The Relationship between FDI and growth under economic integration: is there one?

Marasco, Antonio

Lahore University of Management Sciences

June 2007

THE RELATIONSHIP BETWEEN FDI AND GROWTH UNDER ECONOMIC INTEGRATION: IS THERE ONE?[1]

Antonio Marasco
Lahore University of Management Sciences (LUMS)[2]

Abstract

This study is a contribution to the debate on the relationship between FDI and growth. The idea that the alleged link between FDI and growth is rather the consequence of both FDI and growth responding endogenously to economic integration is tested empirically. The results confirm precisely this point: it is not FDI as such but economic integration, in any form or shape that determines growth.

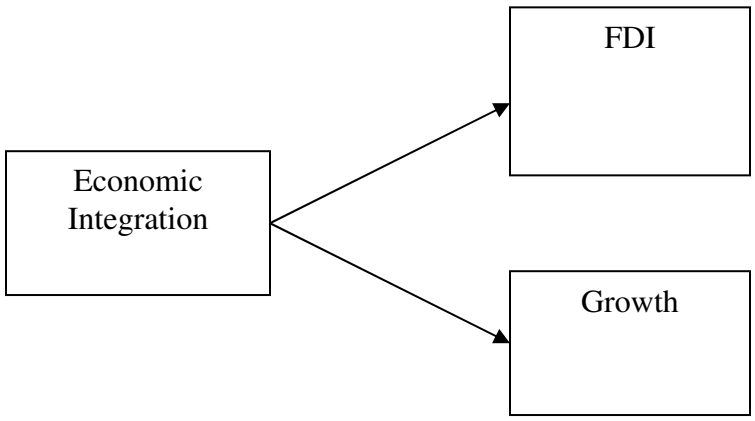
JEL Classification: F1, F15, F21, F43
Keywords: FDI, Growth, Economic Integration

1. Introduction

The relationship between FDI and growth is one of the most intensively researched issues in international economics. There is a fair amount of evidence suggesting that there exists a positive relationship between these two quantities, albeit with some qualifications (see, among others, Borenzstein et al. 1998). More controversial has been the issue whether underpinning such a positive relationship there is causality running from FDI to growth or not. One recent twist on this debate has been provided recently by Ting Gao (2005). According to Ting Gao's paper, the often observed positive correlation between FDI and growth might not imply any causal relationship, since both of them might respond endogenously to economic integration. The situation he suggests is like the one illustrated in flowchart 1 below:

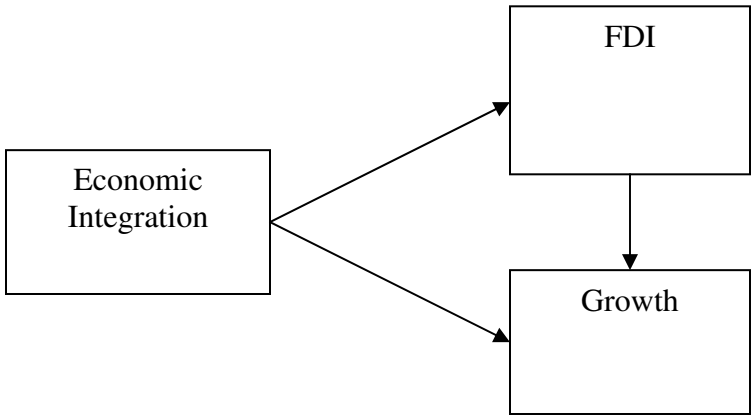
[2] Comments and feedback may be sent to Antonio@lums.edu.pk

Flowchart 1

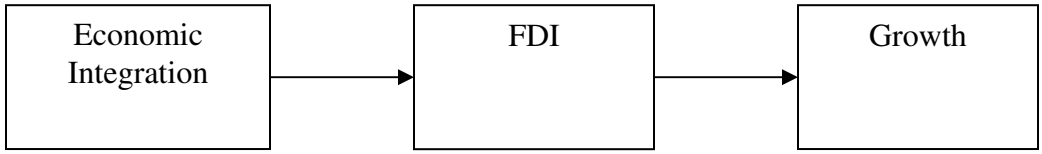


By contrast, according to the bulk of the literature on FDI and growth, causation would run from FDI to growth. Economic integration could then also be accommodated in either of two ways, as shown in flowchart 2 below:

Flowchart 2a



Flowchart 2b



The aim of this paper is to gather empirical evidence and evaluate flowchart 1 against flowchart 2. This is novel in the sense that although the literature on FDI and growth is abundant, to the best of my knowledge, there is no study that has tested the relationship when economic integration is included. Such a study would be an important contribution in the face of works like that of Ting Gao, which cast doubts on the causal relationship between FDI and growth.

2. The Econometric Framework

This study aims at testing the existence of a causal relationship that runs from economic integration through FDI to growth. With this objective in mind, the following econometric specification is used:

$$FDI_{it} = \alpha_0 + \alpha_1 \text{int}egr_{it} + \alpha_2 instr_{it} + \alpha_3 controls_{it}$$
$$g_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 \text{int}egr_{it} + \beta_3 controls_{it}$$

The econometric specification consists of a structural model made up of two equations. The first has the ratio of FDI flow to GDP (*FDI*) as the dependent variable, which is regressed on economic integration (*Integr*), on an instrument for *FDI* and on a

set of three control variables (*controls*)[3]. The second equation has the growth rate of output (g) as the dependent variable, and this is regressed on *FDI*, economic integration and the same set of control variables. Estimation is done via two-stage least squares (2SLS), the most common method used for estimating simultaneous-equation models (see Greene, 2003). The quality of this study hinges a great deal on the choice of a good instrument. The variable to be instrumented is FDI, hence in this case an instrument is good if it is highly correlated with FDI and weakly correlated, if at all, with growth. This is a hard call, particularly in growth regressions, where most economic variables have some kind of relationship with growth. In the specific case, the variable chosen as instrument is the lagged value of FDI[4].

Another important issue relates to the computation of the variable *Integr*. The existing literature on the subject has produced measures of integration which are based on FDI, trade and private capital flows (as an example, see Ismihan et al., 1998). In our case, reliance on such an index would create a serious endogeneity issue in the first equation, since FDI would enter both sides of the equation. Ideally, our measure of integration should not include FDI at all in its calculation. On the other hand, an accomplished measure of integration should take financial integration into account, an important part of which is of course FDI. This study tries to strike a delicate balance between these two opposite considerations. To this end, the variable *Integr* consists of an index computed as the average of two items. The first item is a trade integration index which is computed as follows:

[3] The three control variables chosen (in logs) are inflation (measured by GDP deflator), population, and human capital, proxied with years of schooling.

[4] In the regression with the full sample of all 51 countries (i.e. regressions 1.1, 2.1 and 3, see below), lagged FDI correlation coefficient is 0.697 with current FDI, and 0.057 with g respectively.

$$TII_{it} = \frac{Openness_{it} - Min_{Openness}}{Max_{Openness} - Min_{Openness}}$$

where TII_{it} stands for trade integration index for country *i* at time *t*, $Openness_{it}$ is the ratio of exports plus imports to GDP (in constant prices) and $Min_{Openness}$ and $Max_{Openness}$ are the minimum and maximum openness values in the sample respectively (both over time and across countries).

The second item is a financial integration index which is computed in a likewise fashion as follows:

$$FII_{it} = \frac{FI_{it} - Min_{FI}}{Max_{FI} - Min_{FI}}$$

where FII_{it} stands for financial integration index for country *i* at time *t*, FI_{it} is the ratio of financial assets plus financial liabilities to GDP for country *i* at time *t*, and Min_{FI} and Max_{FI} are the minimum and maximum financial integration values in the sample respectively. Finally, the variable $Integr_{it}$ is calculated simply as:

$$Integr_{it} = \frac{TII_{it} + FII_{it}}{2}$$

FDI still enters the calculation of the variable *Integr* because an important part of financial assets and liabilities are FDI assets and liabilities. Notice however that endogeneity concerns have been addressed in three ways. First, FDI assets and liabilities are two stock concepts while the calculation of the variable *FDI* is based on FDI inflows. This difference should work towards decoupling *FDI* from *Integr*. Furthermore, when compared with the integration measure produced by Ismihan et al. the weight of FDI has been reduced. Finally, the variable *Integr* is a measure of the relative position of each

country within the sample, whereas the variable FDI is an absolute measure of the ratio of FDI inflows to GDP. It is perfectly conceivable to think of a situation in which a country witnesses an increase in *FDI* and at the same time its relative position in the sample with respect to the same quantity worsens.

For complete peace of mind, I also run regressions in which the measure of integration is based on the openness measure only. This is done in two ways. First, I use a measure of integration, denoted $Integr2$, which is simply the trade integration index calculated above, as follows:

$$Integr2_{it} = TII_{it}.$$

The third measure of integration employed is just the trade openness variable as such, with no further manipulation. That is:

$$Integr3_{it} = Openness_{it} = \frac{Exports_{it} - Imports_{it}}{GDP_{it}}$$

Underpinning such measures is the idea that economic integration equals trade integration. Obviously, FDI does not enter the calculation of these measures in any way.

The three variables $Integr_{it}$, $Integr2_{it}$ and $Integr3_{it}$ yield three different sets of regressions. As far as $Integr_{it}$ and $Integr2_{it}$ are concerned, in each case regressions are run not only with respect to the full dataset of 51 countries, but also to the reduced dataset including developing and developed countries. This gives six regressions, to which I refer as regressions 1.1, 1.2, 1.3 and 2.1, 2.2, 2.3 in the Tables. This is not repeated in the case of $Integr3_{it}$, since it would not add much information. Hence, the latter is referred to as regression 3.

One further alternative measure of integration could also potentially be used to check for robustness of the results. Such a measure would be based on an evaluation of the barriers to integration. In principle, this measure should account both for tariffs as well non tariff barriers (NTB). Because of severe lack of data on NTB in the time dimension, a measure that account both for tariffs as well as NTB is not feasible. Even if the index were to be based on tariffs' data only, lack of data would still be severe enough to undermine any kind of comparison that one would want to make with the other measures of integration. I therefore leave this option as a possible addition to be included in future research, once data coverage on tariffs and NTB improves.

3. Data and Sample Selection Issues

There is a choice of sources for the data regarding the main variables of this study. FDI data were taken from the UNCTAD FDI online database, GDP data came from the U.N. National Accounts database. Data on trade openness (used in calculating *Integr*) are from the Penn World Tables, Version 6.2. Data regarding financial assets and liabilities, used to calculate the financial integration index, are from the External Wealth of Nations (EWN) database (see Kose et al., 2006). As for the control variables, data on population and inflation came from the World Development Indicators 2005 (World Bank) and, in a few instances (mainly for 2004) from the World Development Indicators online. Finally, data for average years of schooling (my proxy for human capital), came from Barro and Lee dataset on educational attainment (2000).

With respect to sample selection, this was dictated by availability of data for the main variables. Initially I had thought to have a panel of both developed and developing

countries covering as large a geographical area as possible for the time interval 1980-2004. Included in the sample are countries from Latin America, East Asia and Pacific, South Asia, Africa, Middle East, Eastern Europe, as well as the OECD countries. It soon became clear, though, that in order to maintain the countries of Eastern Europe in the sample, the time interval had to be shortened to the period 1990-2004. After running the regressions, breath of geographical coverage seemed to be qualitatively more important than the length of the time interval chosen, I opted for sticking to the period 1990-2004 and keeping the countries of Eastern Europe in the sample. As a result of this strategy, the sample includes 51 countries (the full list is given in the Appendix) covering 15 years. In the year 2000, these 51 countries accounted for approximately 65% of world GDP[5], and for 78% of world population. The regression with the full sample, both in terms of countries included and years covered, features 680 observations, instead of the potential 765 (51*15=765), because 51 values are lost when lagging FDI for the first year (1990), and inflation data include 34 negative rates, which result into 34 lost values when taking logs (51*15=765-51=714-34=680). Detailed descriptive statistics are shown in Tables 4, 5 and 6.

4. Results

The results of the 2SLS regressions are displayed in Table 1 (first stage) and Table 2 (second stage)[6]. As discussed earlier, results are given for three different types of

[5] The figure for world GDP in 2000 is taken from world GDP estimates produced by DeLong and available online at http://econ161.berkeley.edu/TCEH/1998_Draft/World_GDP/Estimating_World_GDP.html. The figure for world population in 2000 is taken from the U.N. population database (online address: http://esa.un.org/unpp/).

[6] In all regressions concerned, the fitted model is the one with fixed-effects. The Hausman test, performed to test for its suitability against the random-effects model, returned high values of the chi-square statistic in all cases.

integration measures, and along three different levels of aggregation (all countries, developing countries and developed countries). Regressions are identified by two digits, the first referring to the integration measure used, and the second referring to the level of aggregation. For example regression 2.1 refers to $Integr2_{it}$ and to all countries, and so on. Table 1 clearly shows that economic integration is a significant and positively signed determinant of FDI. Such result holds no matter how one defines integration or which level of aggregation is chosen. In the case of Table 2, two points emerge in almost as equally clear-cut a manner as the message conveyed by Table 1. Firstly, integration is a positive determinant of growth in all cases but regressions 1.2 and 1.3. This point is in full accordance with Gao (2005). Secondly, an even more important point, FDI is never a significant contributor to growth. This (non) result is very robust to all types of integration measures and all levels of aggregation. It is also perfectly in line with the argument that the alleged relationship between FDI and growth might just be a classical example of omitted variable bias, where the omitted variable in the specific case would be economic integration. To make the evidence more compelling, I run a fixed-effects regression of FDI on growth without economic integration[7], whose results are presented in Table 3. As before, the exercise is repeated for all countries in the sample, the developing countries and the developed countries respectively. The evidence that I get is mixed, since FDI is significant at the 5% level if I restrict attention to developed countries, not significant when attention is restricted to developing countries and significant at the 10% level if the entire sample is included. This is precisely the kind of mixed evidence that would emerge from past literature on FDI and growth. Such

[7] Once again the Hausman test was used to aid the decision whether to go for fixed or random effects. Once again that test returned a high chi square statistic in all cases, confirming appropriateness of the fixed-model.

uncertainty is wiped out though once economic integration enters the frame, as we have seen. Then, there is simply no role for FDI, singularly considered, as a determinant of growth.

5. Conclusion

This study has been yet one more attempt at shedding light on the relationship between FDI and growth. The new twist here, after taking inspiration from recent theoretical work by Gao (2005), consisted in adding the variable "economic integration" to the analysis. Exactly as expected, and as claimed by Gao, the alleged positive link between FDI and growth disappears once integration is added. This study suggests that the current frenzy of countries from all income brackets to attract FDI as a way to improve their growth prospects, might be misplaced. What countries that want to grow faster should do is to become ever more integrated with the world economy. The actual mode of integration, whether through trade, FDI or else, seems not to matter.

This study can be improved upon and extended in several ways. Firstly, the dataset of reference should be extended as new data become available, particularly with respect to the countries of Eastern Europe and the countries belonging to the lower income brackets. Also, the concept of economic integration should be augmented to include labor market integration. Labor of course, is a very important dimension of the economy, and I have left it out both for problems of data availability and a lack of an effective proxy to measure labor integration. In future work however, the latter should definitely be included if one is to make a more convincing claim that, under economic integration, there is no link between FDI as such and economic growth.

References

Barro, Robert J., Lee, Jong-Wha, 2000. "International Data on Educational Attainment: Updates and Implications" CID Working Paper No. 42, April 2000

Borensztein, E., De Gregorio, J., Lee, J.-W., 1998. "How does foreign direct investment affect economic growth?" Journal of International Economics 45 (1), 115–135.

Gao, Ting, 2005. "Foreign Direct Investment and Growth under Economic Integration." Journal of International Economics 67 (1), 157-174.

Ismihan, M., Olgun, H. and Utku, F. M. 1998. "A Proposed Index for Measuring 'Globalization' of National Economies." METU Economic Research Center (erc) Working Papers in Economics, No.98/5.

Kose, M. Ayhan, Prasad, E., Rogoff, K., Wei, Shang-Jin, 2006. "Financial Globalization: a Reappraisal" NBER Working Paper No.12484, August.

Lane, Philip R., Milesi-Ferretti, G.M., 2006. "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004" IMF Working Paper No. 69 (WP/06/69), March.

Motta, Massimo, Norman, George, "**Does Economic Integration Cause Foreign Direct Investment?"** International Economic Review, Department of Economics, University of Pennsylvania and Osaka University Institute of Social and Economic Research Association, 37(4), 757-83, 1996.

Appendix

a) Tables

TABLE 1 **First Stage Estimation Result of 2SLS Regression**
Dependent Variable: FDI

	Regression Number						
Independent Variable	1.1 (All Countries)	1.2 (Developing)	1.3 (Developed)	2.1 (All Countries)	2.2 (Developing)	2.3 (Developed)	3 (All Countries)
	Coefficient (Standard Error)						
integr (integr2, integr3)	0.1009***	0.0275*	0.1334*	0.063***	0.0254*	0.2128***	0.0003***
	(0.02523)	(0.01548)	(0.0498)	(0.0202)	(0.0147)	(0.0626)	(0.0001)
lagged FDI	0.4504***	0.4550***	0.4247***	0.4814***	0.4546***	0.4069***	0.4814***
	(0.0379)	(0.047)	(0.0629)	(0.0361)	(0.0471)	(0.0621)	(0.0362)
pop	-0.0091	-0.0174	-0.0713	-0.0010	-0.0105	-0.0957	-0.0009
	(0.0337)	(0.0249)	(0.1335)	(0.0340)	(0.0249)	(0.1303)	(0.0339)
infl	-0.00094	-0.0023**	0.0026	0.0006	-0.0023**	0.0028	-0.0006
	(0.0015)	(0.0012)	(0.0045)	(0.0015)	(0.0012)	(0.0045)	(0.0015)
H	-0.0091	0.0017	-0.0138	-0.0086	-0.0028	-0.1002	-0.0086
	(0.0346)	(0.025)	(0.1035)	(0.0352)	(0.0262)	(0.1100)	(0.0352)

TABLE 2 **Second Stage Estimation Result of 2SLS Regression**
Dependent Variable: g

	Regression Number						
Independent Variable	1.1 (All Countries)	1.2 (Developing)	1.3 (Developed)	2.1 (All Countries)	2.2 (Developing)	2.3 (Developed)	3 (All Countries)
	Coefficient (Standard Error)						
FDI	-0.1160	-0.0098	-0.0466	-0.1140	-0.1451	-0.1256	-0.114
	(0.1064)	(0.2415)	(0.0686)	(0.0930)	(0.2382)	(0.0737)	(-0.9299)
integr (integr2, integr3)	0 .1215***	0.0385	0.0259	0.1449***	0.1414***	0.1267***	0.0006***
	(0.0379)	(0.0376)	(0.0284)	(0.0273)	(0.0356)	(0.0397)	(0.0001)
pop	-0.1168***	-0.1345**	-0.0145	-0.1003**	-0.1096*	-0.0843	-0.1004**
	(0.0426)	(0.0584)	(0.0622)	(0.0420)	(0.0574)	(0.0635)	(0.0421)
infl	-0.0066***	-0.0073**	-0.0041*	-0.0055***	-0.0062**	-0.0036	-0.0055***
	(0.0019)	(0.0029)	(0.0021)	(0.0019)	(0.0029)	(0.0022)	(0.0019)
H	0.0628	0.0892	0.0860*	0.0306	0.0378	0.0052*	0.0306
	(0.0438)	(0.0599)	(0.0481)	(0.0436)	(0.0602)	(0.054)	(0.0437)

TABLE 3 Fixed-Effects Regression
Dependent Variable: g

	Regression Number		
Independent Variable	1.1 (All Countries) Coefficient (Standard Error)	1.2 (Developing)	1.3 (Developed)
FDI	0.0958*	0.0921	0.0630**
	(-0.0503)	(0.1224)	(0.0248)
pop	-0.0886*	-0.1150*	0.0295
	(0.0459)	(0.0630)	(0.0488)
infl	-0.0120***	-0.014***	-0.0035**
	(0.0019)	(0.0027)	(0.0019)
H	-0.0302	-0.0216	0.0503
	(0.0438)	(0.0592)	(0.0402)

TABLE 4
Descriptive Statistics **all**

	Obs	Mean	Standard Error	Min	Max
FDI	765	0.0298	0.0406	-0.0588	0.4603
integr	765	0.1811	0.1179	0	0.8839
integr2	765	0.2674	0.1689	0	1
FII	765	0.9486	0.1034	0	1
integr3	765	32.9814	19.4799	1.9823	115.3647
GDP(millions)	765	482267.4	1109062	4904	8734868
g	765	0.0323	0.0466	-0.3392	0.6854
laggedFDI	714	0.0297	0.0408	-0.0239	0.4603
pop (millions)	765	90.706	212.664	3.049	1294.846
infl	765	39.6876	323.1064	-5.5509	7485.8
H	765	7.5422	2.6319	0.55	12.306
logpop	764	17.2019	1.4015	14.9303	20.9816
loginfl	731	1.8242	1.3792	-3.0909	8.9207
logH	765	1.9301	0.4924	-0.5978	2.51

TABLE 5
Descriptive Statistics **developing**

	Obs	Mean	Standard Error	Min	Max
FDI	450	0.0289	0.0321	-0.0239	0.2146
integr	450	0.2887	0.1373	0	0.7992
integr2	450	0.2532	0.1759	0	1
FII	450	0.3243	0.1511	0	1
integr3	448	30.98	19.931	1.982	115.364
GDP(millions)	450	153275.4	207277.2	4904	1477367
g	450	0.0373	0.0578	-0.3392	0.6854
laggedFDI	420	0.0281	0.0313	-0.0239	0.2146
pop (millions)	450	125.8228	265.6321	3.049	1294.864
infl	450	65.4176	419.2691	-5.5509	7485.8
H	450	6.2771	2.3816	0.55	10.756
logpop	450	17.555	1.4077	14.9303	20.9816
loginfl	437	2.4736	1.3286	-3.0909	8.9207
logH	450	1.7312	0.5327	-0.5978	2.3754

TABLE 6
Descriptive Statistics **developed**

	Obs	Mean	Standard Error	Min	Max
FDI	315	0.031	0.0505	-0.0588	0.4603
integr	315	0.2173	0.161	0.0061	0.9689
integr2	315	0.31	0.2042	0	1
FII	315	0.1247	0.1432	0	1
integr3	315	35.7891	18.5092	8.0979	101.0557
GDP(millions)	315	950757.9	1597697	43043	8734868
g	315	0.0252	0.0209	-0.0638	0.1168
laggedFDI	294	0.0319	0.0515	-0.0053	0.4603
pop (millions)	315	39.7873	60.864	3.448	295.4069
infl	315	2.812	2.7968	-2.4899	20.6907
H	315	9.35	1.7867	4.33	12306
logpop	315	16.692	1.2263	15.0533	19.5038
loginfl	294	0.8564	0.7341	-2.3834	3.0296
logH	315	2.2141	0.2173	1.4655	2.51

b) Countries Included in the Sample

Argentina	Philippines	Denmark
Brazil	Rep. Korea	Finland
Chile	Sri Lanka	France
Colombia	Thailand	Germany
Costa Rica	Egypt	Greece
Dominican Republic	Nigeria	Ireland
Mexico	South Africa	Italy
Paraguay	Czech Republic	Japan
Peru	Hungary	Netherlands
Uruguay	Poland	New Zealand
Venezuela	Romania	Norway
Bangladesh	Russian Federation	Portugal
China	Turkey	Spain
India	Australia	Sweden
Indonesia	Austria	Switzerland
Malaysia	Belgium and Luxemburg	United Kingdom
Pakistan	Canada	United States