FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH IN TRANSITION ECONOMIES: A PANEL DATA STUDY

Introduction

Global flows of foreign direct investment (FDI) increased at an extraordinary rate during the 1990s. As United Nations Conference on Trade and Development (UNCTAD, 2004) reported, global inflows increased more than eight-fold from $ 159 billion in the year 1991 to peak at $ 1.39 trillion in 2000. Besides considering the determinants of flows into different countries, many studies have been conducted to judge the impact of FDI inflows, particularly in terms of the effect on economic growth. Relative to the FDI-growth research, we note four aspects that motivate our study. First, despite the fact that FDI inflows into Central and Eastern Europe (CEE) countries increased at a much faster rate than into other developing countries, and, as UNCTAD (2004) shows, there was a nearly 13-fold increase in the flows into the CEE countries from $ 2.6 billion in 1991 to $ 31.2 billion in 2002, there is very little research on the FDI-growth link in these "transition" economies. While Institute of International Finance (2005) recently claimed that "Stronger FDI inflows will help sustain growth in output and exports in much of central and eastern Europe this year", the FDI-growth nexus seems to have been assumed and not empirically supported. Almost the only systematic study of the FDI-growth linkage in transition economies is that by Lee and Tcha (2004)[1]. Although their research is good in several respects, it seems to have some limitations. For example, while the study had the unusual merit of using panel data, it followed the almost universal practice of not permitting any cross-country parametric variation because "most economies demonstrated similar patterns of FDI inflow and GDP increases" (2004, p.

[1] Even Blonigen and Wang (2004), who studied differential structures across countries, classified their sample into LDCs and DCs, and did not identify transition economies as a separate group.

223, footnote 19). However, as Svejnar (2002) noted, economic performance has "varied widely across the transition economies", and inferences based on identical-parameter models can be seriously problematic. Also, their research relies critically on capital-stock data that have well-known reliability problems for most non-OECD countries. Moreover, the authors (2004, pp. 223-224) seem to have misinterpreted the parameters for domestic and foreign capital as resembling marginal products. Second, despite the abundance of research on the topic, few studies are based on panel data which offer several advantages. Third, even in those rare cases, like that of Lee and Tcha (2004), where the researchers worked with cross-country panel data, little attempt has been made to soften the well-known stringencies of models that postulate identical parameters. Despite the cross-country heterogeneity that Brock and Durlauf (2001), Kenny and Williams (2001), and other scholars have emphasized, use of models that permit cross-country parametric variability is almost nonexistent not merely in the FDI-growth studies, but also in the massive literature on economic growth. Fourth, the overall position about the FDI-growth link appears uncertain. Theoretically, as Ram and Zhang (2002, p. 205) noted, FDI can (a) augment domestic savings and investment, (b) help transfer of new technology, (c) increase competition and efficiency in the host country's market, (d) increase exports and foreign exchange earnings, and (e) generate other positive spillovers. On the other hand, it may repatriate funds in substantial amounts and the net inflows may be small, transfer inappropriate technology, kill indigenous enterprise, target the host country's market and not exports, and cause distortions in the host country's policies and social and cultural norms. Lim's (2001) survey also notes a somewhat ambiguous position, and Razin (2002) similarly observed that "Both economic theory and recent empirical evidence suggest a beneficial impact of FDI on developing countries. But recent work also points to some sources of potential risks and excesses". Therefore, an additional study, especially one that focuses on an overlooked country-group, works with panel data, and permits parametric flexibility, has the potential to advance significantly the overall understanding about the FDI-growth linkage.

Based on the foregoing discussion, the present study seeks to advance research on the FDI-growth nexus along five dimensions. First, it focuses on transition economies which have been sparsely studied despite their intrinsic importance and the obvious structural differences from the developed countries (DCs) and the traditional group of less-developed countries (LDCs). Second, it works with a

sizable panel data, which very few scholars have used in the FDI-growth studies. Third, taking advantage of the panel observations, and recognizing the substantial cross-country heterogeneity that Brock and Durlauf (2001), Kenny and Williams (2001), and other scholars have noted, it permits a degree of parametric flexibility that, to our knowledge, almost no other cross-country study has done in the FDI-growth literature or even in the massive growth research at large. Fourth, we work with a fairly well-known model that obviates the need for data on domestic or foreign capital stock and whose parameters are easy to interpret. Fifth, we provide an extensive comparison of the patterns indicated by models with different degrees of parametric flexibility, including the almost universal identical-parameter format and the fixed-effects and random-effects procedures that have not been used in most of the FDI-growth studies, but have been employed in some other growth research.

Models, data, and the main results

We broadly follow Ram and Zhang (2002) in the specification of the model, which is an adaptation of the "neoclassical" growth accounting framework and is used fairly extensively in studies of economic growth. As noted by Ram and Zhang, the general form of the aggregate production function, that includes conventional labor input (L) and capital stock (K) along with FDI stock (F), may be written as

$$Y = f(L, K, F) \tag{1}$$

where Y is aggregate real output. Taking total derivatives, manipulating the expression, and adding a constant (a) and a stochastic term (u), the growth equation may be written as

$$GY_{it} = a + b_L(GL_{it}) + b_K(GK_{it}) + b_F(GF_{it}) + u_{it} \tag{2}$$

where GY_{it} denotes (annual) rate of increase of aggregate real output in country i and year t, GL similarly stands for rate of increase of the labor force, and GK and GF denote rates of increase of domestic and foreign capital stocks. Being rates of growth, GY, GL, GK and GF reflect first differences of logarithms of Y, L, K and F. The b's in this formulation are output elasticities with respect to L, K and F. Since data on domestic and foreign capital stocks are of uncertain quality for most non-OECD countries, as Ram and Zhang (2002) explained, equation (2) can be reformulated in terms of flows represented by ratios of domestic investment and FDI inflows to aggregate output (I/Y and FDI/Y), in which case

the corresponding parameters approximate the marginal products of domestic investment and FDI. Also, one could add an education term (ED) for which rationale has been provided by Romer-type endogenous growth models. The reformulated and expanded model may be written as

$$GY_{it} = a' + b'_{L}(GL_{it}) + a_{K}(I/Y)_{it} + a_{F}(FDI/Y)_{it} + a_{E}(ED_{it}) + u'_{it} \quad (3)$$

GY is proxied by annual rate of increase of real GDP (in local currency) in percentage points and is taken from World Bank (2004). GL is similarly the annual (percent) rate of increase of labor force and is also taken from the same source. I/Y and FDI/Y are gross capital formation and FDI inflows as percent of GDP. These represent ratios of change in domestic capital stock and in FDI stock to aggregate real output and are fairly reasonable proxies. The source for these also is World Bank (2004). ED is mean years of schooling of population age 15 and over, and the source is the compilation by Lee and Barro (2001). Since the compilation gives data at 5-year intervals, the number for each available year has been used for the next four (or more) years. Despite the potential importance of human capital in economic growth, limitations of the available data on education are well known and have been discussed at length by Krueger and Lindahl (2001). In general, despite their limitations, Lee-Barro data are considered to be among the best.

Of the CEE countries listed by UNCTAD (2004), our study includes Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovakia, and Slovenia. The inclusion is based solely on data availability. The period covered is from 1991 to 2002, which is homogeneous in the sense of being the post-Soviet era and is longer than that covered in most research.

TABLE 1 – *Main Variable Notations and the Data Sources*

Annual rate of growth of real GDP (GY), percentage points: World Bank (2004)
Annual rate of increase of labor force (GL), percentage points: World Bank (2004)
Gross domestic capital formation as percent of GDP (I/Y): World Bank (2004)
Gross inflow of foreign direct investment as percent of GDP (FDI/Y): World Bank (2004)
Mean years of school of population age 15 and over (ED): Lee and Barro (2001)

To give a consolidated perspective on the variable proxies and data sources, Table 1 defines each variable and states the source.

Table 2 provides descriptive statistics for each country and also for the pooled sample. The most striking aspect is the huge dispersion in almost every variable across the countries and also within each country. For example, mean GDP growth rate varies from -2.23 (percent per year) for Russia to 4.08 for Slovenia, and gross FDI flows range from 1.57 (percent of GDP) for Russia to 7.74 for Estonia. Even mean schooling ranges from 6.04 (years) for Croatia to 10.08 for Russia.

TABLE 2 – *Descriptive Statistics for the Main Variables by Country and for the Entire Sample: 1991-2002*

PART A

Country	sample means				
	GY (%)	GL (%)	I/Y (%)	FDI/Y (%)	ED (years)
Bulgaria	-0.58	-0.75	16.19	3.22	9.29
Croatia	-0.16	-0.44	20.00	4.44	6.04
Czech Republic	0.61	0.38	29.38	6.74	9.31
Estonia	0.20	-0.94	27.87	7.74	8.97
Hungary	1.35	0.21	24.40	5.40	8.94
Latvia	-1.65	-1.03	25.00	5.53	9.45
Lithuania	-1.27	-0.41	21.74	3.55	9.42
Poland	3.31	0.52	21.02	3.31	9.63
Romania	-0.58	0.06	23.58	1.96	9.45
Russian Federation	-2.23	0.04	23.84	1.57	10.08
Slovak Republic	1.11	0.73	29.77	3.51	9.07
Slovenia	4.08	0.05	22.86	2.19	6.84

PART B

Entire sample	MEAN	0.27	-0.13	23.80	4.11	8.87
[N varies	SD	7.33	0.78	5.95	3.24	1.15
from 128	MIN.	-34.86	-2.91	8.12	0.15	5.85
to 144]	MAX.	10.00	1.52	41.23	15.23	10.50

NOTE. Please see Table 1 for variable definitions. The means were generated on SAS for Windows (version 8), which was used for all computations.

Table 3 reports simple correlations across the pooled variables. It is somewhat interesting to see that most numbers are modest or small, and the largest is 0.30 (between GY and FDI/Y).

TABLE 3 – *Simple Correlations Across the Main Variables in the Entire Sample*

	GY	GL	I/Y	FDI/Y
GL	0.13			
I/Y	0.08	0.14		
FDI/Y	0.30	-0.05	0.25	
ED	-0.07	0.06	0.17	0.04

NOTE. Please see Table 1 for variable definitions.

Part A of Table 4 shows ordinary least-squares estimates from pooled data in the nearly universal identical-parameter format specified in equation (3). In view of the weakness of the education variable, the estimates are shown both with and without the education term. Aside from high labor elasticities and an implausible negative sign for education, the estimates indicate an almost zero productivity of domestic capital and high productivity of FDI. Despite the insignificance of our domestic-investment parameter, this is broadly the kind of scenario reported by Lee and Tcha (2004, p. 223) from their panel data, although their interpretation of the C_1 and C_2 parameters is probably inaccurate due to non linearity of the model.

However, as noted by Svejnar (2002), discussed in the previous section, and indicated by our Table 2, there are likely to be major structural heterogeneities across the countries even within this relatively similar group. Therefore, identical-parameter estimation is unlikely to generate a credible pattern. Of the several ways to model parametric heterogeneity in such panel data, we adopt an approach which is somewhat similar to that of Krueger and Lindahl (2001, p. 1128) and Brock and Durlauf (2001, p. 263). We let the parameters of FDI/Y and I/Y, which are the two variables of primary interest,

vary freely across the countries through "slope dummies", which implies augmentation of equation (3) into the following form

$$GY_{it} = a' + b'_{L}(GL_{it}) + \sum_{i=1}^{12} a_{ik}[D_i(I/Y)_{it}] + \sum_{i=1}^{12} a_{iF}[D_i(FDI/Y)_{it}] + a'_{E}(ED_{it}) + u'_{it} \quad (3a)$$

TABLE 4 – *Foreign Direct Investment and Economic Growth in Transition Economies: 1991-2002*

	C	coefficient of GL	ED	I/Y	FDI/Y	Adj-R^2	N
A. Pooled OLS: equation (3)							
WITH ED	7.953	2.001*	-0.919+	-0.036	0.661*	0.14	126
	(1.58)	(2.94)	(-1.84)	(-0.36)	(3.83)		
WITHOUT ED	-0.230	1.922*		-0.036	0.656*	0.13	126
	(-0.10)	(2.80)		(-0.35)	(3.76)		
B. Pooled with country-specific "slope" dummies for FDI/Y and I/Y: equation (3a)							
WITH ED	-20.907	1.862+	1.236	0.331[a]	1.211[a]	0.41	126
	(-0.95)	(1.82)	(0.50)				
WITHOUT ED	-10.016*	1.717+		0.327[a]	1.255[a]	0.41	126
	(-3.40)	(1.75)					
C. Pooled with country-specific "intercept" dummies and "slope" dummies for FDI/Y and I/Y							
WITH ED		1.313	4.810	0.407[a]	1.360[a]	0.42	126
		(1.17)	(0.92)				
WITHOUT ED		1.141		0.436[a]	1.418[a]	0.42	126
		(1.03)					
D. Fixed-Effects Models							
WITH ED		-0.178	-19.546*	0.128	0.260	b	126
		(-0.21)	(-3.95)	(1.15)	(1.20)		
WITHOUT ED		0.859		0.027	0.132	b	126
		(1.00)		(0.23)	(0.58)		
E. Random-Effects Models							
WITH ED	53.022	0.863	-6.387+	0.078	0.678*	b	126
	(1.54)	(0.95)	(-1.65)	(0.65)	(3.17)		
WITHOUT ED	0.001	1.481*		-0.023	0.300+	b	126
	(0.00)	(2.52)		(-0.28)	(1.81)		

NOTE. The relevant t-statistics are in parentheses. An asterisk (*) indicates significance at least at the 5% level and + indicates significance at the 10% level. Estimates for the constant term are not meaningful for fixed-effects models and models with country-intercept dummies, and thus are not reported.

[a] These are averages of the individual-country estimates for FDI/Y and I/Y in each model. The estimates for each country are shown in Table 5. As reported in that table, the relevant F-statistics show that the mean of the individual-country estimates is significant at least at the 5% level in every case.

[b] Adjusted-R^2 is not included in SAS printouts for fixed- and random-effects models.

where D_i is a dummy variable that takes the value 1 for country i and 0 for others, and $D_i(I/Y)_{it}$ and $D_i(FDI/Y)_{it}$ denote the products of D_i and I/Y and FDI/Y for each country and year. By including these "slope dummies", the formulation provides complete flexibility in the effect of FDI and domestic investment on economic growth in each country[2].

The first two columns in Table 5 report the estimates of FDI/Y and I/Y parameters for each country by using equation (3a). The next two columns report the estimates after dropping the education term. Part B in Table 4 reports the other parameters and the means for FDI/Y and I/Y parameters from Table 5. Although due to limited degrees of freedom, caution is appropriate and the focus should be on broad patterns and not on a literal interpretation, seven points may be noted from these estimates.

First, Table 5 shows a dramatic variability in the parameters for FDI/Y, which range from -1.352 for Croatia to 6.956 for Russia in the second column. The distribution of the parameters is thus a stark contrast from the identical-parameter estimates in section A of Table 4.

Second, there is an even more striking variability in the domestic investment parameters which range from a low of -0.441 for Latvia to the high positive number of 1.087 for Croatia in the first column of Table 5. This distribution reflects an even more stark contrast from the tiny and insignificant negative numbers generated by the identical-parameter pooled estimates that are shown in section A of Table 4.

Third, as was noted in the study by Krueger and Lindahl (2001) also, the identical-parameter estimates, which are supposed to represent some kind of an average for the sample countries, are so very different from the means of the individual-country estimates. For domestic investment, pooled OLS yields an utterly insignificant estimate of -0.036 and indicates a nearly zero return, while means of the individual-country estimates are high and significant positive numbers (0.331 and 0.327). For FDI also, the means are nearly twice as large as the pooled OLS estimates. While it is true that both

[2] Our approach is probably more structured than that of Krueger and Lindahl (2001), who postulated a "random" variation in the (education) parameter across countries, and is also more flexible than that of Brock and Durlauf (2001) who allowed the parameters to differ only across the Sub-Saharan group and the rest of the sample.

sections A and B in Table 4 indicate FDI to be more productive than domestic capital, the magnitudes are so very different in the two sets.

TABLE 5 – *Foreign Direct Investment and Economic Growth in Transition Economies: 1991-2002: Estimates of the Individual-Country Parameters of I/Y and FDI/Y*

Country	with slope dummies for I/Y and FDI/Y: equation (3a)				with intercept dummies as well as slope dummies for I/Y and FDI/Y			
	with ED		without ED		with ED		without ED	
	I/Y	FDI/Y	I/Y	FDI/Y	I/Y	FDI/Y	I/Y	FDI/Y
Bulgaria	0.410+	1.061+	0.429*	1.106*	0.216	0.931+	0.228	1.076*
Croatia	1.087*	-1.352+	0.892*	-1.160	0.932+	-1.267	0.929+	-1.026
Czech Republic	0.310*	0.192	0.329*	0.211	0.550	0.156	0.662	0.273
Estonia	0.155	1.081*	0.150	1.106*	1.182	1.018*	1.191	1.045*
Hungary	0.484*	-0.145	0.494*	-0.155	0.763*	0.218	0.779*	0.139
Latvia	-0.441*	3.835*	-0.424*	3.872*	-0.361+	4.015*	-0.356+	4.027*
Lithuania	0.295	1.412*	0.328	1.397*	1.657+	0.571	1.650+	0.582
Poland	0.461+	0.414	0.509+	0.430	-0.302	1.137	-0.348	1.521
Romania	0.278*	0.950	0.304*	1.042	-0.621	-1.577	-0.628	-1.563
Russian Fed.	-0.096	6.956*	-0.037	7.061*	0.789	11.524*	0.835	11.080*
Slovak Rep.	0.391*	-0.067	0.402*	-0.039	0.120	-0.271	0.174	-0.149
Slovenia	0.638*	0.194	0.544*	0.189	-0.046	-0.135	0.117	0.014
Mean	0.331*	1.211*	0.327*	1.255*	0.407*	1.360*	0.436*	1.418*
F-statistic	7.05	21.77	6.95	26.68	4.62	11.76	5.48	13.15
(DF)	(1,99)	(1,99)	(1,100)	(1,100)	(1,88)	(1,88)	(1,89)	(1,89)
[p-value] for significance of the mean	[.009]	[.001]	[.010]	[.001]	[.034]	[.001]	[.022]	[.001]
Minimum	-0.441	-1.352	-0.424	-1.160	-0.621	-1.577	-0.628	-1.563
Maximum	1.087	6.956	0.892	7.061	1.657	11.524	1.650	11.080

NOTE. The variables are defined in Table 1.

An asterisk (*) indicates significance at least at the 5% level, and + indicates significance at the 10% level.

Fourth, reflecting the foregoing differences is the fact that while the pooled OLS estimates for I/Y parameters are tiny negative

numbers, a *majority* of the individual-country estimates in the first and the third columns of Table 5 are sizable and highly significant positive numbers.

Fifth, omission of the education term yields essentially the same position as its inclusion. Therefore, weakness of education data does not seem to contaminate the other parameters.

Sixth, while the GL parameter continues to be high, although marginally significant, the education term now has a positive sign, but lacks statistical significance.

Seventh, as compared with section A, section B in Table 4 shows a big improvement in adjusted-R^2, which is an indication of the econometric proposition that the flexible-parameter model is more appropriate and clearly dominates the identical-parameter format.

It is possible to make the parameters a little more flexible by letting the constant term also vary across countries. It might seem unrealistic that while we let the FDI and domestic investment parameters vary, the constant term is kept the same across countries. The last four columns in Table 5 and section C of Table 4 contain estimates from the more flexible form that adds 11 "intercept dummies" (D_2 to D_{12}) to equation (3a). It will be seen that, despite some differences, the patterns indicated by the estimates in sections B and C of Table 4 (and the first four and the last four columns of Table 5) are similar, and the seven points noted for estimates of equation (3a) apply also to the estimates based on the more flexible form. In other words, little insight is gained by letting the constant term vary in addition to varying the FDI and domestic investment parameters.

Some other procedures have been used in the literature to achieve a limited softening of the rigors of identical-parameter models in cross-country growth studies that work with panel data. One is the "fixed effects" format that lets the constant term vary across the countries (and time periods). Apart from the variability of the constant term across the periods, this is a special (and limited) case of section C of Table 4. However, in view of the increasing usage of the procedure, section D in Table 4 reports the (2-way) fixed-effects estimates. These show several major differences from sections A, B and C of that table. First, while the FDI/Y parameters in section D may look numerically plausible, these lack significance at the conventional levels. Second, somewhat similarly, while the I/Y parameters are positive, these also lack significance. Third, therefore, despite the size of the FDI/Y parameters being larger than of I/Y

coefficients, it is difficult to say that FDI has a significantly stronger effect on growth than domestic investment. Fourth, the education parameter is an implausible negative number and the labor coefficients lack significance. Fifth, although the parametric flexibility implicit in the fixed-effects format is small, the appropriate F-test favors it over the identical-parameter format[3]. Another approach to a limited modelling of cross-country heterogeneity is the "random effects" format that lets the structure of the error terms vary across countries. Section E in Table 4 reports the random-effects estimates. Although Hausman's test rejects the random-effects format in favor of fixed-effects, the pattern of estimates is fairly similar in sections D and E.[4] Neither the fixed-effects nor the random-effects format indicates domestic investment to be a significant determinant of economic growth, but random-effects estimates indicate significance for FDI. It is, however, somewhat surprising that these models show FDI and domestic investment to be less significant when the education variable is dropped. Despite their increasing usage, and the (small) parametric flexibility they introduce, these formats generate estimates that contrast sharply from those in sections B and C of Table 4 which are based on letting the FDI and domestic investment parameters vary freely across the countries.

While showing somewhat dramatically the hazards of the usual identical-parameter methodology, the estimates in Table 4 also reveal the disquieting point that one can get almost any kind of results by choosing an "appropriate" methodology. Relative to FDI, exactly the same data can be used to "conclude" that its growth effect is insignificant or that its effect is huge. For domestic investment also, one could conclude that its effect is insignificantly negative or that it has a highly significant positive return. Such conclusions are likely to obscure the huge cross-country variability, and some of these could be misleading even relative to the "average" effect.

A few other methodological observations seem useful. First, it might be thought that while gross FDI inflows are relevant, the more appropriate variable would be net inflows. Although it is not clear

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[3] For example, F-statistic (22,99) for the null hypothesis, that the fixed-effects dummy variables for the first row of section D of Table 4 are not jointly significant, is 4.78 and rejects the null at better than the 1% level.

[4] For instance, the m-statistic (with 2 degrees of freedom) produced by SAS for the null hypothesis that the error structure follows the random-effects postulate for the first row of section E in Table 4 is 122.34 with a p-value of less than .001, and clearly rejects the null.

which of these is "better", use of net FDI inflows generates patterns that are almost identical with those reported in Tables 1 to 5. We do not report those numbers since the additional insight gained is minor[5]. Second, while it is customary in such studies to have an FDI variable along with domestic investment, the latter usually consists of all investment, including foreign capital. Therefore, comparing the parameters of FDI/Y and I/Y is really a comparison of the role of FDI with that of a variable in which the predominant component is domestic investment.

More important, there can be a legitimate concern about the exogeneity of the regressors in our models, particularly relative to the possible "feedback" from growth to FDI and domestic investment. We use a reasonable procedure to address that concern and conduct White's (1980) test which is premised on the joint hypotheses of homoscedasticity and lack of specification error in the sense of lack of independence of the error terms and the regressors. Although this point is often overlooked in the literature, White (1980, p. 823) has explicitly stated, "Note that the null hypothesis maintains not only that the errors are homoskedastic, but also that they are independent of the regressors, *and* that the model is correctly specified...". He has further suggested (1980, p. 824) that if the test rejects the null, one could conduct Hausman-type tests to see whether the problem is heteroscedasticity or misspecification. For our main models, White-test statistics do not reject the null that there is no heteroscedasticity or misspecification. For example, the chi-square statistic for the second row of section B of Table 4 is 85.51 with a p-value of .49.[6]

Last, by way of a general observation relative to the role of FDI in economic growth, it should be noted that while higher FDI may almost definitionally be expected to contribute to output and its rate of increase, the direct returns on such FDI generally belong to the foreign investors and not to the host country. Therefore, if the return to FDI is seen to be high in such aggregate models of economic growth, it may not be uncritically inferred that FDI is "good" for the host country. This is apparently the sense of a recent article in *China Business* (2005) which suggested that "economic losses may follow high FDI". The article stated that FDI in China currently

[5] Additional details of estimates based on net FDI inflows are available from the authors.

[6] In view of the large number of regressors in White's test regressions, some caution is appropriate in interpreting the chi-square statistics.

earns a return of about $ 50 billion per year. That return shows in China's GDP, and thus in economic growth, but really belongs to the foreign investors. The benefit to the host country might lie mainly in the positive "spillovers" to the domestic economy.

Concluding remarks

Noting the paucity of FDI-growth studies for transition economies, to which FDI inflows increased dramatically during the 1990s, this research seeks to make a contribution to the FDI-growth literature by focusing on 12 CEE countries in this group. Besides the use of most recent panel data that cover the period 1991-2002, two other considerations guided our research. First, in view of the likely cross-country heterogeneity, we explore flexible models that permit the parameters of main interest to vary across the countries. Second, we use a "growth accounting" framework that avoids the need for data on capital stocks, which are scarce and of uncertain quality, and also avoids interpretational ambiguities inherent in some nonlinear models.

The main outcome of the work may be summarized in ten statements. First, our flexible models indicate tremendous cross-country heterogeneity in the parameters for both FDI and domestic investment. Second, given these dramatic variations, it is somewhat hazardous to make a general statement about the role of FDI (or domestic investment) in growth in these (and possibly other) economies. Third, if a generalized statement were based on the average of the individual-country estimates, one could say that both FDI and domestic capital make a substantial contribution to economic growth in these countries, and also that the role of FDI appears stronger. Fourth, OLS estimates from the usual identical-parameter models reveal dramatic differences from the averages of individual-country estimates for both FDI and domestic investment parameters. In particular, while the OLS estimates show the I/Y parameter to be an insignificant negative number, the individual-country average is large and significantly positive. Fifth, White's (1980) test indicates absence of misspecification as well as heteroscedasticity in the main models. Therefore, neither any possible omitted variable nor a feedback from growth seems to constitute a significant econometric problem. Sixth, both fixed-effects and random-effects formats reveal a fairly similar parametric structure, which, however, is dramatically different from the identical-parameter and varying-parameter formats, particularly for FDI in the fixed-effects format. Seventh, relative to

such aggregate studies, despite the indication that FDI probably makes a substantial contribution to growth, it should be recognized that all direct returns on FDI, while showing in the country's GDP and its growth, generally belong to the foreign investors, and the primary gain to the host economy might lie in positive "spillovers" to the domestic sector. Eighth, methodologically, inclusion or exclusion of the education variable, for which data are somewhat weak, does not seem to matter for parameters of main interest. Ninth, the comparison of parameters for FDI/Y and I/Y should be treated as an approximation since investment data generally include both domestic and foreign capital. Last, by way of another methodological point, the main parameter estimates from flexible models are similar whether or not the constant term is allowed to vary along with the coefficients of FDI and domestic investment.

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ABSTRACT

Noting the paucity of studies that relate foreign direct investment (FDI) with economic growth in transition economies, this paper uses panel data for 12 CEE countries covering the period 1991-2002 and estimates a fairly standard growth framework with several different procedures. Seven main points are noted. First, our flexible models reveal a dramatic cross-country heterogeneity in parameters for both FDI and domestic investment. Second, the observed heterogeneity makes it hazardous to articulate a general substantive statement about the role of FDI (or domestic capital) in growth. Third, if a general statement were based on the averages for individual-country estimates, one might say that both FDI and domestic capital contribute substantially to growth in these economies and the role of FDI appears stronger. Fourth, estimates from identical-parameter models show huge differences even from individual-country averages, particularly for domestic investment. Fifth, a reasonable test indicates absence of any major specification error (or "feedback") as well as heteroscedasticity. Sixth, fixed-effects and random-effects models, that permit limited parametric variability, yield fairly similar patterns which, however, are different from both identical-parameter and flexible models. Seventh, it is pointed out that even when FDI is observed to have high returns and thus to make a substantial contribution to growth in such aggregate models, it should be recognized that direct returns on FDI generally belong to the foreign investors.

JEL Classification: F21, F23, O40, O50

RIASSUNTO

Investimenti diretti all'estero e crescita economica nelle economie in transizione: uno studio panel-data

Data la scarsità di studi che collegano gli investimenti diretti all'estero (IDE) con la crescita economica nelle economie in transizione, questo articolo usa panel data per 12 paesi CEE coprendo il periodo 1991-2002, e stima una struttura di crescita abbastanza standard attraverso una serie di procedure diverse. Si osservano sette punti principali. Primo, i modelli flessibili rivelano una drammatica eterogeneità nei parametri *cross-country* sia per gli IDE e sia per gli investimenti interni. Secondo, l'eterogeneità osservata rende rischioso esprimere dichiarazioni generali sul ruolo degli IDE (o capitale interno) nella crescita. Terzo, se una dichiarazione generale si basasse sulle medie delle stime calcolate per ciascun paese, si potrebbe dire che sia gli IDE che il capitale interno contribuiscono considerevolmente alla crescita di queste economie, apparendo più forte il ruolo degli IDE. Quarto, stime derivanti da modelli con parametri identici dimostrano enormi differenze anche sulla base delle medie calcolate per ciascun paese, particolarmente per gli investimenti interni. Quinto, un test di ragionevolezza indica assenza di qualsiasi grande errore di specificazione (o "feedback") e di eteroschedasticità. Sesto, i modelli con effetti casuali e fissi (*random e fixed effects*), che permettono variabilità parametriche limitate, sono modelli di rendimento simili che, tuttavia, differiscono sia dai modelli flessibili e sia dai modelli con parametri identici. Settimo, è stato notato che persino quando gli IDE hanno alti rendimenti - e quindi forniscono un contributo sostanziale alla crescita in tali modelli aggregati - i rendimenti sugli IDE appartengono generalmente agli investitori stranieri.