Revisiting The Foreign Direct Investment – Economic Growth Nexus: Thresholds Of Absorptive Capacity

1. INTRODUCTION

As we enter into the second decade of the 21st century, despite the anticipated decline in FDI flows, opportunities for reaping the full benefits of inward direct investment remain high in the long run (Pack and Saggi, 1997; De Mello, 1997; Blomström and Kokko, 1998; OECD, 2002; Nissanke and Thorbecke, 2006; Ozturk, 2007; Meyer and Sinani, 2009).

FDI is usually viewed as a channel through which knowledge and technology is able to spread into host countries contributing positively to economic growth (Findlay, 1978; Romer, 1993; Markusen and Venables, 1999; Veugelers and Cassiman, 2004 and more recently Tang et al., 2008; Thangavelu et al., 2009 and Waldkirch, 2010). Notwithstanding, its benefits do not accrue automatically and evenly across communities. FDI will contribute most fully to sustainable development when the underlying conditions in place are adequate (Nissanke and Thorbecke, 2006; Greenaway et al., 2007).

A recurring theme appears to be the need for the host economy to have absorptive capacity in order to benefit from FDI (see, for example, Borensztein et al., 1998; Xu, 2000; Ford et al., 2008; Jyun-Yi and Chih-Chiang, 2008). Absorptive capacity may be defined as the host country's capacity to access, learn and implement new technologies from overseas (Rogers, 2004; Meyer and Sinani, 2009).

This paper revisits the relationship between FDI and economic growth. While the relationship between FDI, growth and the role of the moderating variable 'absorptive capacity' has been intensely debated, the identification of the minimum thresholds of absorptive capacity for a positive effect from FDI to arise remains largely unexplored

(Balasubramanyam et al.,1999; Xu, 2000; Ford et al., 2008;, Meyer and Sinani, 2009). For this reason, two threshold variables - host country's human capital level and the share of R&D performed by business sector on total GDP - are used as proxies for host countries' absorptive capacity. The study is based on a sample of 30 countries of OECD for the period 1997-2007.

The remainder of this paper is organized as follows: in section 2, we discuss the main literature on the relationship between FDI and economic growth. Section 3 describes the data and the methodology used. In section 4, we present and discuss the empirical results. Section 5 concludes and discusses the main implications of our results.

2. FDI - GROWTH NEXUS AND MODERATING THRESHOLDS

A great majority of recent empirical studies have found a positive effect of FDI on economic growth contingent on some host country specificities (e.g., Blomström et al., 2000; Lim, 2001; Alfaro et al., 2009; Meyer and Sinani, 2009). From a look at the literature it is possible to identify critical host country characteristics, being absorptive capacity a central one.

Absorptive capacity refers to the ability of an organization or region to identify, assimilate and exploit knowledge from the environment (Cohen and Levinthal, 1989). The majority of the literature emphasises that FDI can only contribute to economic growth through spillovers when there is a sufficient absorptive capacity in the host country. Host absorptive capacity is frequently measured by human capital levels and, less often, by R&D expenditures or patents (Rogers, 2004; Meyer and Sinani, 2009). The great majority of the studies found educational level of the population (or workers) to be relevant, supporting an enhancing effect resulting from the interaction between FDI and absorptive capacity (e.g. Lai et al., 2006; Fu, 2008; Tytell and Yudaeva, 2006; Chudnovsky et al., 2008; Karbasi et.

al., 2005). FDI effects upon growth are likely to depend on the technological conditions and capacity of the firms in the host country (e.g. Barrios et al., 2002; Barrios and Strobl, 2002; De Mello, 1997; OECD, 2002; Fu, 2008). Both measures of absorptive capacity, human capital and R&D activities, are indeed complementary because firms' and regions' R&D activity may suggest a need for highly skilled labour.

Borensztein et al. (1998), Balasubramanyam et al. (1999) and Xu (2000) are seminal studies quantifying a minimum threshold of absorptive capacity above which host countries can benefit from FDI. Borensztein et al. (1998) study a sample of 69 developing countries for the period of 1970-1989 and proxy host countries' absorptive capacity with the stock of human capital, by using the initial-year level of 'average years of male secondary schooling' constructed by Barro and Lee (1993). Their results reveal that only countries with an average of 0.52 years of male secondary schooling would positively benefit from FDI. Xu (2000) found that the positive effect from FDI depended on countries achieving a minimum level of male secondary schooling somewhere between 1.4 and 2.4 years. Jyun-Yi and Chih-Chiang (2008) considered the overall population rather than just the men population. The minimum threshold obtained was 2.108 years of secondary school attainment.

More recently, using data from 48 U.S. contiguous states for 1978–97, Ford et al. (2008) demonstrate that U.S. states with higher foreign presence grow faster relative to states with a low foreign presence, provided that the state has a minimum level of human capital. They considered as proxy for human capital the percentage of population with a college degree. The authors estimated a range for the minimum educational thresholds to be of 12%-16% of the population with, at least, a college degree.

Finally, Meyer and Sinani (2009) measured human capital by the enrolment ratio in tertiary education, finding the minimum threshold for gross enrolment ratio in tertiary education to be of 33%. They also considered innovative activities, namely R&D as share of GDP and patents per resident. They found a minimum threshold of 2.93 patents per resident and of 1.33% the share of R&D in total GDP.

In spite of these contributes, there is still a gap in the empirical literature regarding

the quantification of the minimum threshold of absorptive capacity required to a country to benefit from foreign entry. Hence, our paper identifies the thresholds for two proxies of absorptive capacity: human capital and business innovation activity.

We are aware that a few other host country factors may influence FDI effects upon growth performance and even the FDI-Growth-Human Capital relationship. One of the host countries' specificities pointed in the literature as likely to affect FDI impact on growth is the level of economic development of receiving countries (Blömstrom et al., 1994; Jyun-Yi and Chih-Chiang, 2008; Meyer and Sinani 2009). Hence, in this paper our central focus is on absorptive capacity, but we consider also the initial level of GDP as it may play an important role in forming the overall dynamic capabilities required to take advantage from the presence of foreign firms. More precisely, we search for a threshold level of endowments of absorptive capacity as a necessary condition for the promotion of growth through FDI.

3. DATA SET, METHODOLOGY AND SUMMARY STATISTICS

For the empirical analysis we used data from OECD Country Statistical Profiles 2009, UNESCO Custom Tables and World Development Indicators 2008 from World Bank. The data covers all 30 OECD countries for the period 1997-2007. Despite the limitations on the time span of analysis, due to availability problems for data on human capital and technological competencies proxies, the 11-year period used in our analysis is reasonable to test our main questions of interest, namely whether developed economies also need to reach a minimum threshold of absorptive capacity to benefit from inward FDI.

The dependent variable is the natural log of real GDP per capita (2005 constant prices), so that fluctuations in independent variables (in absolute or relative terms) will

cause percentage variations in real GDP per capita, in order to capture the effect on host economic growth. Similar specifications were adopted by several studies (e.g., Yao and Wei, 2007; Herzer et al., 2008). Our empirical specification is represented in equation (1):

$$Log(GDPpc_{it}) = \beta_0 + \beta_1 FDI_{it} + \beta_2 HC_{it} + \beta_3 R\&D\_Busin_{it} + \beta_4 GDP(0)_{it} + \beta_5 FDI_{it} * \mathbf{X_{it}} + u_i, \quad (1)$$

$$with\ \mathbf{X_{it}} = \{\mathbf{HC_{it}}, \mathbf{R\&D\_Busin_{it}}\}$$

Our key explanatory variables will be FDI inflows (in percentage of GDP), human capital and technological competencies proxies. Human capital level is measured through the proportion of population aged between 25-64 years old with a college degree. Technological competencies are mainly captured by R&D expenditures from business sector in percentage of country's GDP. We control as well for initial host country development.

The coefficient β_1 captures the direct effect of foreign direct investments in the relative variations of real GDP per capita. If β_1 is negative, or positive but insignificant, FDI inflows will not exert any positive impact on OECD countries' economic growth. In opposition, if the coefficient is positive and statistically significant, FDI can act as an engine of growth for host economies. According to the literature reviewed, either result is possible to obtain. The coefficients β_2 and β_3 determine the potential effects of host human capital level and the share of R&D expenditures from business sector in total GDP, respectively. Both coefficients are expected to be positive. β_4 captures a possible catching-up effect, being consistent with conditional convergence theories if the respective signal is negative.

The coefficient β_5 test whether host countries' absorptive capacity in terms of human capital and technological competencies is important to benefit with FDI inflows. If β_5 is positive and significant, the interaction between FDI and absorptive capacity proxies

exerts an especially important influence upon growth performance of host economies. Moreover, if β_1 is negative, or positive but insignificant, a minimum threshold of absorptive capacity must be achieved to gain with foreign presence.

Table 1 provides the description of variables applied in our estimations and some summary statistics. Next section presents and discusses the empirical results, in addition to detailed explanation on the estimation of absorptive capacity thresholds.

*** *insert Table 1 about here* ***

4. ECONOMETRIC ANALYSIS

The first columns with Model A (Table 2) show the results for the human capital threshold. The columns with Model B reflect the results for the Business R&D variables.

*** *insert Table 2 about here* ***

The coefficient on HC, our measure of human capital, is positive and significant, highlighting the importance of education in the growth process of OECD countries.

The most striking result is that the sign of FDI coefficients are all negative and significant while the interaction terms FDI*HC and FDI*R&D_Busin are all positive and significant. Jointly these results reveal that a minimum threshold of human capital and business sector R&D (in percentage of GDP) are needed for FDI to contribute to economic growth.

Contrary to the expectations, the coefficient of initial real GDP per capita does not present a negative signal, thus the conditional convergence hypothesis is not verified. A possible explanation for such result is the high level of development of the countries under analysis. The catching-up effect is more easily found in empirical studies on developing countries, rather than among developed ones (e.g. Borensztein et al., 1998).

For the estimation of minimum absorptive capacity thresholds, we adopted similar methodologies to those used in the studies of Borensztein et al. (1998) and Durham (2004).

For the human capital level, the results suggest that a minimum threshold must be attained and that such value is about 26.5% and 27.3% of the population aged between 25 and 64 years old with a college degree. For the share of R&D expenditures by business sector, the break-even point must be about 1,4% of total country's GDP. By 2007 a great portion of OECD countries still remain below both thresholds (13 for human capital and 23 for business R&D).

From the literature reviewed, very few studies have attained precise estimations for the minimum threshold of absorptive capacity so that we have few comparable results in the literature. Two notable exceptions are Ford et al. (2008) and Meyer and Sinani (2009), whose results for the threshold of human capital were between 12.04% and 15.56% of US population with a college degree and 33% of population with tertiary education, respectively. Since we use the proportion of active population with such degree of education, rather than total population as did Ford et al. (2008), our results seem to be reasonable for the sample of countries under analysis and thus are more comparable with those of Meyer and Sinani (2009). Moreover, Meyer and Sinani (2009) also estimate a minimum threshold of R&D expenditures as percentage to GDP. Our results of 1,4% for the minimum level for R&D_Busin are thus comparable to their outcomes of 1,33%, which are very similar to ours.

5. CONCLUSION

Our objective in this paper was to calculate minimum thresholds of absorptive capacity for countries to benefit with foreign presence. The results confirm the suspicion

that FDI effect on economic growth should not be taken for granted, even in developed countries, requiring the gathering of some conditions within host economies. By using the empirical setting of OECD countries for the period 1997-2007, our results are strongly supportive of a moderating effect played by both human capital and business sector R&D expenditures upon the growth enhancing effects of FDI. We contribute to the existing empirical evidence by quantifying the minimum thresholds required for countries to gain with FDI.

It was found that the benefits from inward FDI in terms of growth only emerge when the country level of population with a college degree reaches about 27% and the share of business sector R&D in total GDP is about 1,4%.

In 2007 a great portion of OECD countries still remain below both thresholds. Hence, it is crucial to stimulate R&D investments by private firms and to promote human capital accumulation. The business sector is part of the solution and has the potential to be a strong partner in an investment strategy for growth and sustainable development.

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TABLES

Table 1. Variables and Descriptive Statistics

Variable	Description	Mean	Std. Dev.
Log(GDPpc)	Log of Real GDP per capita in US dollars (2005 constant prices)	10.198	0.380
FDI	Log of FDI inflows to GDP ratio	1.011	1.332
HC	Proportion of population aged between 25 and 64 years old with a college degree (%)	23.468	9.089
R&D_Busin	R&D expenditures by business sector as % of GDP	0.974	0.698
GDP(0)	Log of Initial Real GDP per capita in US dollars (2005 constant prices)	10.173	0.393
FDI*HC	Interaction variable between FDI and HC	23.191	33.955
FDI*R&D_Busin	Interaction variable between FDI and R&D_Busin	0.008	0.018

Table 2. Estimation Results – Random Effects Estimations (GLS)

	A. Human Capital Threshold			***B. Business R&D Threshold***		
Dependent Var: Log (GDPpc)	Model A.1	Model A.2	Model A.3	Model B.1	Model B.2	Model B.3
FDI	-0.0207	-0.1310***	-0.1139***	-0.0240	-0.1176***	-0.0980***
	(0.0142)	(0.0360)	(0.0357)	(0.0183)	(0.0361)	(0.0357)
HC	0.0161***	0.0124***	0.0128***			
	(0.0035)	(0.0036)	(0.0034)			
FDI*HC		0.0048***	0.0043***			
		(0.0014)	(0.0014)			
R&D_Busin				19.1892***	14.5514**	14.1411**
				(6.4691)	(6.4971)	(5.7485)
FDI*R&D_Busin				8.2063***	6.9736***	
				(2.7322)	(2.6902)	
GDP(0)	0.4339***	0.3931***				
	(0.1039)	(0.1101)				
Constant	9.8351***	9.925***	5.4941***	10.0109***	10.0777***	6.0732***
	(0.0986)	(0.1011)	(1.0574)	(0.0864)	(0.0872)	(1.1196)
N	280	280	280	225	225	225
R^2 Within	0.0596	0.0958	0.0921	0.0277	0.0528	0.0505
R^2 Between	0.2008	0.2301	0.5010	0.1350	0.2338	0.4683
R^2 Overall	0.2329	0.2805	0.4372	0.1651	0.2456	0.3536
Threshold	-27.3%	26,5%	-1,4%	1,4%		
No. of countries below the threshold: 13				No. of countries below the threshold: 23		

Notes: *Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. Standard errors within parentheses.

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