OUT OF CAVEATS:
THE IMPACT OF FOREIGN DIRECT INVESTMENT ON GROWTH IN TRANSITION ECONOMIES

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Abstract: Although the theoretical literature has identified a large number of sizeable benefits from foreign direct investment (FDI), the empirical literature has failed to establish a significant unconditional positive impact of FDI inflows on economic growth. One reason for this inconsistency is that theory tends to equate FDI to technology transferred, while in most countries and regions of the world FDI encompasses an array of arrangements that goes well beyond pure technology transfer. This paper tests for these effects in a set of countries in which FDI is purer technology transfer: the 25 Central and Eastern European and former Soviet Union "transition" countries between 1990 and 1998. Our main finding is that, in this appropriate setting, FDI has an impact on economic growth that is positive, statistically significant, direct, unconditional, and robust.

Keywords: FDI, Economic Growth.
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1. INTRODUCTION

Although the positive impact of foreign direct investment (FDI) on economic growth seem to have acquired status of stylised fact in the international economics literature, a closer examination of the attendant empirical evidence disappoints all but the most fervent believer. Despite the numerous alleged benefits of FDI to the host economy, the empirical evidence has failed to establish a significant unconditional positive impact of FDI inflows on economic growth.[1]

The empirical support we believe necessary is cross-country evidence spanning meaningful periods of time. It should be such that the impact of FDI on economic growth is positive, statistically significant, robust, direct, unconditional and free of endogeneity concerns. This type of empirical support is not available.

Borenzstein, De Gregorio and Lee (1998) find that a positive impact of FDI on growth obtains 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." Focusing solely on OECD countries, de Mello (1999) finds that FDI is growth-enhancing only for countries in which domestic and foreign capital are complements. Lipsey (2000) reports that there is little evidence on the impact of FDI inflows on domestic capital formation. Blomstron, Lipsey and Zejan (1994) find that FDI has a positive impact on growth mostly in what these authors define as "low-quality data" countries. And Saltz (1992) even finds that FDI has a negative impact on growth. As de Melo puts it: "whether FDI can be deemed to be a catalyst for output growth, capital accumulation, and technological progress seems to be a less controversial hypothesis in theory than in practice" (1999, p. 148).

[1] For surveys of this literature, see Blomstron (1992), de Mello (1997), Lall (2000) and Hanson (2001).

We believe that one possible reason for this inconsistency between economic theory and econometric evidence is that the former tends to equate FDI to technology transferred, while in most countries and regions of the world FDI encompasses an array of arrangements that goes well beyond pure technology transfer. The transition economies may be the right context in this case. These economies started out (in 1989) really far away from the international technological frontier. Yet, differently from many developing countries, they started out with a complete industrial structure and a highly educated work force. Another advantages these economies enjoy are their proximity to richer European markets and the fact that most embarked in a comprehensive process of privatisation at the time when FDI was starting to peak in a world-wide scale. Hence transition economies have the "enabling environment" that lacks in many developing countries, but share their long distance away from the world technological frontier. It is this combination of potential gains and favourable conditions to realise these gains that makes the transition experience the perfect testing ground for the impacts of FDI on growth.

The objective of this paper is to assess empirically the impact of FDI on economic growth. This paper tests for the alleged positive impacts of FDI in a set of countries in which FDI is purer technology transfer: the 25 Central and Eastern European and former Soviet Union “transition” countries between 1990 and 1998. Our main finding is that, in this setting, FDI has an impact on economic growth that is positive, statistically significant, direct, unconditional, causal and robust.

This paper is organised as follows. The next section describes the various transmission mechanisms of FDI that have been identified by recent theories of economic growth. Section III presents the panel data set we assemble for this paper and uses it to discuss the observable main trends. Section IV presents our econometric results. The first set of results substantiates the claim that in our sample and time frame FDI is not

endogenous with respect economic growth, using the Granger causality framework and reporting Anderson-Hsiao estimates. This is a very important result because it dismisses concerns about potential endogeneity problems due to the fact that countries that grow faster attract more FDI. For our second set of results, we report fixed-effects panel estimates as well as fixed-effects instrumental variables panel estimates for four standard specifications from the literature. We estimate aggregate production functions derived from the augmented Solow model (Mankiw, Romer and Weil, 1992), from the model developed by Borensztein, de Gregorio and Lee (1998) and from Easterly (forthcoming). Our IV estimates provide for a crude but needed endogeneization of FDI. Our main results substantiate our claim that FDI has an impact on economic growth in transition economies that is positive, statistically significant, direct, unconditional, and robust. Section V concludes.

II. THEORETICAL CONSIDERATIONS

In the Solow-type standard neoclassical growth models, FDI is traditionally conceived as an addition to the capital stock of the host economy (e.g., Brems, 1970). In this view, there are no substantial differences between domestic and foreign capital. More importantly, the impact of FDI on growth is similar to that of domestic capital. With diminishing returns to capital, FDI has no permanent impact on the growth rate. FDI will have, however, a short-run impact on growth, which depends on the transitional dynamics to the steady-state growth path.[2]

In endogenous growth models, the potential role of FDI is much less limited. There are a number of conceivable channels through which FDI permanently affects the growth

[2] For surveys of the literature on economic growth, see Barro and Sala-i-Martin (1995) and Aghion and Howitt (1998). For surveys of the methodology and empirical evidence, see Temple (1999) and Durlauf and Quah (1999). For a survey of the literature on growth in transition, see Campos and Coricelli (2000).

rate. A convenient way to think about these effects is by separating out how FDI affects each argument in the production function. FDI can affect output by increasing the stock of capital. However this impact is likely to be small under the assumption of perfect substitutability. Although the empirical evidence on this matter is ambiguous (Hanson, 2001), if foreign and domestic capital are complements the final impact of FDI on aggregate output will be larger as a result of these externalities.

One can also think about the impact of FDI on labour. Once again, the expected impact is small and in this case it will be in terms of job creation. Yet, the role of FDI as knowledge and technology transfer becomes even more apparent as FDI has clearly a more import role in the augmentation of human capital than on the numbers employed. Consider the case in which foreign investment is carried out in activities in which the host economy has limited previous experience. In this case FDI will entail importantknowledge transfers in terms of training of the labour force, skills acquisition, new management practices and organisational arrangements.

The last and arguably the most important venue through which FDI affect economic growth is through technology. FDI inflows directly raise the levels of technology in the host economy. That can be for a variety of mechanisms. One plausible mechanism is that FDI inflows increase the variety of intermediate products and types of capital equipment in the host economy (Borensztein et al., 1998). In so doing, FDI inflows lead to an increase of the productivity in the host economy. Another important mechanism through which FDI affects growth is learning. FDI inflows diffuse knowledge about production methods, product design and new organisational and managerial techniques. In this light, imitation becomes a crucial element. Another important mechanism is that FDI raises the productivity of domestic Research and Development activities.

In what follows, we re-estimate four different specifications for the aggregate production function. Criteria for selection was basically how standard are these formulations in the growth as well as in the FDI literatures. We estimate aggregate production functions derived from the augmented Solow model (Mankiw, Romer and Weil, 1992), from the model developed by Borensztein, de Gregorio and Lee (1998) and from Easterly (forthcoming). Let us comment on each of these in turn.

The augmented Solow specification from Mankiw et al. (1992) will have the following form

$$y = f\ (\ y0\ ,\ inv\ ,\ pop\ ,\ \ hk,\ fdi) \qquad \text{(MRW eq.)}$$

where y is real GDP growth, y0 is initial income, inv is investment, pop is population growth, hk is human capital and fdi is foreign direct investment. The model predicts that the impact of initial income and of population growth is negative, while that of investment, human capital and FDI is positive.

The model developed by Borensztein, de Gregorio and Lee (1998) yields the following

$$y = f\ (\ y0\ ,\ hk,\ fdi,\ infl,\ govc,\ war,\ buroqual) \qquad \text{(BGL1 eq.)}$$

where, for the variables not defined above, infl is the annual inflation rate, govc is government consumption as a percentage of GDP, war is a dummy variable for war and buroqual is an institutional variable capturing the quality of the bureaucracy. The model predicts that the impact of initial income, of inflation, of government consumption and of war is negative, while that of human capital, FDI and the institutions is positive. We also estimate the following variant of the Borensztein, de Gregorio and Lee (1998) model:

$$y = f\ (\ y0\ ,\ hk,\ fdi,\ infl,\ govc,\ war,\ buroqual,\ inv) \qquad \text{(BGL2 eq.)}$$

where investment is added. This second formulation allows Borensztein et al. to study the relationship between foreign and domestic investment.

The fourth econometric model we use in this paper differs from the previous three in that it is not the result of an explicit theoretical framework. Instead, it originates from a search for a specification able to highlight the main determinants of cross-country growth. The model postulated by Easterly (forthcoming) is as follows

$$y = f\ (\ y0\ ,\ hk,\ fdi,\ infl,\ phone,\ oecdgrowth) \qquad \text{(GDN eq.)}$$

where, for the variables not defined above, phone is a proxy for the quality of the infrastructure in the host economy and oecdgrowth is a proxy for international trade activity. The predictions are that the impact of initial income and of inflation is negative, while that of human capital, FDI and infrastructure and OECD growth is positive.

III. FDI AND GROWTH IN TRANSITION: DATA SET AND BASIC TRENDS

The data set we assemble for this paper contains yearly observations for 25 transition economies in Central Europe and in the former Soviet Union and covers the period from 1990 to 1998. It is a rather unique data set that is able to extend existing work in terms of both country and time coverage. We collected data on annual per capita GDP growth rates, initial GNP per capita (in PPP US$), basic education gross enrolment, general secondary gross enrolment, government consumption as a percentage of GDP, Foreign Direct Investment, Gross domestic fixed investment as a percentage of GDP, population growth, government expenditures as a percentage of GDP, and on the stock of FDI. The tables in the Appendix lists all the variables in our data set and provide basic statistics.

There are three remarks we should make examining simple pair-wise correlations. First, across the spectrum of standard determinants, the two highest correlation coefficients involving economic growth are with FDI and with the lagged FDI stock. Second, FDI and lagged FDI stocks are highly correlated (indeed, the highest coefficient in the matrix). This results partly by construction: in order to compute the existing stocks

of FDI, we cumulated past inflows. Although this is clearly an imperfect way to deal with the issue, it is common practice in the literature and maybe the only way to tackle it given the paucity of data. Finally, it is worthy noting that the highest correlation coefficient involving FDI is with basic education.

There are a number of important aspects of the growth performance of the former communist economies of Central and Eastern Europe that should be mentioned. Figure 1 shows annual GDP growth rates. First, notice that there has been a massive output fall. Second, so far only three countries have surpassed the 1989 level of per capita GDP. Third, the countries of Eastern Europe experienced output declines that turned out to be much smaller than the ones observed, at a later date, among the CIS economies. And finally, there seems to be a "Baltic puzzle": although Estonia, Latvia and Lithuania all had output contractions comparable to other CIS countries, their recovery was much faster.

Although the decline in GDP at the start of transition was common, the intensity of recessions, both in terms of the extensiveness of output decline, duration of the decline, and strength of the recovery, differed substantially among countries. For example, in its lowest point the GDP index of Vysegrad group recorded 85 per cent of 1990 GDP level, and the corresponding value of the electricity consumption index was 90 per cent. Electricity consumption is one accepted way of gauging the level of underground or informal activity in transition economies. In contrast, the trough values of GDP and electricity consumption indexes for the Central Asian transition countries were only 46 and 62 per cent, respectively. The economic performance of the other three regions fell in-between the two extremes. The corresponding figures for the Balkan, Baltic and BUR (Belarus, Ukraine and Russia) countries were 72 and 73, 57 and 58, 56 and 66 per cent, respectively. The duration of the decline and the strength of recovery have also varied considerably. The Vysegrad and Balkan countries re-started growth as early as 1993, the

Baltics as early as 1995, while only later did the Central Asian and BUR countries. Although it is too early to consider the extent and speed of recovery in the latter two groups, the experience of the former three provide two more observations. First, because of the milder initial output decline and longer growth period as well as because of higher average growth rates only Vysegrad group has managed to surpass the pre-transition level of aggregate output by now. In this respect, the Balkan and Baltic groups have performed much worse, as their GDP index in 1997 stood at only 71 and 65 per cent of 1990 level, respectively. Second, it is not only that the performance of transition countries in the recovery part of the cycle has not been strong, the Balkan region experienced a recovery reversal in 1997. This resulted in a 4 percentage points decline in GDP index in 1997 and brought the output of the region to all times low as compared to the pre-transition level.

Let us turn to the performance of foreign direct investment in these economies. We look at four different aspects of FDI performance: cumulative net FDI inflows per capita, annual net FDI inflows per capita, FDI as a share of GDP and FDI relative to GDI. There is one feature about the pattern of FDI activity in transition, which is revealed by all four FDI measures. Since the start of transition, FDI flows have been constantly rising but their magnitude and importance remain highly unequal among the country subgroups. And in most cases, the pattern of dispersion is highly persistent in time. For example, in terms of cumulative per capita net FDI inflows transition economies naturally fell into three groups, and the relative position of these groups had no tendency to change during the period of analysis. The Vysegrad countries (Hungary, Poland, Czech Republic, Slovenia and Slovakia) have maintained a clearly leading position, with cumulative FDI inflow per capita reaching $700 by 1997. The Balkan, BUR, and Central Asian countries remained far behind as the amount of cumulative per capita FDI was just $100 or less, while $500 stock of per capita FDI in the Baltic countries placed these in between.

The same differentiation among country groups is reflected in the figures of annual per capita FDI inflows. Although these series have been more volatile, the relative position of countries with respect to new FDI inflows remains by and large the same. In 1997, average per capita FDI inflows were $120 and $160 for Vysegrad and the Baltic countries respectively, while the other countries received less that $40, and a gap of similar magnitude has prevailed since 1994.

The measure of net FDI inflows relative to countries' GDP has been somewhat more dynamic since 1994 and hints that FDI is rapidly gaining importance not only in the Baltic countries but also in some Central Asian countries. For this latter group, the average rate of foreign direct investment went up from mere 0.5 in 1994 to almost 5 per cent of GDP in 1997. As a result, the group ranked second after the Baltics (6%) and left behind even Vysegrad and Balkan countries (almost 3%). However, if GDP is measured in PPP terms, net FDI inflows to Asia become the lowest among transition countries, only 0.5 percent. Balkan and BUR stand close (1%) and the Baltics lead the sample with the FDI inflow rate close to 4 per cent of GDP-PPP.

One can conceive that in transition countries the FDI-to-domestic investment could be used to assess the contribution of foreign capital to restructuring. This indicator provides a very similar picture to that implied by the FDI-GDP ratios. The share of FDI in domestic investment has been rising in all the countries but the Vysegrad group, where the share has a relatively flat trend. But in terms of FDI/GDI the levels achieved so far show a very dispersed pattern. In 1997, the ratio ranged from 25 per cent in the Asian and Baltic cpountries, 18 per cent in the Balkans to 10 per cent in Vysegrad and 5 per cent in the BUR countries. Perhaps not surprisingly, BUR and Vysegrad countries were also the ones to have smallest gaps between their saving and investment rates, 0 and 2 percentage points respectively. In contrast, the gaps were 14, 11, and 8 percentage points in Asia, Balkan,

and the Batic countries respectively. These significant gaps imply that the latter countries must use some external sources to finance investment. FDI is clearly one of such sources.

To summarise, the inflow of FDI to the region has been rising constantly as reflected by both relative and absolute FDI measures but the distribution of these flows is highly uneven and remains such, again, as implied by all these measures. Looking at individual countries, one finds that the largest recipients of FDI by far are, in descending order, Hungary and Poland, then Czech Republic and Russia. We interpret this ranking as an indication of the highly complex set of determinants of FDI in transition. For instance, we hypothesise that FDI is attracted to Hungary and Poland by the type of economic policies that have been pursued in these countries after 1989 (policies to attract FDI directly as well as other general economic policies). On the other hand, we expect that FDI is attracted to say the Czech Republic by the generally favourable initial conditions (for instance, higher level of technical sophistication in industry). Finally, the reasons for FDI flowing to Russia have to do with the abundance of natural resources (oil and gas) in that country. This constellation of reasons for FDI in transition is to be kept in mind.

IV. ECONOMETRIC RESULTS

The objective of this section is to report and discuss our two main sets of econometric results for this paper. The first set of results substantiates the claim that in our sample and time frame FDI is not endogenous with respect to economic growth, using the Granger causality framework and reporting Anderson-Hsiao estimates. The second set of results refers to the impact of FDI on economic growth in transition economies, using panel data estimates.

One major concern in studying the impact of FDI on economic growth is that of reverse causality. It is almost natural to suspect that countries that grow faster attract more

FDI. If foreign investors believe that the (potential) host country's high growth rate is sustainable, this expectation should serve as an additional reason to invest in that particular country or market. This possibility has been openly recognised in many empirical studies but seldom dealt with in full. The common remedy one finds is to instrument FDI on growth regression, but the issue of the quality of instruments is a very difficult one to solve in this context. Thus we decide that to test directly for reverse causation would be the most appropriate way. We selected the Granger-causality framework to investigate this possibility.

The Granger-causality framework has endured the test of time because of its elegance and strong intuitive appeal: the notion that an event in the future cannot cause one in the past.[3] Consider two time series, x_t and y_t. Series x_t is said to Granger-cause series y_t if, in a regression of y_t on lagged y's and lagged x's, the coefficients of the lagged x's are jointly significantly different from zero.

There are two critical issues that have to be addressed in conducting Granger causality tests. The first concerns the length and frequency of the time lags. On their length, Granger admonishes that "using data measured over intervals much wider than actual causal lags can also destroy causal interpretation" (Granger, 1987, 49). We use one-year periods. As for their frequency, there are a number of tests to determine the "optimal number of lags," but because ours is a short panel we used a grid procedure to evaluate the robustness of the results presented below.

The second issue to be dealt with lies in the information set. The Granger test depends on the assumption that the cause contains unique information about the effect, in the sense that it is exhaustive and not available elsewhere. If the information set

[3] Granger remarks that "causation is a non-symmetric relationship, and there are various ways in which asymmetry can be introduced, the most important of which are controllability, a relevant

underlying the test is composed solely of two series, both of which may be affected by a third variable, the test can be rendered useless.[4] In what follows, we present Granger causality results that are unaffected after enlarged by variables that could potentially play this disruptive role. We also present results that explicitly take into account the size of the market by studying the relationship between FDI *per capita* and economic growth.

Finally, we must attend to the econometric issue that arises from the inclusion on the right-hand side of the (lagged) dependent variable, referred to in the econometric literature as the dynamic panel problem: unless the time dimension of the panel is very large, parameter estimates will be inconsistent and biased.[5] When there is a country-specific effect that is time invariant and unobservable, then the lagged dependent variable will be correlated with the error term and OLS will lead to asymptotically biased estimates. While the best solution to this problem is still an object of debate in the econometrics literature,[6] in one of the few studies focusing on "short and wide" panels (like ours), Kiviet finds that the instrumental variable approach pioneered by Anderson and Hsiao (1982) performs as well as any other alternative. On this basis, we use this method which requires first-differencing all variables and using second lag differences as instruments.

Table 1 presents these Granger causality results using the Anderson-Hsiao estimator. The results show that lagged FDI is a weak predictor of current FDI levels, and that lagged *per capita* FDI is a bad predictor of current levels of *per capita* FDI. The table also shows results strongly suggesting that growth does not Granger-cause FDI or *per*

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theory, outside knowledge, and temporal priority" (1987, 49.) For discussion see, e.g., Hsiao (1979), and Zellner (1989).

[4] See Harvey for a discussion of this issue (1990).

[5] For discussion see, e.g., Hsiao (1986), Sevestre and Trognon (1992), and Baltagi (1995).

[6] See, among others, Holtz-Eakin et al. (1988), Arellano and Bond (1991), Kiviet (1995), and Judson and Owen (1999).

capita FDI in transition economies between 1990 and 1998. This is a very important result. It is also unfortunately rare in the literature.

In sum, so far we have provided evidence that for our sample of countries and period of analysis the concern about FDI being attracted to countries with higher growth rates is unfounded. This possibility of reverse causality does not find support in our data set. Thus, we can be comfortable in treating FDI as an independent variable in the results that follow.

Let us turn to our second set of results. In table 2 we report fixed-effects panel data estimates. The column labelled "MRW" in Table 2 contains an Augmented Solow specification derived from Mankiw, Romer and Weil (1992). The first important thing to notice is that the coefficient on FDI carries the positive sign we expect and is statistically significant at the 1% level. Second, it noteworthy that the specification behaves satisfactorily (maybe surprisingly) well for the transition economies. The coefficient on initial income carries the predicted negative sign and is statistically significant. The coefficient on domestic investment carries the predicted positive sign and is statistically significant. One unexpected result is that the coefficient on human capital turns out to be negative and is statistically significant.

The second column of Table 2 contains the specification proposed by Easterly (forthcoming).[7] Once again, the coefficient on FDI carries the positive sign we expect and is statistically significant (at the 5% level). Also note that the specifications seems to perform reasonably well for our data set, with the repeated exception of the human capital variable. Notice that the coefficients on initial income, inflation rate and OECD growth all are statistically significant and carry the predicted signs.

[7] The Easterly specification also contains two variables for which we were unable to obtain data. One is the black market premium for the exchange rate and the other is the real exchange rate.

The third column of Table 2 is labelled "BGL1" because it contains the first specification proposed by Borensztein, De Gregorio and Lee (1998).[8] The first important thing to notice is that the coefficient on FDI carries the positive sign we expect and is statistically significant at the 5% level. Second, it is noteworthy that the specification behaves satisfactorily (maybe surprisingly) well for the transition economies. The coefficient on initial income carries the predicted negative sign and is statistically significant. And so do the coefficients on war and inflation. The coefficient on the quality of the bureaucracy carries the predicted positive sign and is statistically significant. One unexpected result is that the coefficient on government consumption turns out to be positive and is statistically significant.

In the original paper (Borenszten et al. 1998), the coefficient on GFDI is not statistically significant. The authors propose to include an interaction terms between human capital and FDI to evaluate whether this inclusion would yield more satisfactory results in the case of the coefficient on FDI. It does. It is only after the inclusion of this interaction term that FDI becomes statistically significant (and positive). This lead the authors to argue that FDI is able to generate a detectable beneficial impact on economic growth only for those countries in which the existing stock of human capital has reached a certain minimum threshold level. This is a fulcral caveat of this literature. Using the data for transition economies, it is clear from the discussion above that the addition of this interaction term is not needed. However, we find that if we introduce it, not only the

[8] This specification contains one additional variables for which we were unable to obtain data: the black market premium for the exchange rate. Originally the specification also contained dummy variables for countries in Latin America and in Sub-Saharan Africa. It also contained variables reflecting the number of assassinations per capita, the extent of political freedoms and the occurrence of civil wars. To substitute for these, we use a dummy variable for internal and external armed conflict. Finally, the original specification contained a variable for the quality of institutions, here substituted for a measure of the quality of the bureaucracy.

interaction term turns out not to be statistically significant but also, and more serious, the coefficient on FDI loses statistical significance.

Finally, the fourth column of Table 2 is labelled "BGL2" because it contains the second specification proposed by Borensztein, De Gregorio and Lee (1998). It differs from BGL1 because it incorporates domestic investment. The first important thing to notice is that the coefficient on FDI carries the positive sign we expect and is statistically significant at the 1% level. Second, it is noteworthy that the specification behaves satisfactorily (maybe surprisingly) well for the transition economies. The coefficient on initial income carries the predicted negative sign and is statistically significant. And so do the coefficients on war and inflation. The coefficient on the quality of the bureaucracy carries the predicted positive sign and is statistically significant. One unexpected result is that the coefficient on government consumption turns out to be positive and is statistically significant.

In summary, so far we have established two important findings. The first is that there seems to be little ground for concern regarding the possibility that countries that grow faster receive more FDI. The second is that we have found an impact of FDI on economic growth that is positive, statistically significant, unconditional and robust across the various standard specifications we studied.

One important aspect here is that although there is little ground for concern about reverse causality, one would like to be assured that these nice results hold if we are able to differentiate between the different reasons for attracting FDI in the first place. For instance, we know that natural resource abundance is an important determinant of FDI inflows into many former Soviet Union countries. We also know there is strong evidence that highly skilled (educated) labour is a very important reason that attracts FDI inflows into the Central European countries (see Kinoshita and Campos, 2001). It would be re-

assuring to know that despite these differences the impacts of FDI are still strong and easily detectable. In order to investigate this issue, we present fixed-effects instrumental variables panel data estimates in table 3. Following Kinoshita and Campos (2001), we use as instruments for FDI the following variables: lagged stock of FDI (agglomerations), quality of the bureaucracy, telephone lines, cumulative liberalisation index, and OECD growth. Let us turn to the results.

The column labelled "MRW" in Table 3 contains an Augmented Solow specification derived from Mankiw, Romer and Weil (1992). The first important thing to notice is that the coefficient on (predicted) FDI carries the positive sign we expect and is statistically significant at the 1% level. Second, it noteworthy that the specification behaves satisfactorily (maybe surprisingly) well for the transition economies. The coefficient on initial income carries the predicted negative sign and is statistically significant. The coefficient on domestic investment carries the predicted positive sign and is statistically significant. One unexpected result is that the coefficient on human capital turns out to be negative and is statistically significant.

The second column of Table 3 contains the specification proposed by Easterly (forthcoming). Once again, the coefficient on FDI carries the positive sign we expect and is statistically significant (at the 5% level). Also note that the specifications seems to perform reasonably well for our data set, with the repeated exception of the human capital variable and now of the coefficient on the inflation rate that is not significant anymore. Notice that the coefficients on initial income and OECD growth all are statistically significant and carry the predicted signs.

The third column of Table 3 is labelled "BGL1" because it contains the first specification proposed by Borensztein, De Gregorio and Lee (1998). The first important remark is that the coefficient on FDI carries the positive sign we expect and is statistically

significant at the 10% level. Second, it is noteworthy that the specification behaves satisfactorily well for the transition economies. The coefficient on initial income carries the predicted negative sign and is statistically significant. And so do the coefficients on war and inflation. The coefficient on the quality of the bureaucracy carries the predicted positive sign and is statistically significant. Notice that the coefficient on government consumption is not statistically significant anymore.

Lastly, the fourth column of Table 3 contains the second specification proposed by Borensztein, De Gregorio and Lee (1998), the one that incorporates domestic investment. The first important thing to notice is that the coefficient on FDI carries the positive sign we expect and is statistically significant at the 5% level. Second, it is noteworthy that the specification behaves satisfactorily well for the transition economies. The coefficient on initial income carries the predicted negative sign and is statistically significant. And so do the coefficients on war and inflation. The coefficient on the quality of the bureaucracy carries the predicted positive sign and is statistically significant. Notice that the coefficient on human capital is still negative but at least not statistically significant anymore.

V. CONCLUSIONS

Although one would expect to find extensive solid evidence on the positive impact of FDI on economic growth, that does not seem to be the case. The available evidence is scant at best. The manner the literature has chosen to proceed so far is to attempt to determine the conditions under which the expected positive impact obtains. In doing so, a number of provisos or caveats have been proposed. One of them is that there is a minimum level of average years of schooling per worker necessary for FDI to show its true impact. Another well-known caveat regards trade regimes: the impact of FDI on growth is positive only in countries and periods in which an export promotion regime is in place (as opposed to an

import substitution regime). A third common caveat in this literature is that FDI has a positive impact on growth only in countries where domestic and foreign investments are complements.

The point of departure for this paper was to inquiry into the reasons for all these provisos and caveats. We put forward the notion that a reason for this inconsistency between economic theory and econometric evidence is that the former tends to equate FDI to technology transferred, while in most countries and regions of the world FDI encompasses an array of arrangements that goes well beyond pure technology transfer. We conjectured that the transition economies may be the right context in this case and carried out a detailed econometric analysis using a panel data set we constructed. Our results strongly suggest that this conjecture is correct. We provided evidence for an impact of FDI on economic growth that is positive, statistically significant, direct, unconditional, and robust. Further, our results show that FDI is a crucially important explanatory variable for growth in transition, maybe more important than education or liberalisation.

There are a number of suggestions for future research. One is that we should do more work in terms of "endogeneizing FDI." There are econometric issues in this regard that can be tackled better than we have done so far, but there are also important potential improvements in terms of measurement that should be pursued. For instance, better measurements for geographical distances (for example taking into account travel time and bureaucratic delays) and the abundance of natural resources would make for a more complete and potentially more interesting story about the determinants and impacts of FDI in transition.

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Figure 1. Real GDP index (1989=100)

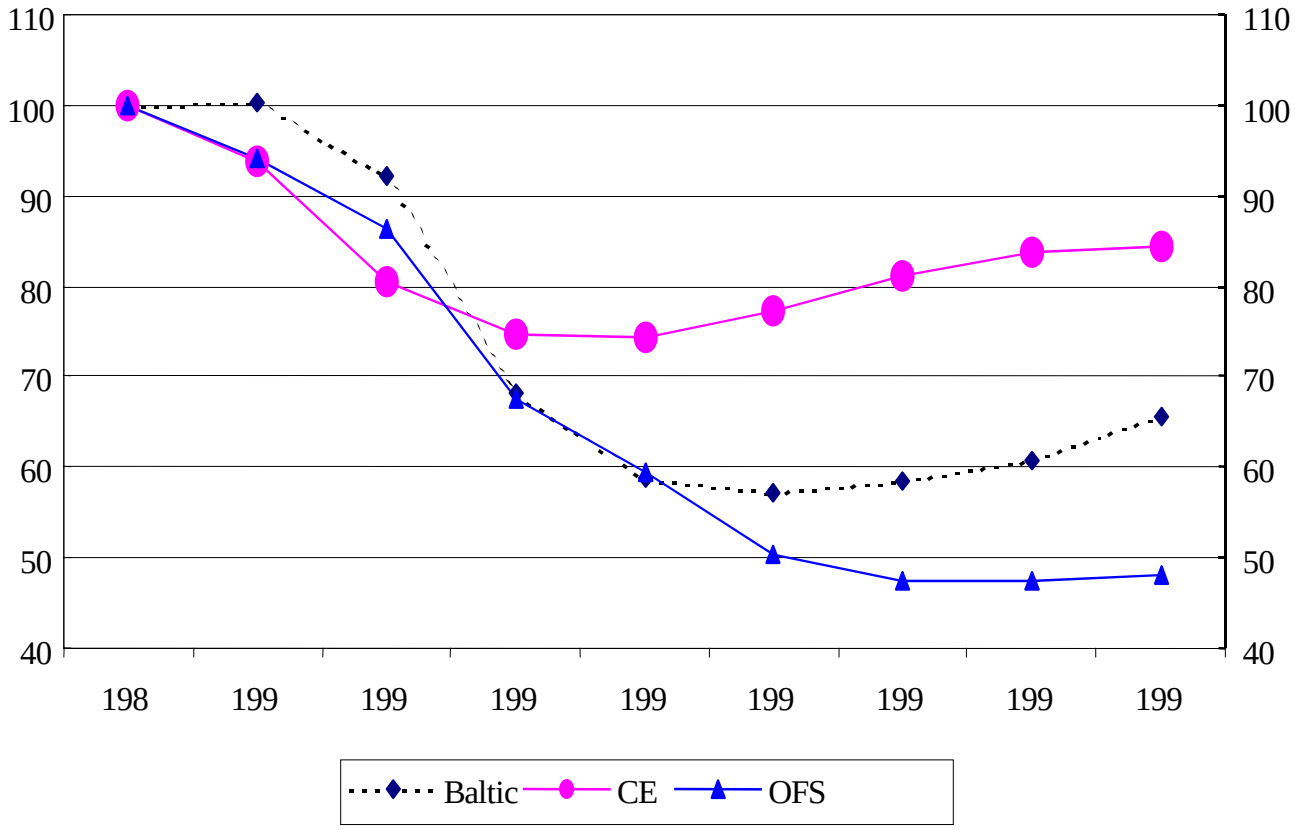

Table 1.
Do fast growing economies attract more FDI?
The Granger evidence for Transition Economies, 1990-1998

	Dependent variable			
	FDI inflows	FDI inflows	FDI inflows per capita	FDI inflows per capita
Lagged FDI inflows	.914*	.725		.135
	(.553)	(.489)		.284
Lagged FDI inflows per capita			.229	
			(.299)	
Lagged real per capita growth		3.74		.299
		(7.14)		(.495)
Adjusted R-squared	.187	.192	.186	.161
No. observations	144	138	144	138

Note: Anderson-Hsiao IV estimates are reported with standard errors in parenthesis.
* denotes statistically significant at the 10 percent level,
** denotes statistically significant at the 5 percent level, and
*** denotes statistically significant at the 1 percent level.

Table 2.
The Impact of FDI on Growth in Transition Economies, 1990-1998
Fixed-Effects Panel Data Estimates

	MRW	WB-GDN	BGL1	BGL2
Constant	195.23***	119.5***	55.36***	105.08***
	(37.26)	(29.9)	(32.32)	(34.96)
Initial income	-12.38***	-8.16***	-6.75***	-8.54***
	(2.317)	(2.135)	(2.045)	(2.065)
Population growth	.0909			
	(1.361)			
Investment	.816***			.5248***
	(.181)			(.161)
Human capital	-1.379***	-.771**	-.329	-.807**
	(.3767)	(.307)	(.317)	(.3413)
Foreign direct investment	.0048***	.004**	.006**	.0027***
	(.001)	(.002)	(.001)	(.0009)
Inflation rate		-.001**	-.001*	-.0008*
		(.0005)	(.0005)	(.0005)
Telephone lines		-.00001		
		(.001)		
Average growth in OECD		4.727***		
		(.8498)		
Government consumption			.494**	.382
			(.249)	(.245)
Dummy for war			-23.667***	-21.52***
			(3.782)	(3.74)
Quality of the bureaucracy			4.834***	4.117***
			(1.427)	(1.43)
R-squared	0.275	0.351	0.432	0.469
No. observations	173	182	174	173

Notes: Dependent variable is real GDP growth. Specifications are as follows: MRW is from Mankiw, Romer and Weil (1991), WB-GDN is from Easterly (forthcoming), BGL1 and BGL2 are from Borenstein, de Gregorio and Lee (1998).
* denotes statistically significant at the 10 percent level,
** denotes statistically significant at the 5 percent level, and
*** denotes statistically significant at the 1 percent level.

Table 3.
The Impact of FDI on Growth in Transition Economies, 1990-1998
Fixed-Effects Panel Data Instrumental Variables Estimates

	MRW	WB-GDN	BGL1	BGL2
Constant	153.04***	336.72**	31.768	71.21*
	(41.21)	(147.63)	(36.215)	(36.96)
Initial income	-10.132***	-15.63**	-5.064**	-7.35***
	(2.556)	(7.286)	(2.191)	(2.225)
Population growth	.345			
	(1.367)			
Investment	.803***			.6156***
	(.211)			(.182)
Human capital	-1.09***	-1.893*	-.164	-.519
	(.3958)	(1.028)	(.3475)	(.352)
Foreign direct investment	.0049***	.0442**	.0024 *	.003**
	(.0013)	(.0213)	(.0013)	(.002)
Inflation rate		-.0006	-.0008*	-.0007*
		(.0012)	(.0005)	(.0004)
Telephone lines		-0.0001		
		(0.001)		
Average growth in OECD		4.517**		
		(2.099)		
Government consumption			.1735	.1621
			(.2836)	(.275)
Dummy for war			-25.32***	-24.715***
			(4.982)	(4.84)
Quality of the bureaucracy			5.549***	4.47***
			(1.687)	(1.66)
No. observations	156	164	157	156
R-squared	0.194	0.196	0.381	0.427

Notes: Dependent variable is real GDP growth. Specifications are as follows: MRW is from Mankiw, Romer and Weil (1991), WB-GDN is from Easterly (forthcoming), BGL1 and BGL2 are from Borensztein, de Gregorio and Lee (1998). Instruments for FDI are: lagged stock of FDI (agglomerations), quality of the bureaucracy, telephone lines, cumulative liberalisation index, and OECD growth.
* denotes statistically significant at the 10 percent level,
** denotes statistically significant at the 5 percent level, and
*** denotes statistically significant at the 1 percent level.

Appendix 1.
Definitions of variables

FDI stock	Cumulative FDI stock in constant million USD [source: World Development Indicators]
Lagged FDI stock	One-year lagged cumulative FDI stock
ypc	GDP per capita (USD)
wagen	Gross nominal wage (USD) [source: UNECE 'Economic Survey of Europe']
ss3	General secondary school enrollment (%) [source: TransMONEEE]
natres	Natural resource endowment: =0 if poor, =1 if moderate, and =2 if rich.[source: DDGT]
dist	Distance from Dusseldorf (km)
tele2	Number of telephone mainlines
infav	Average annual inflation rate (%)
fbal	Fiscal balance, % of GDP
gov_c	Government consumption, % of GDP
clie	Cumulative external liberalization index, i.e. trade liberalization
rulelaw	Degree of law enforcement [source: Campos(2000)]
buroqual	Quality of bureaucracy [source: Campos(2000)]
good_ope	A share of imports plus exports to GDP [source: IMF Directions of Trade Statistics]

Appendix 2. Summary Statistics

	Obs	Mean	Std. Dev.	Min	Max
FDI stock	163	1343	3067	0	18495
Lagged FDI stock	169	1295	3022	0	18495
ypc	220	2134	1784	219	9850
wagen	151	167	217	0.02	1247
ss3	221	26	7.7	8.8	45.6
natres	225	0.52	0.75	0	2
dist	225	2237	1476	559	5180
tele2	219	2520528	4985387	0	2.89E+07
infav	225	434	1304	-0.8	15606
fbal	201	-5.53	7.94	-56	13
gov_c	209	17.58	5.03	5.86	29.43
clie	225	2.74	2.45	0	9.5
rulelaw	225	6	2.46	2	10
buroqual	225	2.45	1.63	0.83	8.33
good_ope	168	0.6	0.31	0.02	1.54