(0.045)
R^2	0.505	0.501	0.503	0.553	0.540	0.551
Adjusted R^2	0.430	0.426	0.429	0.480	0.465	0.479
D-W Statistics	1.412**	1.391**	1.404**	1.885	1.932	1.855
No of observations	139	139	139	137	137	137

Note: The numbers in parentheses are the standard errors**.** For PLS regression we estimate White's heteroskedasticity-consistent standard errors.*** significant at 1 percent level; ** significant at 5 percent level; * significant at 10 percent level

Table 5. Trade, FDI and per capita GDP growth: fixed effects panel estimates for 13 CEEB transition economies. Sensitivity analysis results

Dependent variable: Growth rate of real GDP per capita

Independent variable	1	2	3	4	5	6
Lagged per capita real GDP growth rate				0.255*** (0.080)		0.228*** (0.086)
Gross Domestic Investment-to –GDP Ratio (G*DI*)	0.074 (0.091)		0.363*** (0.100)	0.166 (0.104)	0.353*** (0.090)	0.180* (0.100)
FDI-to-GDP Ratio (*FDI*)	-0.012 (0.144)		0.476*** (0.138)	0.257* (0.133)		
(Exports+Imports)-to-GDP Ratio (*TRADE*)	0.031** (0.015)	0.005 (0.038)				
*FDI*TRADE*					0.004*** (0.001)	0.002*** (0.001)
*PVT*GDI*		0.005*** (0.002)				
*PVT*FDI*		0.003 (0.003)				
Inflation (*INF*)	-0.008*** (0.002)	-0.008*** (0.002)	-0.011*** (0.004)	-0.006*** (0.002)	-0.011*** (0.004)	-0.006*** (0.002)
Fiscal Balance (*FBAL*)	0.884*** (0.173)	0.776*** (0.133)	0.795*** (0.171)	0.583*** (0.184)	0.727*** (0.150)	0.570*** (0.177)
Size of the government (*GOV*)	0.187*** (0.059)	0.166** (0.067)	0.134** (0.055)	0.125** (0.060)	0.150*** (0.054)	0.134** (0.059)
R^2	0.554	0.540	0.459	0.537	0.483	0.543
Adjusted R^2	0.460	0.461	0.383	0.466	0.411	0.474
D-W Statistics	2.298	1.588**	1.352**	1.92	1.358**	1.867
No of observations	104	124	139	137	139	137

Note: The numbers in parentheses are the White's heteroskedasticity-consistent standard errors.*** significant at 1 percent level; ** significant at 5 percent level; * significant at 10 percent level

Appendix Table

Table A.1 Sample periods for different data series by country

Series	Albania	Bulgaria	Croatia	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Macedonia FYR	Poland	Romania	Slovak Republic	Slovenia
Per capita real GDP	1989-2003	1989-2003	1990-2003	1989-2003	1990-2003	1989-2003	1990-2003	1990-2003	1990-2003	1989-2003	1989-2003	1989-2003	1990-2003
Gross fixed investment	1989-2002	1989-2003	1990-2003	1989-2003	1990-2002	1989-2002	1990-2002	1990-2002	1990-2002	1989-2002	1989-2002	1989-2003	1990-2003
Government consumption	1989-2002	1989-2003	1990-2003	1989-2003	1990-2002	1989-2002	1990-2002	1990-2002	1990-2002	1989-2002	1989-2002	1989-2003	1990-2003
Exports of goods and	1989-2002	1989-2003	1990-2003	1989-2003	1990-2002	1989-2002	1990-2002	1990-2002	1990-2002	1989-2002	1989-2002	1989-2003	1990-2003
Imports of goods and	1991-2002	1989-2003	1990-2003	1989-2003	1990-2002	1989-2002	1990-2002	1990-2002	1990-2002	1989-2002	1989-2002	1989-2003	1990-2003
FDI	1992-2003	1990-2003	1993-2003	1993-2003	1992-2003	1989-2003	1992-2003	1992-2003	1994-2003	1989-2003	1991-2003	1993-2003	1992-2003
CPI Inflation	1991-2003	1989-2003	1990-2003	1989-2003	1989-2003	1989-2003	1989-2003	1989-2003	1989-2003	1989-2003	1989-2003	1989-2003	1989-2003
Fiscal Balance	1990-2002	1989-2002	1992-2002	1990-2002	1993-2002	1991-2002	1994-2002	1993-2002	1991-2002	1989-2002	1992-2002	1992-2002	1991-2002
Share of private sector	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001	1991-2001
Tariff	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001	1993-2001

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