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FDI and Absorptive Capacity in Emerging Economies

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Abstract

Inward FDI is believed to promote economic growth and transfer technology across countries. This led many economies to promote policies that encourage and support inward FDI. Researchers have been undertaking empirical research to determine whether inward FDI does in fact have the proclaimed effect on the economy. The findings from the studies on the spillover effects of FDI are mixed. More recent studies explain that it is not a matter of whether FDI influences the host country's economy; but rather of whether the necessary factors for the existence of spillover effects are present. This raises the issue of what is known as the *absorptive capacity* of the country; that is, a country's capacity or ability to absorb the benefits that FDI can offer. This study focuses on the absorptive capacity of emerging and MENA economies. The absorptive capacity factors examined are the following: human capital, trade openness, and institutional quality. The results indicate that FDI spillovers exist in emerging and MENA economies, yet are more evident when controlling for schooling as an absorptive capacity factor. Both trade openness and institutional quality appear to be of little influence on the FDI spillovers. Moreover, it appears that countries with lower schooling levels stand to benefit the most from FDI spillovers.

Keywords: FDI, Spillover Effects, Absorptive Capacity, MENA

JEL Classification: F21, O11, O40

I- Introduction

In theory, FDI is believed to have a positive impact on economic growth; not only through the direct effect of contributing to the host country's capital stock, but also through spillover effects. These spillover effects translate into higher productivity for the domestic economy. A foreign firm setting up in a domestic market is expected to be enjoying a competitive advantage by possessing superior knowledge or technology to that possessed by domestic firms. The benefits that are thought to accrue to the host country are the spillovers of the technology to the domestic firms. Recent literature has been examining spillover effects of FDI to the host country, attempting to find empirical evidence in support of the theory. However, empirical findings are not fully in support of the theoretical spillover benefits of FDI. The studies examining FDI spillovers have ranged from micro-level studies to macro-level ones. The results are ambiguous, and vary from one case to another.

In recent years, the notion of absorptive capacity has been increasingly examined. The motive for such a strand of research lies in the notion that the existence of significant FDI spillovers to the host economy depends on the economy's ability to benefit from the opportunity. *Absorptive capacity* refers to an economy's capacity to absorb the benefits spilled over by FDI. Absorptive capacity factors are factors that mediate FDI spillovers; factors that influence an economy's ability to absorb the knowledge and technology spillovers. Human capital, financial development, trade openness, quality of institutions, and infrastructure are all examples of absorptive capacity factors examined previously by the literature.

The aim of this study is to focus on three of these factors; namely, human capital, trade openness, and quality of institutions, and to determine whether they play a role in mediating the FDI knowledge and technology spillovers in Emerging and MENA economies. The study goes to great length to test for the sensitivity of the results, by including further control variables, as well as using alternative variables to test for the significance of a given factor, and distinguishing between high-income countries and lower-income ones. Furthermore, it provides a different approach to the human capital factor by introducing in the analysis another dimension which is that of quality of education. It also uses an alternative measure of institutional quality to that used in previous studies. Threshold levels are computed when possible.

The paper proceeds as follows. Section II provides a literature review, whereas section III provides an overview of the data and methodology. The results and analysis are provided in section IV, while section V provides a summary and some concluding remarks.

II- Literature Review

Many countries encourage inward FDI, hoping to reap benefits in terms of direct impact on capital accumulation, as well as spillovers and externalities that are in the form of a positive impact on productivity. FDI is believed to transfer knowledge and technology from one country

to another. There are several channels through which the superior technology of the foreign firm is expected to spillover to the domestic economy.

The first channel is the *demonstration* channel, where the foreign technology or know-how may be adopted through imitation; hence the name *imitation* channel by some researchers. The second channel is the *labor turnover* channel, also known as the *acquisition of human capital* channel. Labor employed by the foreign firm could contribute to the transfer of technology or knowledge when moving to a domestic firm, or when setting up their own business. The third channel is the *vertical linkages* channel. This channel refers to the possible spillover from a multinational company to its domestic suppliers or customers. This channel relies on the interaction of the foreign firm with it suppliers or customers via assistance with the set-up of production facilities, provision of managerial know-how and training, and demanding minimum levels of quality of the product in question, among others (Lall, 1980, cited in Lim, 2001).

A fourth channel is the *competition* channel. A multinational company will introduce competition with the domestic firm, unless it is entering a new market and will be in a state of monopoly. As a result of the imported competition, the domestic firm will attempt to become more efficient in order to be able to maintain its ground. Even if the domestic firm cannot imitate the multinational company's technology and knowledge, it can at least reduce inefficiencies within its own processes, or adopt new technologies at a faster speed (Gorg and Greenaway, 2004).

Several studies emerged to test the existence of such spillover effects empirically. Lim (2001) refers to some of those conducted for developing countries. "Blomstrom (1986) and Kokko (1994) find econometric evidence of positive FDI spillovers for Mexico; Blomstrom, Kokko and Zejan (1994), for Uruguay; and Sjoholmn (1999), for Indonesia" (Lim, 2001). Hoekman et al. (2005) give examples of cases where inward FDI led to technology transmission such as Mexico's maquiladoras and Intel's investment in Costa Rica. Other micro-level studies finding positive spillover effects are Haskel et al. (2002) in the UK, Smarzynska (2002) in Lithuania through vertical linkage, and Seck (2009) from developed to developing countries.

However, Potterie and Lichtenberg (2000) find that inward FDI is an ineffective channel of international technology transmission in 13 industrialized countries, and Hale and Long (2007) conclude that there are no systematic positive spillover effects to Chinese productivity.

Findlay (1978) argued that the technology gap between countries plays an important role in the determination of the impact of FDI on the domestic economy. The argument is that the larger the technology gap, the greater the benefit from FDI. Glass and Saggi (1998) agree to the importance of the technology gap between the two economies involved; however, they argue the exact opposite. They argue that the smaller the technology gap, the greater the ability to benefit from the transferred technology. Their argument is that the greater the gap, the lower the ability of the host country to absorb the incoming technology since it lacks the human capital, networks and general infrastructure to make use of such technologies. Hence, the notion of *absorptive capacity*.

Borensztein *et al*. (1998) examine a sample of 69 countries, and reach several important conclusions. One conclusion is that FDI has a positive influence on economic growth, "although the magnitude of this effect depends on the stock of human capital available in the host economy." There seems to be strong "complementarity between FDI and the stock of human capital" in the impact on economic growth, according to Borensztein *et al*. (1998). Their results imply that a higher level of secondary school attainment is associated with greater spillover effects; hence, the importance of schooling as a prerequisite for the absorption of the benefits of FDI. As a matter of fact, they go as far as calculating a threshold for secondary school attainment of 0.52, beyond which the host country would benefit from the spillover effects of FDI.

Blonigen and Wang (2005) repeat the procedure undertaken by Borensztein *et al*. (1998) using the same sample, but distinguish between developed and developing countries. Their results support those of Borensztein *et al*. (1998) but for developing countries only. Therefore, Blonigen and Wang (2005) find schooling a significant absorptive capacity factor in the case of developing countries. However, schooling is found to be insignificant as an absorptive capacity factor in the case of developed countries. Li and Liu (2005) also find evidence in support of schooling's importance for absorptive capacity.

On the other hand, some researchers do not find schooling to be a significant absorptive capacity factor. For example, the results of Carkovic and Levine (2005) do not support the claim that more schooling allows better absorption of FDI benefits. Similar results emerge in several other studies, such as Kinoshita and Lu (2006), and Darrat *et al*. (2005).

The literature on education as an absorptive capacity factor does not delve into the issue of education quality. It is unreasonable to believe that a year of schooling in one country is equivalent to a year of schooling in another. The essence of education lies not within the number of years, but essentially within the quality of the education itself. Failing to take quality of education into account could produce misleading results.

The problem of examining the effects of education quality lies within the difficulty of measuring it in the first place. Some researchers have been examining schooling inputs, such as student-teacher ratio and expenditure on schooling, as possible proxies for education quality. Hanushek and Kimko (2000) propose using international test scores as proxies for cognitive ability, reflecting education quality. They use their constructed variable to examine its influence on economic growth, and find that the "labor-force quality has a consistent, stable and strong relationship with economic growth." Hanushek and Woesmann (2008) confirm this finding through a more extensive study. The role of education quality as an absorptive capacity factor will be addressed in this study.

Another factor, trade openness, could also play a role in facilitating the spillover of FDI benefits to the host country. It is hypothesized that FDI and trade openness can be complementary for economic growth, and that an economy promoting more open trade policies, especially export-promotion policies, are more likely to benefit from FDI spillovers. Balasubramanyam *et al.* (1996) investigate the impact of inward FDI on economic growth, yet focus on the role of the trade regime. The results indicate that the impact of FDI on economic growth is stronger under an export-promotion trade regime rather than an import-substitution one. Makki and Somwaru

(2004) find that trade openness facilitates the spillover of FDI benefits. On the other hand, Carkovic and Levine (2005) fail to find a robust significant role for trade openness as an absorptive capacity factor.

A third factor, institutional quality, has been recently emerging in the literature as one of the absorptive capacity factors. It has been increasingly included in growth regressions, and therefore is also hypothesized by some researchers as capable of acting as a mediating factor for FDI spillovers. A stronger set of institutions in the host country would allow stronger connections and linkages between domestic firms and the foreign capital, and hence would increase the likelihood of a spillover effect.

Institutional quality has been examined as an absorptive capacity factor in studies that were examining the impact of financial openness in general, such as Bekaert *et al*. (2010) and Kose *et al*. (2009), and others that were examining the impact of foreign R&D on the economy, such as Coe *et al*. (2009), and Seck (2009). All these studies, except Kose *et al*. (2009) found institutional quality to be a mediating factor. The findings of Kose *et al*. (2009), however, indicate that a higher level of institutional quality is associated with a lower FDI impact. They interpret their results by arguing that with high quality of institutions, even FDI is not very influential to Total Factor Productivity.

Several studies examine other potential absorptive capacity factors. For example, Hermes and Lensink (2003), Omran and Bolbol (2003), and Alfaro *et al*. (2006) investigate the impact of financial development on the relationship between FDI and economic growth, whereas Kinoshita and Lu (2006) examine the role of infrastructure. Furthermore, some studies, such as Nunnenkamp and Spatz (2003), Alfaro (2003) and Wang (2003), examine the notion of absorptive capacity at the sector level. However, this paper will concentrate on only three factors at the aggregate level, which are, as previously mentioned, human capital, trade openness and institutional quality.

III- Model

The overall aim of the study is to examine three of the potential elements of absorptive capacity that are relevant for the impact of FDI on the host country, in a sample of Emerging and MENA countries. The factors that are under examination are human capital, trade openness and institutional quality.

The basic model is:

$$\mathbf{Y = f (K, L)} \qquad (1)$$

where, Y is real GDP per capita, K is the stock of capital, and L is the labor force. The function is assumed to be logarithmic. Differentiating the function we get the following:

$$y = \alpha_1 k + \alpha_2 l \qquad (2)$$

where ***y*** is the growth of real GDP per capita, ***k*** is the growth rate of capital, and ***l*** the growth rate of the labor force.

Including the FDI as a variable in the production function we get

$$\mathbf{Y = f (K, L, FDI)} \qquad (3)$$

Differentiating (3) we get

$$y = \alpha_1 k + \alpha_2 l + \alpha_3 fdi \qquad (4)$$

where ***fdi*** is the growth rate of FDI.

The ratio of investment to GDP will represent ***k***, whereas the ratio of FDI inflows to GDP will represent ***fdi***. To account for important variables found significant by previous studies a set of control variables are added.

Empirically, the model to be tested is the following one:

$$GROWTH = b_1 + \mathbf{b_2 M} + b_3 FDI + b_4\, ABC + b_5 I + \mathbf{b_6 X} + u \qquad (5)$$

The dependent variable is the growth rate of real GDP per capita, GROWTH. The vector **M** is made up of variables that are found to be significant for economic growth in previous economic growth literature. These are fixed variables that will appear in every regression. There are 4 variables in vector **M**; namely, log of initial GDP per capita (LOGINITIAL), schooling (SCHOOLING), domestic investment to GDP ratio (INVESTMENT), and population growth (POPULATION). The initial GDP per capita variable is included to account for the catch-up theory, while the schooling variable is included to proxy for human capital. The variable FDI represents the FDI inflows to GDP ratio. The ABC variable is the absorptive capacity factor in question, and the I variable represents the interaction term; the interaction term being the FDI variable multiplied by the absorptive capacity factor in question, i.e., I = ABC x FDI. The significance of the factor as a requirement for FDI knowledge spillover is tested by the interaction term. The variable ABC is included individually in addition to the interaction term to account for its own influence on economic growth regardless of FDI.

The vector **X** represents the extra control variables that are included. These extra control variables are factors found by some studies in the economic growth literature to have a significant effect on economic growth. These will be included one at a time and in various re-runs of the regression in order to check for the robustness of the results. These variables include measures of trade openness, financial development, institutional quality, government expenditure, inflation rate, political stability, geographic dummy variables, as well as time period dummy variables.

The presence of the INVESTMENT variable must be clarified. Borensztein *et al.* (1998) and Hermes and Lensink (2003) run their regressions twice; once with INVESTMENT and once without. Hermes and Lensink (2003) explain that the interpretation of FDI's influence on economic growth depends on the existence of INVESTMENT. In the absence of INVESTMENT, the influence of FDI on economic growth could be due to its mere contribution

to capital accumulation, its spillover effects, or both. The reason would not be distinguishable in that case. However, with the INVESTMENT present in the regression, FDI's influence through capital accumulation would be already accounted for, and hence only the spillover effects will be accounted for by the coefficient of FDI.

A panel data model is used in this study because of its benefits. One important benefit is that it accounts for individual heterogeneity, even if that heterogeneity is unobserved. Leaving the unobserved heterogeneity unaccounted for would lead to biased results. Furthermore, panel analysis offers "more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency," according to Baltagi (2005).

A positive correlation between FDI and economic growth could be attributed to FDI's positive influence on economic growth. However, it could also be attributed to economic growth's positive influence on FDI. Therefore, the direction of causality might be either from FDI to economic growth, from economic growth to FDI, or both. The fact that economic growth could be causing FDI leads to the problem of endogeneity leading to biased results. To deal with such a problem an instrument must be used to replace FDI in the equation. Finding an instrument for FDI is a difficult task. The lagged FDI variable is typically used as an instrument for FDI in the literature (such as Darrat *et al*. (2005), among others). Therefore, the regressions are run once more but applying the Instrumental Variable (IV) technique, using the lagged FDI as an instrument. The results are then compared to the OLS results in a manner similar to that conducted by Frankel and Romer (1999) while testing the relationship between trade and growth.

To get an estimate of what the required levels of the factors of absorptive capacity are, the threshold level for each significant absorptive capacity factor is calculated. This is done simply by differentiating the estimated regression with respect to FDI and then equating to zero. Furthermore, an alternative approach is followed to determine the existence of a threshold effect. This approach was followed by Bekaert *et al*. (2009) and Carkovic and Levine (2005). A dummy variable, THRESHOLD, is created and given the value 1 in case the factor of interest is greater than the median value, and 0 otherwise. This THRESHOLD is then interacted with the FDI variable. In this case, the following regression is run:

$$GROWTH = b_1 + \mathbf{b_2 M} + b_3 FDI + b_4\, ABC + b_5 FDI.THRESHOLD + u \qquad (6)$$

If the coefficient of FDI.THRESHOLD is significant, then this indicates that there is a significant difference between those below the median value and those above with respect to FDI's influence on GROWTH. However, an insignificant FDI.THRESHOLD implies that there is no significant difference between observations below the median level and those above; hence no threshold effect.

One criticism of the sample used could be that it mixes between high-income and middle-income countries. Fourteen out of the 45 countries in the sample are high-income countries. These are: Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, United Arab Emirates, Hong Kong, Singapore, Czech Republic, Estonia, Hungary, Korea, Poland and Slovak. The rest is either upper- or lower-middle income. Blonigen and Wang (2005) argue that inappropriate pooling of wealthy and poor countries would lead to misleading results. Therefore, a dummy variable, HIGH, is included to

account for whether the country is a high-income country or not, and takes on a value of 1 for a high-income country and 0 otherwise.

The analysis goes further to try to distinguish the effect on the MENA countries in specific. To determine whether the MENA countries are in any way different in terms of the absorptive capacity analysis, a MENA dummy variable is included in the regressions, taking on a value of 1 in case of a MENA country, and 0 otherwise.

IV- Data

The sample consists of 45 Emerging and MENA economies. These are chosen from the pool of economies identified as Emerging by one classification or another, as well as the MENA region economies. The time period covered is between 1990 and 2009. The data is divided into 5 four-year averages. The data are obtained mainly from the World Development Indicators, as well as from the World Economic Outlook Database of the International Monetary Fund, unless otherwise specified. Trade openness, TRADE, is measured by the ratio of the sum of exports and imports to GDP. On the other hand, financial development will be measured by the ratio of domestic credit to GDP, CREDIT. A market-based measure, the turnover ratio, TURNOVER, will be examined as a financial development indicator as well. The variable SCHOOLING is measured by the average years of schooling for adults aged 25 and above. This is obtained from Barro and Lee (2010)[1].

Another education measure will be used in order to proxy for the quality of human capital: cognitive ability. This is in line with the education economics literature that has been looking at evidence for a stronger link of education quality to economic growth than that of years of schooling. The literature argues that cognitive ability could proxy for education quality and that it represents a better representation of human capital. This study uses the TIMSS (Trends in Mathematics and Science Scores) test scores as a measure of cognitive ability. The TIMSS is an international assessment conducted for fourth and eighth graders world-wide. Mathematics and Science scores are reported separately. Over here, the mathematics and science scores are added up to give an overall TIMSS score. Scores for eighth graders are used. The data for TIMSS is obtained from the Education Statistics database of the World Bank. The problem with the TIMSS data is that it is not available for all countries, especially in the earlier years. Unfortunately, this reduces the sample size. Nevertheless, the analysis is conducted looking at the TIMSS score while controlling for years of schooling using the same measure used in all previous regressions, and looking at its interaction term.

Institutional quality is measured using the World Governance Indicators, compiled by Kaufmann et al. (2010). The World Governance Indicator is reported in disaggregation; each of its components is reported individually. For the study's purpose, 5 of the components are used in the construction of a WGI variable. These 5 variables are: political stability (POLITICAL),

[1] The last 4-year interval in our study does not have a corresponding value in the Barro and Lee (2010) data. Therefore, the value of 2010 is used for that last time period interval in this study.

government effectiveness (GOVEFF), regulatory quality (REGULATORY), rule of law (LAW), and control of corruption (CORRUPTION). Each of these variables is measured on a scale from -2.5 to 2.5; a higher value indicating better performance. The WGI variable is constructed by computing a simple average of the above-mentioned 5 components, and takes values ranging from -2.5 to 2.5. There are several reasons for choosing the World Governance Indicator as a measure of institutional quality. First, the data is available since 1996, which leaves each country in the sample with 4 observations. Second, the data is constructed from a wide variety of data sources. Kaufmann et al. (2010) explain that their " data sources include surveys of firms and households, as well as the subjective assessments of a variety of commercial business information providers, non-governmental organizations, and a number of multilateral organizations and other public sector bodies."

The variable LOGINITIAL is expected to have a negative sign, indicating that the larger the initial real per capita GDP the slower the rate of growth, whereas the smaller the initial real per capita GDP the faster the rate of growth. This is in line with the catch-up theory, or the convergence theory. SCHOOLING, on the other hand, is expected to have a positive sign indicating that a greater number of years of schooling should lead to higher economic growth rates.

The variable POPULATION is expected to have a negative sign, since a higher population growth rate would lower per capita economic growth; everything else held constant. INVESTMENT is expected to have a positive sign, indicating a positive relationship between investment and economic growth. Similarly, FDI is also expected to have a positive sign to indicate a positive influence on economic growth. Control variables such as inflation and government expenditure are expected to have a negative effect on economic growth; whereas financial development is expected to have a positive sign. All the absorptive capacity factors and their interaction terms are also expected to have a positive sign.

The appendix provides a list of the countries included in the sample (Table A.1), as well as a table presenting descriptive statistics of the main variables used (Table A.2).

V- Results and Analysis

Initially, GROWTH is regressed on the chosen fixed control variables alone; namely, LOGINITIAL, SCHOOLING, POPULATION and INVESTMENT. All control variables are found to be significant. The results are shown in Table 1. The signs are all as expected; LOGINITAL and POPULATION have negative signs, whereas SCHOOLING and INVESTMENT are positively signed. The results indicate that a 1 year increase in SCHOOLING leads to a 0.19% increase in GROWTH. A 1% increase in investment as a percentage of GDP increases GROWTH by the same percentage.

Table 1.

	1.1	**1.2 (LS)**	**1.3 (IV)**
CONSTANT	2.234*	2.301*	2.942*
	(1.337)	(1.297)	(1.629)
LOGINITIAL	-0.593***	-0.599***	-0.598***
	(0.195)	(0.230)	(0.229)
SCHOOLING	0.189*	0.183*	0.098
	(0.100)	(0.106)	(0.126)
POPULATION	-0.243*	-0.243*	-0.236
	(0.138)	(0.131)	(0.167)
INVESTMENT	0.189***	0.188***	0.171***
	(0.025)	(0.029)	(0.031)
FDI		0.011	0.133
		(0.041)	(0.081)
Cross sections	45	45	45
Time periods	5	5	5
Observations	212	212	209
R^2	0.246	0.246	0.251

-Standard error is reported between brackets
-The significance level is indicated by (*). One (*) indicates significance at the 10% level, (**) indicates significance at the 5% level, while (***) indicates significance at the 1% level.

Adding FDI to the regression (specification 1.2) does not change any of the control variables' significance. Their coefficients are almost unchanged. However, FDI itself is insignificant. This of course could be due to the problem of endogeneity. The regression is run once more but employing the IV technique, using lagged FDI as an instrument for FDI. The results are shown in specification 1.3. The significance of LOGINITIAL and INVESTMENT are unchanged, and their coefficients are almost the same as those obtained in the previous specifications. However, SCHOOLING and POPULATION become insignificant. Most importantly, FDI is still insignificant. However, whereas the p-value was previously 0.79 in specification 1.2, it is 0.101. This indicates that the significance of FDI improves a lot with IV, becoming almost significant at the 10% significance level. There is also a clear increase in the coefficient of FDI, going from a mere 0.011 to 0.133.

Table 2 shows the results for specifications that include each extra control variable in addition to the fixed controls and FDI. FDI becomes significant in 3 cases only; specifications 2.2, 2.5 and 2.7. In other words, FDI becomes significant when either CREDIT, GOVEXP or time period dummy variables are included as extra control variables. The coefficient ranges from 0.13 to

0.16, implying that a 1% increase in FDI inflows as a percentage of GDP leads to an increase in GDP per capita growth anywhere from 0.13% to 0.16%.

As for human capital and schooling, the findings for testing whether SCHOOLING is a significant absorptive capacity factor are shown in Table 3. The results for the RE Least Squares specification indicate that neither FDI nor the interaction term are significant, although SCHOOLING is significant at the 10% significance level. However, in the IV specification, FDI becomes significant at the 5% significance level. The size of the coefficient of the FDI is much larger than that in the previous specification, indicating that a 1% increase in the FDI inflows as a percentage of GDP, leads to a 0.833% increase in per capita GDP growth rate, compared to an insignificant 0.165 coefficient in the previous specification. Therefore, FDI is significant when endogeneity is accounted for. This reinforces the previous finding that the Least Squares estimates are biased downwards.

The interaction term is also significant in the IV specification with a larger coefficient (in absolute value). However, the sign of the term is negative, contrary to expectations. In order to check for the sensitivity of the results, further control variables are added to the specification. These control variables are: TRADE, CREDIT, TURNOVER, WGI, INFLATION, GOVEXP, POLITICAL, geographical dummy variables, and time period dummy variables. Each of these is added one at a time. The results also appear in Table 3.

Out of the 9 new specifications, 8 indicate that FDI is significant, whereas 7 indicate that the SCHOOLING interaction term is significant. These results support the initial specification that lacked any extra control variables (3.1). In particular, the only specification that did not support a significant FDI is the one with the TURNOVER control variable (3.5). The coefficients of FDI ranged from a low of 0.795, when including the POLITICAL control variable, to a maximum of 1.07, when including the TRADE control variable. This implies that a 1% increase in FDI inflows as a percentage of GDP can raise GDP per capita growth rate anywhere between 0.795% and 1.07%.

The results suggest that FDI becomes significant when controlling for the effects of SCHOOLING as a channel for the spillover effects of FDI. Since FDI is insignificant in the base regression that includes SCHOOLING without its interaction term, then the significance of FDI with the addition of the SCHOOLING interaction term is solely attributed to the presence of the interaction term.

The SCHOOLING interaction term maintains its negative sign in all specifications regardless of the control variables. It is insignificant only when including either CREDIT or TURNOVER control variables. The coefficient of the schooling interaction term varies from -0.094 to -0.079. These results imply that an extra year of average schooling leads to a decrease in the spillovers of FDI to economic growth as measured by the per capita GDP growth rate. Given that the average of the SCHOOLING indicator for the sample is 7 years, then a 1% increase in FDI inflows as a percentage of GDP has the total effect of increasing GDP per capita growth between 0.243 and 0.419. For the initial specification, a 1% increase in FDI leads to a 0.268% total increase in per capita GDP growth.

Table 2

	2.1	**2.2**	**2.3**	**2.4**	**2.5**	**2.6**	**2.7**	**2.8**	**2.9**
CONSTANT	2.402	3.081*	2.294	5.494*	2.674*	3.112*	3.044*	5.400**	3.119*
	(1.820)	(1.646)	(1.617)	(2.549)	(1.515)	(1.616)	(1.647)	(2.437)	(1.646)
LOGINITIAL	-0.490*	-0.570**	-0.562**	-0.805*	-0.580***	-0.583**	-0.660***	-0.771**	-0.577**
	(0.274)	(0.231)	(0.220)	(0.315)	(0.207)	(0.227)	(0.253)	(0.305)	(0.231)
SCHOOLING	0.058	0.079	0.123	0.093	0.096	0.090	0.092	0.087	0.094
	(0.149)	(0.127)	(0.115)	(0.147)	(0.115)	(0.124)	(0.127)	(0.153)	(0.133)
POPULATION	-0.212	-0.234	-0.271*	-0.195	-0.239	-0.247	-0.233	-0.173	-0.264
	(0.183)	(0.168)	(0.152)	(0.191)	(0.151)	(0.165)	(0.167)	(0.199)	(0.183)
INVESTMENT	0.174***	0.178***	0.177***	0.148***	0.172***	0.165***	0.172***	0.143***	0.166***
	(0.033)	(0.032)	(0.029)	(0.037)	(0.028)	(0.031)	(0.031)	(0.039)	(0.032)
FDI	0.227	0.159*	0.103	0.043	0.130*	0.124	0.148*	0.071	0.125
	(0.164)	(0.084)	(0.073)	(0.111)	(0.074)	(0.080)	(0.087)	(0.097)	(0.082)
TRADE	-0.011								
	(0.013)								
CREDIT		-0.008							
		(0.006)							
TURNOVER			0.003						
			(0.003)						
WGI				0.749					
				(0.638)					
PERIOD2					0.468				
					(0.571)				
PERIOD3					-0.736				
					(0.585)				
PERIOD4					1.467**				
					(0.593)				
PERIOD5					-0.702				
					(0.636)				
INFLATION						-0.002			
						(0.001)			
GOVEXP							0.026		
							(0.043)		
POLITICAL								0.524	
								(0.379)	
AFRICA									-0.553
									(0.623)
LATIN									-0.298
									(0.616)
EUROPE									-0.141
									(0.680)
Cross sections	45	45	42	45	45	45	45	45	45
Time periods	5	5	5	5	5	5	5	5	5
Observations	209	209	187	176	209	209	209	176	209
R^2	0.203	0.249	0.288	0.265	0.358	0.267	0.246	0.257	0.260

Table 3

	3.1 (LS)	**3.2**	**3.3**	**3.4**	**3.5**	**3.6**	**3.7**	**3.8**	**3.9**	**3.10**	**3.11**
CONSTANT	2.013	1.935	1.031	2.045	1.919	4.123**	2.112	2.020	4.186***	2.242	1.632
	(1.242)	(1.623)	(1.920)	(1.794)	(1.473)	(1.796)	(1.549)	(1.647)	(1.584)	(1.620)	(1.928)
LOGINITIAL	-	-	-0.432	-0.552**	-	-	-	-	-	-	-0.561**
	(0.220)	(0.219)	(0.269)	(0.243)	(0.198)	(0.205)	(0.209)	(0.246)	(0.186)	(0.222)	(0.255)
SCHOOLING	0.212*	0.269*	0.240	0.256*	0.217*	0.274**	0.260*	0.270*	0.257**	0.241*	0.281
	(0.114)	(0.146)	(0.160)	(0.162)	(0.124)	(0.124)	(0.139)	(0.148)	(0.121)	(0.144)	(0.172)
POPULATION	-0.253**	-0.304*	-0.281	-0.305*	-0.302**	-0.281**	-0.314**	-0.303*	-0.252**	-0.254	-0.318*
	(0.128)	(0.164)	(0.178)	(0.181)	(0.139)	(0.122)	(0.156)	(0.166)	(0.121)	(0.176)	(0.191)
INVESTMENT	0.185***	0.159***	0.161***	0.166***	0.170***	0.135***	0.154***	0.159***	0.132***	0.150***	0.159***
	(0.029)	(0.031)	(0.033)	(0.034)	(0.027)	(0.024)	(0.029)	(0.031)	(0.024)	(0.032)	(0.036)
FDI	0.165	0.833**	1.070**	0.894**	0.426	0.848**	0.813**	0.885**	0.795**	0.952**	0.893*
	(0.226)	(0.391)	(0.524)	(0.438)	(0.260)	(0.374)	(0.372)	(0.406)	(0.345)	(0.442)	(0.454)
TRADE			-0.015								
			(0.014)								
CREDIT				-0.009							
				(0.006)							
TURNOVER					0.003						
					(0.003)						
WGI						0.555					
						(0.425)					
SCHOOLING*FDI	-0.017	-0.081*	-0.093*	-0.084	-0.037	-0.086**	-0.079*	-0.084*	-0.079**	-0.094*	-0.088*
	(0.023)	(0.043)	(0.050)	(0.047)	(0.028)	(0.038)	(0.041)	(0.044)	(0.037)	(0.048)	(0.050)
INFLATION							-0.002				
							(0.001)				
GOV EXP								0.034			
								(0.043)			
POLITICAL									0.431*		
									(0.232)		
AFRICA										-0.570	
										(0.598)	
LATIN										-0.358	
										(0.591)	
EUROPE										0.715	
										(0.792)	
PERIOD2											0.312
											(0.711)
PERIOD3											-0.814
											(0.725)
PERIOD4											1.405*
											(0.734)
PERIOD5											-0.661
											(0.785)
Cross sections	45	45	45	45	42	45	45	45	45	45	45
Time periods	5	5	5	5	5	4	5	5	4	5	5
Observations	212	209	209	209	187	176	209	209	176	209	209
R^2	0.255	0.255	0.192	0.254	0.315	0.184	0.270	0.247	0.200	0.255	0.348

A negative SCHOOLING interaction term signifies that the lower the SCHOOLING, the greater the FDI spillovers. Although this unexpected finding rejects the claimed hypothesis and is in contradiction with the findings of some widely-cited literature, such as Borensztein *et al*. (1998), it is not unheard of in the literature. For instance, Hermes and Lensink (2003) find that the schooling interaction term is significant only when INVESTMENT is left out of the regression. Kinoshita and Lu (2006) find the human capital interaction term with FDI negative and significant in several of their specifications. Their comment on that result is that it "suggests that the effect of FDI on growth is not necessarily conditional on educational attainment." Darrat *et al*. (2005) also find the human capital interaction term negative, yet insignificant. Carkovic and Levine (2005) find the human capital interaction term negative and significant in various specifications. They note that the results do not agree with those expected, yet do not provide a satisfactory explanation of such a finding. It is also worth noting that although Borensztein *et al*. (1998) find the schooling interaction term significant, they find FDI insignificant and negatively signed. They argue that "most likely, the estimates result from the linearization of what is probably a nonlinear interaction between FDI and human capital" (Borensztein *et al*., 1998).

To test for the robustness of the estimates for schooling, 4 other proxies are used: SECONDARY25, which is the average years of secondary education for those aged 25 and above, TERTIARY25, the average years of tertiary education for those aged 25 and above, ATTAINMENT, secondary attainment, and SECONDARYMALE, which is the average years of schooling for males 15 years of age and above.

The results in Table 4 indicate that FDI is only significant with the proxies SECONDARY25 and SECONDARYMALE, whereas the interaction term is significant only with SECONDARY25. The interaction term still carries a negative sign with all the proxies. TIMSS is also tried as a proxy for education, but R^2 drops significantly, and none of the variables is found to be significant.

The main conclusion in this case is that the number of years of schooling is not an absorptive capacity factor. It is not a prerequisite for better absorption of the benefits spilled over by FDI. One interpretation of the significant negative coefficient of the SCHOOLING variable is that a lower level of SCHOOLING gives greater room for spillover effects because there is a lot to learn from the FDI. Any training, managerial knowledge, or new know-how is of great value to the economy because the value-added is large since the starting point in the host country is very low. The higher the SCHOOLING level, the less the extra benefit to the economy because the economy is already at a high-standing when it comes to knowledge and know-how. Accordingly, the results imply that the lower the level of schooling, the greater the pressure for change, and the greater the opportunity for the host country to benefit from FDI spillovers. This is similar to Findlay's (1978) technology gap argument that was previously-mentioned, although Findlay (1978) discusses the technology gap and not schooling.

The computed threshold level varies from 9.9 years to 11.5 years. In the initial specification the threshold is 10.3 years of average schooling. However, it must be noted that the computed threshold level indicates that if average schooling for a given country is above that level, the total effect of FDI on GDP per capita growth is negative, whereas if average schooling falls below that level, the total spillover effect will be positive. Only 24 of the 204 observations in the sample lie above the 10.3 years threshold. These observations belong to the following countries: Czech Republic, Estonia, Hungary, Korea, Latvia (only the most recent observation), Lithuania, Romania (only the most recent observation) and Slovak Republic. This implies that FDI inflows to all the remaining countries have a positive spillover effect.

Moreover, the sample is tested for the presence of a significant difference between the coefficient of the FDI for observations that are above the threshold and those that are below. No significant difference is found. This indicates that the computed threshold level might not really reflect a solid number beyond which FDI contributes negatively to the efficiency of the domestic economy. Similarly, the sample is also tested for the presence of a significant difference between the results for those observations enjoying an above-median SCHOOLING level, and those lying below the median. Again, no significant difference is found. The results are shown in Table 4.

Table 4

	4.1 SECONDARY25	**4.2 TERTIARY25**	**4.3 ATTAINMENT**	**4.4 SECONDARYMALE**	**4.5 TIMSS**	**4.6 threshold:10.3**	**4.7 median**
CONSTANT	3.376**	2.811	2.746*	2.676	1.661	2.587	2.617
	(1.886)	(2.553)	(1.653)	(1.867)	(7.148)	(2.197)	(1.825)
LOGINITIAL	-0.758***	-0.581*	-0.532***	-0.601**	-0.289	-0.608**	-0.583**
	(0.266)	(0.320)	(0.204)	(0.246)	(0.749)	(0.302)	(0.255)
SCHOOLING	0.785*	2.422	0.031	0.528	0.001	0.156	0.173
	(0.407)	(2.259)	(0.035)	(0.391)	(0.006)	(0.180)	(0.149)
POPULATION	-0.210	-0.303	-0.304**	-0.259	-0.361	-0.260	-0.240
	(0.164)	(0.214)	(0.146)	(0.162)	(0.410)	(0.222)	(0.186)
INVESTMENT	0.156***	0.164***	0.160***	0.150***	0.096	0.177***	0.154***
	(0.036)	(0.050)	(0.033)	(0.038)	(0.103)	(0.042)	(0.037)
FDI	0.498**	0.456	0.311	0.539*	0.324	0.139	0.340*
	(0.246)	(0.307)	(0.193)	(0.287)	(1.120)	(0.106)	(0.185)
SCHOOLING*FDI	-0.121*	-0.684	-0.006	-0.118	0.000		
	(0.073)	(0.579)	(0.006)	(0.077)	(0.001)		
FDI*THRESHOLD						-0.144	-0.243
						(0.163)	(0.179)
Cross sections	45	45	45	45	31	45	45
Time periods	5	5	5	5	4	5	5
Observations	209	209	209	209	84	209	209
R^2	0.256	0.220	0.280	0.250	0.082	0.283	0.272

-For specifications 4.1-4.5 the variable in the heading of the column is the variable used in place of SCHOOLING, both as a standalone variable and in the interaction term.

Table 5

	5.1 (LS)	**5.2**	**5.3**	**5.4**	**5.5**	**5.6**	**5.7**	**5.8**	**5.9**	**5.10**
CONSTANT	1.118	5.906	6.667	3.943	8.010*	3.258	5.954	4.665	7.772	5.178
	(2.185)	(6.543)	(6.983)	(6.573)	(4.094)	(4.632)	(6.511)	(6.355)	(6.379)	(7.041)
LOGINITIAL	-0.540*	-0.903	-0.883	-0.650	-1.131**	-0.722	-0.847	-1.096	-1.015	-0.885
	(0.300)	(0.740)	(0.765)	(0.721)	(0.447)	(0.510)	(0.737)	(0.764)	(0.679)	(0.753)
SCHOOLING	0.367**	0.440	0.410	0.461	0.512**	0.323	0.377	0.341	0.399	0.415
	(0.169)	(0.319)	(0.328)	(0.284)	(0.195)	(0.220)	(0.319)	(0.312)	(0.293)	(0.345)
POPULATION	-0.119	-0.096	-0.054	-0.134	-0.021	-0.065	-0.178	-0.067	-0.085	-0.069
	(0.161)	(0.370)	(0.390)	(0.325)	(0.212)	(0.251)	(0.370)	(0.369)	(0.332)	(0.410)
INVESTMENT	0.090*	0.114	0.110	0.137*	0.117**	0.106*	0.084	0.115	0.109	0.111
	(0.046)	(0.082)	(0.084)	(0.077)	(0.046)	(0.056)	(0.083)	(0.081)	(0.074)	(0.082)
FDI	0.016	-0.460	-0.433	-0.579	-0.732	-0.116	-0.382	-0.527	-0.517	-0.422
	(0.317)	(1.091)	(1.126)	(0.974)	(0.660)	(0.798)	(1.086)	(1.095)	(0.979)	(1.151)
CREDIT			-0.010							
			(0.011)							
TURNOVER				-0.007						
				(0.008)						
WGI					0.191					
					(0.731)					
TIMSS	0.002	-0.002	-0.002	-0.002	-0.003	0.000	0.000	-0.001	-0.002	-0.001
	(0.002)	(0.006)	(0.006)	(0.006)	(0.003)	(0.004)	(0.006)	(0.006)	(0.005)	(0.006)
TIMSS*FDI	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
PERIOD3						-0.920				
						(0.862)				
PERIOD4						1.678				
						(0.853)				
PERIOD5						-0.735				
						(0.971)				
INFLATION							-0.046**			
							(0.023)			
GOVEXP								0.140		
								(0.097)		
POLITICAL									0.498	
									(0.738)	
AFRICA										0.461
										(1.538)
LATIN										0.098
										(2.109)
EUROPE										0.173
										(1.264)
Cross sections	31	31	31	29	31	31	31	31	31	31
Time periods	4	4	4	4	4	4	4	4	4	4
Observations	84	84	84	82	84	84	84	84	84	84
R^2	0.209	0.127	0.115	0.207	0.086	0.379	0.321	0.132	0.164	0.135

Table 6

	6.1 TIMSSLOW	**6.2 TIMSSADV**	**6.3 (threshold)**
CONSTANT	5.520	3.490	4.583
	(6.456)	(5.582)	(5.145)
LOGINITIAL	-0.921	-0.764	-0.887
	(0.843)	(0.809)	(0.738)
SCHOOLING	0.427	0.442	0.388
	(0.365)	(0.350)	(0.280)
POPULATION	-0.041	-0.199	-0.067
	(0.444)	(0.378)	(0.369)
INVESTMENT	0.106	0.119	0.099
	(0.094)	(0.089)	(0.072)
FDI	-0.399	-0.038	-0.221
	(0.938)	(0.219)	(0.807)
TIMSS	-0.013	-0.034	
	(0.048)	(0.041)	
TIMSS*FDI	0.006	0.006	
	(0.011)	(0.007)	
FDI*THRESHOLD			0.000
			(0.001)
Cross sections	31	31	31
Time periods	4	4	4
Observations	84	84	84
R^2	0.104536	0.213949	0.143

-For specifications 6.1-6.2 the variable in the heading of the column is the variable used in place of TIMSS, both as a standalone variable and in the interaction term.

The results for **cognitive ability** are very fragile. The regression as a whole is not doing so well. Even the fixed control variables that usually maintain a significant correctly-signed coefficient become insignificant when TIMSS is tested for absorptive capacity. In the Least Squares specification FDI,

TIMSS and its interaction term are insignificant. However, the fact that SCHOOLING becomes significant at the 5% significance level implies that when controlling for cognitive ability, the number of years of schooling becomes significant for economic growth.

Turning to the IV specification, everything falls apart. Nothing in the regression is significant. This can be seen in Table 5. Things are not much better when extra control variables are added. In some specifications some of the fixed control variables become significant, but in no case does FDI, TIMSS or the interaction term become significant. R^2 in general is very low. Testing for a threshold effect (shown in Table 6) does not lead anywhere, with everything insignificant again.

In an attempt to test further the robustness of the results, two other proxies for cognitive ability are used. Instead of using the average TIMSS score, the percentage of students reaching both the low and advanced benchmarks are used. These are identified as TIMSSLOW and TIMSSADV, respectively. The results, shown in Table 6, confirm the previous findings. These results could indicate that the quality of education, represented by the cognitive ability of students, is not an absorptive capacity factor. However, these results must be dealt with cautiously since the sample size is relatively small, especially in the context of an RE Panel model. Nevertheless, given the results that emerge when using the SCHOOLING variable, if countries with less years of schooling benefit more from FDI in terms of knowledge and technology spillovers, then it is only normal for quality of education to be irrelevant for such spillovers.

Trade openness has also been tested for its importance as an absorptive capacity factor. In specification 7.1, neither FDI nor the interaction term is significant. This does not change after using an instrument for FDI, although the coefficients increase. TRADE, however, goes from significant to insignificant when using an instrument for FDI (specification 7.2). The insignificance of FDI, TRADE and the interaction term recurs in all specifications that deal with trade openness. When including the extra control variables, one at a time, similar results emerge (Table 7). Not once do any of these terms become significant.

Looking at the dummy variable approach, dividing the sample according to a country's position relative to the median leads to the following conclusion: there is no significant difference between those below and those above the median with respect to the TRADE variable. The results are shown in Table 8, specification 8.2.

The value of exports as a percentage of GDP, EXPORTS, is used instead of the trade openness measure. This is to test whether greater exports facilitate the spillover effects of FDI, since Balasubramanyam *et al*. (1996) found that FDI benefits spillovers are promoted by the export-promoting policies. However, the results (specification 8.3) reinforce those of the TRADE variable, where both the interaction term and the FDI are insignificant, as well as the EXPORTS variable. Obviously, the findings imply that trade openness and export-orientedness do not necessarily promote FDI spillover effects.

Table 7

	7.1 (LS)	**7.2**	**7.3**	**7.4**	**7.5**	**7.6**	**7.7**	**7.8**	**7.9**	**7.10**
CONSTANT	2.965*	2.400	2.613	1.815	5.388*	2.099	2.532	2.510	5.398*	2.193
	(1.585)	(1.801)	(1.824)	(1.763)	(2.860)	(1.697)	(1.784	(1.822)	(2.802	(1.850)
LOGINITIAL	-	-0.488*	-0.479*	-0.478*	-0.716*	-0.463*	-0.465*	-0.545*	-0.695*	-0.339
	(0.270)	(0.272)	(0.274)	(0.255)	(0.374)	(0.248)	(0.269)	(0.302)	(0.369)	(0.306)
SCHOOLING	0.163	0.052	0.035	0.122	0.064	0.045	0.053	0.055	0.083	0.052
	(0.115)	(0.161)	(0.162)	(0.146)	(0.195)	(0.145)	(0.159)	(0.161)	(0.202)	(0.161)
POPULATION	-0.278**	-0.215	-0.222	-0.240	-0.150	-0.219	-0.218	-0.211	-0.106	-0.272
	(0.128)	(0.185)	(0.186)	(0.167)	(0.219)	(0.170)	(0.183)	(0.186)	(0.230)	(0.202)
INVESTMENT	0.180***	0.173***	0.178***	0.184***	0.154***	0.174***	0.169***	0.174***	0.150***	0.161***
	(0.032)	(0.034)	(0.035)	(0.033)	(0.042)	(0.032)	(0.034)	(0.034)	(0.044)	(0.036)
FDI	0.037	0.236	0.256	0.127	0.097	0.260	0.213	0.234	0.084	0.308
	(0.088)	(0.198)	(0.200)	(0.176)	(0.237)	(0.186)	(0.197)	(0.199)	(0.244)	(0.223)
TRADE	0.014*	-0.010	-0.007	-0.014	-0.021	-0.009	-0.013	-0.010	-0.025	-0.021
	(0.009)	(0.017)	(0.018)	(0.016)	(0.022)	(0.016)	(0.017)	(0.018)	(0.023)	(0.022)
CREDIT			-0.007							
			(0.006)							
TURNOVER				0.003						
				(0.003)						
WGI					0.947					
					(0.696)					
TRADE*FDI	-0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
PERIOD2						0.437				
						(0.621)				
PERIOD3						-0.779				
						(0.639)				
PERIOD4						1.469**				
						(0.647)				
PERIOD5						-0.901				
						(0.733)				
INFLATION							-0.002			
							(0.001)			
GOVEXP								0.021		
								(0.048)		
POLITICAL									0.683	
									(0.444)	
AFRICA										-0.655
										(0.668)
LATIN										-1.064
										(0.907)
EUROPE										-0.672
										(0.844)
Cross sections	45	45	45	42	45	45	45	45	45	45
Time periods	5	5	5	5	4	5	5	5	5	5
Observations	213	209	209	187	176	209	209	209	176	209
R^2	0.250	0.204	0.208	0.247	0.215	0.319	0.214	0.199	0.193	0.159

Table 8

	8.1	**8.2 Median**	**8.3 EXPORTS**
CONSTANT	1.033	2.380	2.369
	(1.755)	(1.826)	(1.839)
LOGINITIAL	-0.432*	-0.491*	-0.482*
	(0.247)	(0.270)	(0.278)
SCHOOLING	0.239	0.058	0.049
	(0.157)	(0.147)	(0.165)
POPULATION	-0.282*	-0.213	-0.214
	(0.166)	(0.181)	(0.189)
INVESTMENT	0.161***	0.174**	0.174***
	(0.031)	(0.033)	(0.035)
FDI	1.071**	0.237	0.243
	(0.484)	(0.223)	(0.202)
TRADE	-0.015	-0.010	-0.010
	(0.016)	(0.015)	(0.018)
TRADE*FDI	0.000		0.000
	(0.001)		(0.001)
SCHOOLING*FDI	-0.093**		
	(0.045)		
FDI*THRESHOLD		-0.014	
		(0.207)	
Cross sections	45	45	45
Time periods	5	5	5
Observations	209	209	209
R^2	0.192	0.206	0.200

-For specifications 8.3 EXPORTS is the variable used in place of TRADE, both as a standalone variable and in the interaction term.

Since the SCHOOLING interaction term was found to be significant in most specifications examining it, specification 7.2 is run once more but with the SCHOOLING interaction term included this time. This is represented as specification 8.1 in Table 8. When including it with the other absorptive capacity factors and their interaction terms, the SCHOOLING interaction term is significant in both specifications. The results are consistent with the previous findings. The significance of the trade interaction term is not affected by the inclusion of the SCHOOLING interaction term. However, the effect on FDI is important. FDI becomes significant.

Another absorptive capacity factor examined is **institutional quality**, proxied by WGI. In the first specification (9.1), WGI and its interaction term are both significant; yet FDI is insignificant. Running the IV regressions maintains a significant WGI, yet renders its interaction term insignificant. The FDI variable remains insignificant, although the size of its coefficient is much larger. The results are reported in Table 9. Adding other extra control variables does not change the results[2]. As can be seen, in Table 9 in all specifications both FDI and the WGI interaction term are insignificant.

To further test for the robustness of the results, different proxies are used for institutions. These are the 5 components used to make up the WGI index. In all 5 cases FDI and the proxy's interaction term are insignificant; except in the case of GOVEFF. In that case, FDI remains insignificant, yet the proxy's interaction term is significant at the 10% significance level. Results are reported in Table 10. Furthermore, the SCHOOLING interaction term is added to the specification to test for its influence as has been done with the TRADE analysis. The results appear in Table 10, specification 10.1. The inclusion of the SCHOOLING interaction term turns FDI significant, without affecting the significance of the WGI interaction term. The SCHOOLING interaction term itself is also significant. The results indicate that the quality of institutions does not act as a mediator for FDI spillovers.

Do **low and high income** countries have different outcomes? To check for the influence of mixing high-income countries with lower-income ones in the sample, the FDI variable is interacted with the HIGH dummy variable. The results are presented in 11.1. It does not appear that there is a significant difference in the effect of FDI on GROWTH depending on the income category to which the country belongs. FDI itself is still insignificant in this specification. To carry on the investigation further, the dummy variable HIGH is interacted with all the variables and not only FDI. This is to separate the effect of the 2 categories with respect to all variables. The results in 11.2 indicate that all the interaction terms are insignificant, and thus there is no significant difference between these high-income countries and lower-income ones. Furthermore, each interaction term has been tested for the same purpose. As the results indicate, there is no significant difference with respect to the significance of the absorptive capacity factors as channels of FDI spillover to economic growth. The importance of the examined absorptive capacity factors does not vary depending on the income-categorization of the country.

[2] The control variable POLITICAL has not been examined with WGI since POLITICAL is one of the constituents of the WGI measure.

Table 9

	9.1 (LS)	**9.2**	**9.3**	**9.4**	**9.4**	**9.5**	**9.6**	**9.7**	**9.8**
CONSTANT	5.961***	5.342**	5.226*	6.736**	5.204**	5.267**	5.363**	5.602**	5.599**
	(1.832)	(2.488)	(2.765)	(2.660)	(2.169)	(2.464)	(2.545)	(2.486)	(2.521)
LOGINITIAL	-0.801***	-0.717**	-0.671*	-0.771**	-0.818***	-0.656**	-0.694**	-0.862**	-0.700**
	(0.250)	(0.318)	(0.362)	(0.327)	(0.272)	(0.307)	(0.327)	(0.351)	(0.320)
SCHOOLING	0.062	-0.004	-0.015	-0.053	0.134	-0.033	-0.010	0.004	-0.015
	(0.109)	(0.169)	(0.188)	(0.175)	(0.135)	(0.159)	(0.173)	(0.169)	(0.173)
POPULATION	-0.221**	-0.217	-0.194	-0.212	-0.191	-0.234	-0.235	-0.199	-0.227
	(0.104)	(0.186)	(0.210)	(0.191)	(0.152)	(0.179)	(0.193)	(0.187)	(0.206)
INVESTMENT	0.147***	0.141***	0.144***	0.145***	0.138***	0.140***	0.138***	0.143***	0.133***
	(0.028)	(0.037)	(0.041)	(0.038)	(0.032)	(0.036)	(0.038)	(0.037)	(0.039)
FDI	0.021	0.193	0.222	0.207	0.097	0.233	0.183	0.192	0.204
	(0.047)	(0.184)	(0.216)	(0.189)	(0.145)	(0.184)	(0.189)	(0.183)	(0.187)
TRADE			-0.010						
			(0.016)						
CREDIT				-0.012*					
				(0.007)					
TURNOVER					0.003				
					(0.003)				
WGI	1.447***	1.144*	1.131	1.601**	0.873	1.216*	1.110	1.080	1.183*
	(0.382)	(0.672)	(0.746)	(0.728)	(0.600)	(0.663)	(0.689)	(0.680)	(0.691)
WGI*FDI	-0.091*	-0.136	-0.095	-0.147	-0.060	-0.174	-0.132	-0.112	-0.150
	(0.048)	(0.118)	(0.145)	(0.121)	(0.093)	(0.113)	(0.121)	(0.122)	(0.122)
PERIOD3						-1.165**			
						(0.573)			
PERIOD4						1.085*			
						(0.577)			
PERIOD5						-1.007			
						(0.683)			
INFLATION							-0.003		
							(0.004)		
GOVEXP								0.051	
								(0.053)	
AFRICA									-0.421
									(0.722)
LATIN									-0.494
									(0.719)
EUROPE									-0.034
									(0.767)
Cross sections	45	45	45	45	42	45	45	45	45
Time periods	4	4	4	4	4	4	4	4	4
Observations	176	176	176	176	159	176	176	176	176
R^2	0.296	0.254	0.223	0.274	0.284	0.375	0.261	0.253	0.258

Table 10

	10.1	**10.2 Median**	**10.3 CORRUPTION**	**10.4 REGULATORY**	**10.5 POLITICAL**	**10.6 LAW**	**10.7 GOVEFF**
CONSTANT	4.348**	5.458**	5.379**	2.919	5.338**	4.259*	5.579***
	(1.747)	(2.266)	(2.509)	(2.595)	(2.163)	(2.261)	(1.817)
LOGINITIAL	-0.718***	-0.789***	-0.749**	-0.469	-0.737***	-0.608**	-0.730***
	(0.209)	(0.281)	(0.322)	(0.377)	(0.276)	(0.296)	(0.237)
SCHOOLING	0.162	0.076	0.037	-0.004	0.045	-0.009	-0.010
	(0.127)	(0.132)	(0.172)	(0.207)	(0.155)	(0.168)	(0.131)
POPULATION	-0.298**	-0.214	-0.240	-0.248	-0.196	-0.211	-0.225
	(0.120)	(0.170)	(0.198)	(0.231)	(0.180)	(0.185)	(0.145)
INVESTMENT	0.127***	0.146***	0.145***	0.147***	0.143***	0.140***	0.135***
	(0.024)	(0.033)	(0.039)	(0.045)	(0.035)	(0.037)	(0.029)
FDI	0.896**	0.198	0.144	0.298	0.136	0.273	0.185
	(0.377)	(0.196)	(0.164)	(0.256)	(0.149)	(0.179)	(0.131)
WGI	0.901**	1.086*	1.023	0.418	0.724	0.813	1.383**
	(0.446)	(0.628)	(0.670)	(0.673)	(0.453)	(0.590)	(0.519)
WGI*FDI	-0.118		-0.092	-0.146	-0.092	-0.177	-0.138*
	(0.076)		(0.090)	(0.140)	(0.150)	(0.133)	(0.078)
SCHOOLING*FDI	-0.075**						
	(0.036)						
THRESHOLD*FDI		-0.188					
		(0.187)					
Cross sections	45	45	45	45	45	45	45
Time periods	4	4	4	4	4	4	4
Observations	176	176	176	176	176	176	176
R^2	0.154	0.277	0.258	0.210	0.255	0.198	0.270

-For specifications 10.3-10.7 the variables in the heading of the column are used in place of WGI, both as a standalone variable and in the interaction term.

Table 11

	11.1	**11.2**	**11.3 SCHOOLING**	**11.4**	**11.5**	**11.6 SCHOOLING**	**11.7 TRADE**	**11.8**
CONSTANT	2.437	7.101**	2.148	2.376	6.110**	1.937	2.927**	5.027**
	(2.060)	(3.340)	1.827	(2.371)	(2.078)	1.747	(1.415)	(2.468)
LOGINITIAL	-0.529*	-1.098**	-0.621**	-0.484	-0.775**	-0.584**	-0.542**	-0.724**
	(0.289)	(0.453)	0.255	(0.358)	(0.255)	0.236	(0.216)	(0.304)
SCHOOLING	0.081	0.098	0.289*	0.053	-0.024	0.268	0.059	0.007
	(0.148)	(0.254)	0.170	(0.204)	(0.139)	0.163	(0.128)	(0.159)
POPULATION	-0.236	-0.522	-0.307*	-0.215	-0.231	-0.307	-0.321**	-0.065
	(0.191)	(0.367)	0.179	(0.234)	(0.150)	0.190	(0.151)	(0.316)
INVESTMENT	0.170***	0.154***	0.158**	0.173***	0.136**	0.159**	0.183***	0.141**
	(0.036)	(0.053)	0.034	(0.043)	(0.030)	0.034	(0.027)	(0.035)
FDI	0.189	0.276	0.866*	0.231	0.200	0.831*	0.176	0.241
	(0.143)	(0.230)	0.445	(0.289)	(0.149)	0.433	(0.170)	(0.216)
TRADE				-0.010			-0.017	
				(0.023)			(0.014)	
WGI					1.623**			1.393*
					(0.708)			(0.819)
LOGINITIAL*HIGH		0.363						
		(0.436)						
POPULATION*HIGH		0.192						
		(0.521)						
INVESTMENT*HIGH		0.040						
		(0.102)						
FDI*HIGH	-0.070	-0.206						
	(0.129)	(0.263)						
SCHOOLING*FDI			-0.089*			-0.080*		
			0.053			0.047		
TRADE*FDI				0.000			0.001	
				(0.005)			(0.001)	
WGI*FDI					-0.368			-0.179
					(0.239)			(0.156)
ABC*FDI*HIGH			0.005	0.000	0.211			
			0.012	(0.003)	(0.176)			
ABC*FDI*MENA						0.001	0.004	-0.545
						0.021	(0.003)	(0.954)
Cross sections	45	45	45	45	45	45	45	45
Time periods	5	5	5	5	4	5	5	4
Observations	209	209	209	209	176	209	209	176
R^2	0.255	0.305	0.252	0.204	0.268	0.255	0.132	0.193

-ABC stands for any absorptive capacity factor depending on the specification.

This is contrary to the findings of Blonigen and Wang (2005), who title their study "Inappropriate Pooling of Wealthy and Poor Countries in Empirical FDI Studies." However, a closer analysis of the article points out that the authors use the word "wealthy" as synonymous to "developed" and "poor" as synonymous to "developing". Their examination is not really built on distinguishing between wealthy and poor countries, but rather between developed and developing countries. In that effect, they find it necessary to separate developed and developing countries when it comes to FDI empirical studies.

In this study, the sample is made up of Emerging and MENA countries, yet as previously mentioned, some of them are categorized as high-income just like the developed countries. However, according to the evidence, the fact that they share the high-income categorization with the developed countries, they do not differ in terms of FDI influence and absorptive capacity from the other developing countries. Moreover, in their study of whether FDI accelerates economic growth, Carkovic and Levine (2005) follow Blonigen and Wang's (2005) lead and limit their sample to developing countries in an attempt to conduct a sensitivity analysis on their findings. However, the conclusions did not differ from those obtained from their original sample pooling developing and developed countries.

In an attempt to discover whether the **MENA** region differs with any respect in terms of the significance of the absorptive capacity factors, the MENA dummy variable is interacted with the different factor interaction terms. The results, shown in Table 11, indicate that there is no significant difference between the MENA countries and the other Emerging economies in terms of absorptive capacity factors.

VI- Conclusion

This study examines the existence of FDI spillovers and its dependence on certain absorptive capacity factors. The study carries out its investigation over the period 1990 – 2009 for 45 Emerging and MENA economies. Endogeneity of FDI is taken into account and the results are compared to those obtained through Least Squares. The findings refute the claim that there are no significant FDI spillovers. FDI spillovers are present and have a positive impact on the host economy when controlling for the number of years of schooling as a factor of absorptive capacity in Emerging and MENA economies. Furthermore, in all cases, with no exception, the FDI coefficient is larger when using an instrument for FDI. This implies that the Least Squares approach does indeed provide biased estimates, and it indicates that the bias is downwards; that is, Least Squares underestimates the impact of FDI.

The findings in our model do not support that human capital, trade openness and institutional quality are significant mediating factors of FDI spillovers to the host economy in Emerging and MENA economies. As a matter of fact, when it comes to the number of years of schooling, the findings show that a lower level of schooling is associated with higher FDI spillovers. These results, however, should be investigated further. It could be the case that the factors needed to mediate FDI spillovers vary in significance according to the sector receiving the FDI inflows. Such analysis could explain the results obtained in this study. It might be the case that the dominating FDI target sector in the sample is one that does not require the examined factors for mediating spillovers, while sectors that indeed require such absorptive capacity factors are of a smaller size, and hence do not contribute significantly when investigating the impact of FDI at the aggregate level.

The evidence presented in this study suggests that efforts should continue to support FDI inflows and encourage them, since overall, FDI does indeed seem to have positive spillovers regardless of trade openness or institutional quality. The findings imply that economies suffering from low schooling levels should not despair. Their low schooling levels do not necessarily mean they will be deprived of the benefits of FDI knowledge and technology spillovers; on the contrary, they stand a better chance from gaining from the inflowing FDI.

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Appendix

Table A.1. Countries in the sample

Algeria	Colombia	Iran	Mexico	Russia	Tunisia
Argentina	Czech Republic	Jordan	Morocco	Saudi Arabia	Turkey
Bahrain	Egypt	Korea	Pakistan	Singapore	United Arab Emirates
Bangladesh	Estonia	Kuwait	Peru	Slovak Republic	Vietnam
Brazil	Hong Kong	Latvia	Philippines	South Africa	Yemen
Bulgaria	Hungary	Lithuania	Poland	Sri Lanka	
Chile	India	Malaysia	Qatar	Syria	
China	Indonesia	Mauritius	Romania	Thailand	

Table A.2. Descriptive Statistics

	GROWTH	FDI	SCHOOLING	TIMSS	TRADE	WGI
mean	2.95	3.52	7.00	930.50	45.53	0.07
median	2.97	2.24	7.05	944.33	37.02	0.01
minimum	-4.62	-1.94	0.28	508.00	7.35	-1.23
maximum	9.71	29.44	13.09	1188.95	221.64	1.82