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FDI and growth: A new look at a still puzzling issue

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La relation IDE-croissance : une décomposition des effets directs et indirects

Résumé

Dans cet article, nous soutenons l'idée que c'est une mauvaise spécification des modèles qui peut expliquer la difficulté des études empiriques à proposer une évaluation robuste et convergente de l'effet des IDE sur la croissance. Nous construisons pour évaluer la complexité de la relation IDE/Croissance un modèle structurel avec attraction endogène des FDI, en données de panel, pour un échantillon de pays du sud et de l'Est de la méditerranée (MENA). Dans nos estimations, les effets directs des IDE sur la croissance ne sont pas significatifs mais il existe des mécanismes de transmission indirects qui passent par les exportations ou la formation de capital humain.

Mots-clés : IDE, croissance, attractivité, pays MENA, équations simultanées

FDI and growth: A new look at a still puzzling issue

Abstract

In this paper, we argue that the inadequacy of their underlying formal model can explain the failure of the existing empirical studies to exhibit a robust and convergent estimation of the effect of FDI on growth. We build a structural model of growth with endogenous attraction to FDI, and we estimate it on panel data for a sample of Middle East and North Africa countries (MENA). Direct effects of FDI on growth are not significant, and we show that FDI is not only responsive to growth, but it is also likely to promote increases of GDP through indirect channels as it spurs the formation of human capital and exports.

Keywords: FDI, growth, attraction, MENA, simultaneous equations

JEL: F21, F43, O11, O15

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An ever growing series of developing countries have introduced attraction of FDI measures as part of their ongoing structural reforms. These measures frequently act as investment promotion device or incentives and they bear a cost that is supposed to be more than balanced by the beneficial effects of FDI on growth and employment. Investment from multinational corporations is indeed believed to stimulate growth by the way of addition to the domestic accumulation capacities and through the modernization of the means of production. De Gregorio (1992) ou Blomström *et al.* (1994) have shown that FDI is three times more efficient than domestic investment especially owing to their crowding-in and spillover effects. In addition, FDI is also likely to produce backward linkages allowing for the diversification of domestic firms and forward linkages through the provision of domestic firms with more sophisticated inputs (Rodriguez-Clare, 1996; Markusen & Venables, 1999). But above all, FDI is supposed to increase the productivity of domestic firms by creating external advantages through technology spillover, training of workers, incentives for investing in human capital, or easier access to world market (OECD, 2002)[1].

Yet, a remaining puzzle of this literature is the lack of robustness of the results about the direct effects of FDI on growth across existing cross-section studies (UNCTAD, 1999; Carkovic & Levine, 2005). Results are contradictory and generally very sensitive to the choice of countries and to the changes of specification and of estimators[2]. The meaning of that failure could be that either there is no significant effect of FDI on growth, or it is not correctly assessed by existing aggregate empirical models. In this paper, we claim that the inadequacy of the standard formal models could be an explanation for that failure of aggregate cross-sections to provide robust and consistent results. Some of the most common methodological choices of this literature must be questioned actually.

A first problem is that the quality of standard estimations might be altered by problems of reverse causality since FDI should be attracted by countries with a rather high growth rate (Li & Liu, 2005). A related issue is that attraction to FDI is possibly endogenous to the magnitude of the inflows already received. A key issue is that foreign investment probably stimulates technological capacities, human capital and skills, as well as the degree of integration to the international trade. Yet, these factors are likely attractors for FDI (Lim, 2001; Chakrabarti, 2001; Kamaly, 2001) and FDI inflows and these structural factors of attraction should be mutually linked in the right hand side of the growth regressions. A possible outcome is that estimations for the coefficient of FDI are not robust.

Moreover, these structural factors are at the same time critical factors of GDP growth. There are consequently possible indirect effects of FDI on growth operating through the channel of these key intermediate variables. The observed relationship between growth and FDI shall be better assessed through its joint effects with well-known engines of growth such as investment, human capital, technological capacities or infrastructure. The main reason is that those factors are constitutive of the capacity of the host economy to absorb the technological and organizational shocks from FDI and to transform them in productivity gains. A handful of empirical analyses relying on aggregate data have accordingly provided evidence that higher provisions of human capital, technological knowledge, financial development, trade openness or

[1] Sector-based empirical studies have shown that this outcome is conditioned by factors such as the density of the connection between foreign subsidiaries and the local firms (either partners or competitors) or the ability of the domestic firms to absorb the technological and organizational innovations from MNCs (Blomström, 1986; Moran, 1998; Moran *et al.*, 2005).

[2] See Li and Liu (2005) or Crespo and Fontoura (2008) for recent surveys of empirical results.

infrastructure shall ease the coming out of growth enhancement effects from FDI (Borensztein *et al.*, 1998; Balasubramanyam *et al.*, 1996, Bende *et al.*, 2000; OECD, 2002; Hermes & Lensink, 2003; Alfaro *et al.*, 2004, Li & Liu, 2005). Identifying absorption capacities allows assessing complementarities between factors of growth including FDI. Nevertheless, it does not allow measuring the indirect effects of FDI on growth and identifying the channels through which they operate. This purpose would require a structural formal model allowing for the measurement of indirect effects.

Furthermore, increased inflows of FDI are likely to produce a kind of virtuous circle that further increases the degree to which the economy will attract FDI and its capacity to get advantage of FDI through spillover effects. In spite of its evident appeal, the existing empirical literature has rarely adequately addressed this concern. In fact, empirical studies generally split the two questions of the attraction and of the effects of FDI on growth, and only a few studies (Bende *et al.*, 2000, 2003; Li & Liu 2005) have explicitly but partially associated them altogether in a common structural model.

In this paper, we propose a structural model of growth whereby an explicit treatment of the complex linkages between FDI, its determinants and the factors that matter for productivity spillover is possible. We go further than the previous studies of Bende *et al.* (2000, 2003) or Li and Liu (2005) because we not only control for the endogenity of FDI to growth, but we also control for the endogenity of FDI relative to the other variables (trade openness, domestic investment, human development) which are likely to increase the effects of foreign investments on growth through the absorption capacities building.

We further test this model on panel data on a set of Middle East and North African economies (hereafter MENA) and show that it brings in interesting and new results about the interactions between attraction, FDI and growth in MENA countries (Middle East and North Africa countries). The MENA countries are relevant for our purpose because they generally not display positive direct effects of FDI on growth. All these countries have converted to attraction policies since the beginning of the nineties, but they generally failed to uphold their shares of world FDI during the period. There are odds that the relative weakness of FDI inflows in MENA countries results from an attraction that is still too low, and that this very weakness hamper the spillover effects of FDI on growth. At the end of the 1990s, the under-performance of MENA countries in terms of FDI attraction started to be highlighted. Petri (1998) underlines the lack of performance for FDI attraction by comparing it to the higher performances of similar countries. In MENA countries, the FDI share in GDP was on average of 0.9%vduring the 1990s, against 2.5% for African countries, 3.8% for Eastern Asia and 4.5% for Latin America (Sekkat, 2004). A few years later, despite a fast increase in the flow of received FDI for some of the MENA countries (Tunisia, Morocco, Egypt), this weakness in the attraction capacities of this area is still perceived as a problem (Iqbal & Nabli, 2004; Chan & Gemayel, 2004; Sekkat, 2004; Daniele & Marani, 2006). Most of the analyses concur to explain the weak attraction performances of MENA countries by a narrow international and regional integration despite the proximity of the European market and firms (Noland & Pack, 2007; Iqbal & Nabli, 2004), and by the slowness and inefficiency of structural reforms regarding infrastructure, privatizations, shifts in regulations and red-tape improvement (Chan & Gemayel, 2004; Sekkat, 2004; Benassy-Quéré *et al.*, 2005; Aysan et al., 2006; Daniele & Marani, 2006; Sekkat and Veganzones-Varoudakis, 2007) that at the end of the day fail to create adequate conditions for the establishment of foreign firms.

Another feature of these countries is that despite the significant tendency toward liberalization of trade and investment, they could not reach the growth levels experienced by the South and East Asian economies (Iqbal & Nabli, 2004; Chan & Gemayel, 2004; Sekkat, 2004;

Daniele & Marani, 2006; Noland & Pack, 2007). As regards horizontal FDI, it might be that FDI could lessen the domestic capacities of accumulation of the region, the resulting crowding-out effects being detrimental to economic growth[3]. Sadik and Bolbol (2001) give evidence on six Arab countries (Saudi Arabia, Oman, Morocco, Jordan, Tunisia and Egypt) over 1978-1998 that FDI have more effects on growth via capital accumulation than via productivity gains, and they even measure a significantly negative effect of FDI on the Total Factor Productivity (TFP) for Saudi Arabia, Tunisia and Egypt[4]. But, at the same time, the alleged weak capacities of absorption of the MENA countries compared to other developing countries has been put forward to explain the weak effects of FDI on growth (Sekkat, 2004; Elmawazini, 2007). That means that the common structural determinants of attraction and of spillover could be too weak in MENA both to attract a sufficient amount of FDI and to produce significant spillover effects.

In the next section, we survey the main results of the empirical literature about the drivers of FDI and the effects of FDI on growth, and we point out that the inadequacy of the underlying models that are generally used can explain the lack of robustness and convergence of the cross-section empirical results. We then describe the model and the econometric approach in section 2, and the results are displayed and discussed in section 3, before section concludes.

I. FDI attraction and absorption capacities: the need for an adequate formal model

Our basic aim in this section is to show that the common nature of the determinants of attraction and the factors that catalyze the effects of FDI on growth can produce a bias in the commonly adopted econometric approach and that the most convenient model is probably a simultaneous equation one. The other point is that this model allows estimating indirect effects of FDI on growth, even while the former has no significant direct effect on the latter.

The standard linear exogenous models for explaining the effect of FDI on GDP growth (Growth) takes the following form (1):

$$Growth = \Phi\, Z + \alpha\, FDI + \Theta\, Controls \qquad (1)$$

Where Z is the set of the structural determinant of attraction identified above (openness, human capital, infrastructure, financial development, macroeconomic environment), *Controls* stands for the usual controls for growth, and FDI is the inflow of foreign direct investment.

This standard model provides weak evidence of the positive effects of FDI on growth. A remaining puzzle on this literature is the lack of robustness of the results from existing cross-section studies. Borensztein *et al.* (1998), Hermes & Lensink (2003), Alfaro *et al.* (2004) or Durham (2004) all fail to grasp a significant effect of FDI on GDP growth with various countries and time coverage when FDI is introduced alone in the estimation. But results are often contradictory and very sensitive to the choice of specification[5]. UNCTAD (1999), Ram and

[3] As for the FDI received by Egypt, Jordan and Tunisia, inflows of FDI concern sectors that generally induce few technological spillover effects (energy and textile for Tunisia, energy and services for Jordan) or sectors that benefit from a high level of protection against external competition for Egypt (Sadik & Bolbol, 2001).

[4] FDI do not explain significantly growth for Morocco, Oman and Saudi Arabia.

[5] Furthermore, the available cross-sectional data on FDI do not provide the information necessary to test if the productivity gap of local firms matched with foreign affiliates can be explained by the effectiveness of technological spillover or, in a simpler way, by a selection bias. As an illustration, it is likely that the initially most efficient local firms will at the same time be more able to access foreign markets (because they are more competitive) and to attract the partnership offers from foreign firms (because they are more efficient and less distant from the technological frontier). It can also happen that the positive correlation between growth and FDI be the result of the increased

Zhang (2002) and Bloningen and Wang (2004) detect a positive association between growth and FDI, but it disappears for some specifications[6] or when some variables are used to measure inflows of FDI. The introduction of additional fixed effects and the correction for the simultaneity bias between investments and growth produce positive significant and robust effects of FDI on growth for Li and Liu (2005) but these results are not confirmed by Carkovic and Levine (2005) who do not find any robust result with a different sample and a different period, but with a similar model.

A possible explanation for the lack of robustness of the previous results is that the effects of FDI on growth should be gauged through that channelling of the absorption capacities. Inflows of FDI are traditionally supposed to support growth through the utilization of domestic labour or the crowding-in of domestic investment, but it also contributes to increasing the productive efficiency of domestic firms through spillover effects[7]. But, the effectiveness of the productivity spillovers is not unconditional. For example, early microeconomic evidence from Blomström (1986), Kokko (1994) and Kokko *et al.* (1996) pointed out to the fact that the presence of foreign firms has a more important effect on local firms when the technologies shared are simpler, and when the improvement of the technological performance imposed to the local firms by competition, or by the linkage with the foreign firm, is accessible to them. In accordance with the previous firm-level results, cross-country studies have pointed out to a series of structural factors that interact with FDI to spur growth through productivity spillover. Görg and Hijzen (2004) show that imitation and learning increase when cultural and geographical proximities are higher, but economic capacities of the receiving country are equally essential. Thus, Xu (2000), Görg and Greenaway (2004) and Li and Liu (2005) provide significant evidence that the smaller is the technological gap between foreign and local firms, the stronger the FDI impact on the receiving economy will be[8]. Blomström *et al*. (1994), Borensztein *et al.* (1998), Lipsey (2000) or Bloningen and Wang (2004), Li and Liu (2005) have provided robust evidence that the education level is crucial to catalyze the FDI effects on growth because it enables larger technological spillover obtained from workers mobility[9]. It has also been shown that trade openness[10] (Balasubramanyam *et al.*, 1996, Bende *et al.*, 2000; OECD, 2002; Basu *et*

concentration generated by the pro-competitive effect of incoming FDI, without any significant spillover effects towards initially less productive local firms. For this kind of analysis, see Blomström (1986, 1989) on Mexico.

[6] Among the variables that get well into the specifications, we find the level of GDP per capita, education, domestic investment, political instability, terms of trade, the black market premium and the level of financial development (UNCTAD : 1999). In Bloningen and Wang (2004) estimations, the FDI coefficient is not significant in all developed and developing countries but it becomes positive significant only in the developing countries

[7] Firm-based studies generally indicate that spillover occurs through a series of specific channels like connections with foreign firms along the value chain, training by MNC subsidiaries, turnover of workers between foreign and local firms as well as assistance to access the global markets by foreign firms in contact with local companies. Moran (1998) has shown that the magnitude of the spillover effects depends on the degree of cooperation between foreign firms and local suppliers in production and in access to global markets, and are increasing with the complexity of the tasks devoted to the latter, thus enabling them to quickly become competitive exporters and get integrated to global value chains. For developing countries, the proof of significant spillover effects increasing the productivity of the host country's industries has been made by firm level surveys by Aitken *et al.* (1997), Blomström (1986) and Kokko (1994) for Mexico, Blomström *et al.* (1994) for Uruguay, Sjoholmn (1999) and Blalock (2001) for Indonesia, Batra and Tan (2002) for Malaysia, Djankov and Hoekman (2000) for Czech firms and Javorcik (2004) for the Lithuanian manufacturing industry.

[8] See Bende-Nabende *et al.* (2003), on macro-economic data, and Sjoholm (1999) on micro-economic data.

[9] However, the hypothesis of a threshold for absorption capacities has been seriously challenged by Carkovic and Levine (2005) who underline that the likelihood for technological spillover to occur could be independent from the human capital provisions, or that it can increase together with the intensity of the technological gap, and not the contrary.

[10] Openness to trade favours vertical FDI and lowers horizontal FDI.

al., 2003), export diversification (Nicet-Chenaf & Rougier, 2009), financial development[11] (Hermes & Lensink, 2003; Alfaro *et al.*, 2004; Durham, 2004), or a more efficient and stable legal and institutional environment[12] (Olofsdotter, 1998; Bangoa & Sanchez-Robles, 2003; Busse & Groizard, 2006), all favour the positive effects of FDI on growth. In order to assess the catalyse effects and to measure thresholds of absorption capacities, these papers generally use a variant (1') of the standard equation (1) where *Interactives* stands for the interactive terms used to assess the effect of FDI on growth that operate through catalyst factors such as education, trade openness, diversification, financial development:

$$Growth = \Phi\, Z + \alpha\, FDI + \zeta\, Interactives + \Theta\, Controls \qquad (1')$$

A major limitation of the specification (1') is that it just allows assessing the complementarities between two factors of growth and the magnitude by which the first one increases or decreases the effect the second one has on growth. Interactive term just shows that a given level of FDI has a larger contribution to the explanation of growth when human capital, financial development or trade openness is higher. A significant coefficient for a given interactive term does not mean that FDI spurs growth through that very channel, but almost that they are complementary in their operation on growth. Consequently, this approach does not help to identify the mechanisms through which this growth effect of FDI operates at an aggregate level. Moreover, their results just suggest what Blomström *et al.* (1994) had accurately pointed out, that the existence of significant effects of FDI on growth requires that the receiving country has reached the level of development required for the formation of adequate absorptive capacities.

Another limitation is that it does not address the problem of endogenity between GDP growth and FDI though. Li and Liu (2005), or Basu *et al.* (2003) have explicitly addressed this concern, but with a different approach. As the latter propose a simple cointegration analysis[13], the former build a structural model of growth and FDI[14]. Their underlying formal model takes in partial endogenity so as to assess the net effect of FDI on growth. The model is formed of the model (I) below:

$$(I)\begin{cases} Growth = \Phi\, Z + \alpha\, FDI + \Theta\, Controls & (1) \\ FDI = \varphi\, Growth + \delta\, Controls & (2) \end{cases}$$

The point is that none of the two models (1') and (1)-(2) explicitly control for the likely endogenity of the Z vector to FDI. Empirical studies put forward an ever-growing number of explanatory variables for attraction[15]. De Mello (1997), Kamaly (2001), Chakrabarti (2001) and Lim (2001) gather a heterogeneous set of robust factors that explain inflows of FDI. They generally use the standard specification given by equation (2)[16]:

[11] By improving the access to credit and easing the domestic investments, developed and competitive banking and financial systems increase the complementary possibilities between foreign investments and local firms that are necessary to the generation of technological spillover.

[12] Steadier legal and political institutions, less regulated markets and more adapted administrative rules all favour spillover from FDI.

[13] They basically evidence that FDI and growth are mutually explained only for the more open economies, and that FDI does not significantly explain growth for non liberalized countries.

[14] Li and Liu (2005) show that FDI and economic growth are mutually reinforcing from the mid-1980s onwards and that the coefficient of the former remains significant when endogeneity is controlled for.

[15] For recent surveys, see Chakrabarti, (2001), Kamaly (2003), Lim (2005) and Crespo and Fontoura (2008).

[16] However, Chakrabarti (2001) or Kamaly (2001) have underlined the methodological limits of this empirical literature. One of them is that assessing factors of FDI attraction from econometric estimations of equation (2') is puzzling because the empirical assessment does not rest on a robust and constituted theory. Moreover, there are

$$FDI = \mu Z + \delta Controls \quad (2')$$

Among them, traditional advantages such as the size of the market and its rate of expansion (Lim, 2001; Chakrabarti, 2001; Basu & Srinivasan, 2002) or labour costs (Basu & Srinivasan, 2002, Yeaple, 2003; Hanson *et al.*, 2003) remain logically central to explain FDI attraction[17]. But FDI is also significantly attracted by structural dimensions such as financial development (Durham, 2004; Alfaro *et al.*, 2004), macroeconomic stability (Klein & Rosengren, 1994, Apergis & Katrakilidis, 1998; Sekkat & Varoudakis-Veganzones, 2007), the degree of trade openness[18] (Kumar, 2000; Benassy-Quéré *et al.*, 2005; Sekkat & Vaganzones-Varoudakis, 2007) or human capital and skills (Helpman, 1984; Basu & Srinivasan, 2002; Bloningen, 2005). The extent of institutional development and the quality of administrative rules are also important determinants for the capacity for an economy to receive increasing inflows of FDI, especially, as has recently been argued by Helpman (2005), by decreasing the unpredictable costs that foreign investors address in developing economies (Benassy-Quéré *et al.*, 2005; and for MENA, Sekkat & Veganzones-Varoudakis, 2007).

A peculiar point here is that FDI attraction can be endogenous to the inflows of FDI because they contribute to the formation of skills or to the integration of domestic firms to the global supply chains. This is also particularly true for the institutional and red-tape environment of the investment that is likely to be partially endogenous as more foreign investors get more political power and are able to exert more pressures towards a more secured and environment. In addition, Lim (2001), Hanson (2001), Kamaly (2003) and Yehoue (2005) have all pointed out the significance of FDI stocks to explain the intensity of the current inflow of FDI in developing countries. These stocks interact with the quality of infrastructures and labour to produce positive externalities for the foreign firms, especially in special economic zones. This concern has been tackled by Bende-Nabende *et al.* (2000) who endogenize some of variables included in *Z* in order to account for the mutual relationship between FDI and Z. They add a third equation to the previous (1)-(2):

$$Z = \rho FDI + \beta Controls \quad (3)$$

From what precedes, we claim that matters of growth and attraction should be addressed simultaneously for the reason that we can assume that there is a likely circular linkage between FDI inflows, GDP growth, and the determinants for both the attraction to foreign investment and the absorption capacities of an economy. This concern has clearly been underlined by Görg & Greenaway (2002) when they argue that FDI can be endogenous to growth because its size and its content depend on the various dimensions of a country's attraction, particularly when it is assessed in terms of the main factors of growth and development. FDI is then endogenous to Z but some variables from Z are also the set of factors governing the effectiveness of spillover effects from FDI. Moreover, FDI is likely to have feedback effects over the host country's absorption capacities too. The previous effects can be positive, when FDI is prone to induce

possible biases due to the fact that the models that are commonly used do not control enough for parametric heterogeneity or for the dynamic nature of the underlying process that would require more adapted econometric modelling (Kamaly, 2003).

[17] Lim (2001) reports a set of works that qualify this result and reveal its sensibility to the measurement of the selected labour costs.

[18] Trade openness indeed acts ambiguously on the decisions to settle since, if trade and investments were substitutes to feed the national market, higher tariffs would stimulate inward FDI, but would also be an obstacle to vertical FDI with a high import content of exportations. But the puzzle is strengthened by the ever more complex strategies of transnational corporations since a firm located in a country to produce and export can also sell a part of its production locally if the domestic market offers dynamic opportunities for its production (Markusen *et al.*, 1996; Shatz & Venable, 2000).

technological acquisition or export competitiveness for the local partners of foreign firms, or contribute to the training of workers of the host country. But they can also be adverse if the competition inflicted by the foreign subsidiaries on local firms drop down the shares of domestic capital or local technological capacities of the latter.

Up till now, the empirical literature has seldom addressed the concern of the dynamic feedbacks adequately. Significant estimation problems can then occur from these endogenous links if they are not corrected. The inadequacy of the common formal models could be an explanation for the lack of robustness of the results from existing cross-section studies.

What we propose is to explicitly afford for the influence of Z in the attraction for FDI in the equation (3) and to introduce GDP growth as an additional determinant of some of the catalyst factors in (4). The model becomes:

$$(II)\begin{cases} Growth = \Phi Z + \alpha FDI + \Theta Controls & (1) \\ FDI = \psi Z + \varphi Growth + \delta Controls & (2'') \\ Z = \rho FDI + \eta Growth + \beta Controls & (3') \end{cases}$$

In the system (II), equations (1) and (2'') show that growth and FDI attraction display common structural factors included in *Z*. Moreover, equation (3') suggests that the factors of attraction and catalyse could be endogenously determined both by GDP growth and inflows of FDI.

Our hypothesis is that indirect effects on GDP growth from FDI could be stronger than their direct impact, but standard empirical models can not gauge these indirect effects because they are not adequate. Our hypothesis is that the relative weakness of FDI is the consequence of an attraction that is still too weak, and that this weakness simultaneously restricts the spillover effects of FDI on growth. Or it could also be that FDI weakens the regional capacities of domestic accumulation, and that some crowding-out effects detrimental to growth happen.

2. Model and methods

The purpose of our paper is to provide an advance in the understanding of the channels whereby FDI and growth interact. Consequently, we have built a structural model made out of five simultaneous equations and we estimate this model on a panel of seven countries[19] from the Southern Mediterranean shore over the 1975-2004 period. The model has a linear form, and is written as follows:

FDI = f (GDPgrowth, Energy, Education, Openness, Inflation) (1)

GDPgrowth = f (FDI, Education, Export, Investment) (2)

Education = f (FDI, Educspend, Urban) (3)

Export = f (FDI, Exrate, Telephone) (4)

Investment = f (GDPgrowth, FDI, Credit, Interest, Savings) (5)

The two central equation (1) and (2) of our model are thus linking economic growth to FDI, controlling for other growth factors such as domestic investment, exports and human

[19] Algeria, Egypt, Jordan, Morocco, Syria, Tunisia and Turkey

capital. The endogenous variables are the GDP growth per capita (*GDPgrowth*); the net inflows of direct foreign investment in percentage of GDP *(FDI),* the human capital which is approximated by the gross school rate at secondary level *(Education)*[20], the share of domestic investment in GDP (*Investment*) and the share of exports of goods and services in GDP *(Export).* The exogenous variables are the ratio of the credit to the private sector to the GDP *(Credit)*), the spending on education in percentage of GDP (*Educspend*), the production of energy expressed in 1000 T.O.E. (Tons of Oil Equivalent) (*Energy*), the domestic saving rate *(Savings)*, the annual inflation rate (*Inflation*), the capital cost measured by the real interest rate *(Interest)*, the exchange rate of the dollar against the local currency *(Exrate)*, the number of telephone subscribers per 1000 persons (infrastructure of the communication facilities) *(Telephone)*, as well as the degree of urbanization measured by the urban population in percentage of the total population *(Urban)* as a proxy of the access to social, cultural, medical and educative amenities[21]. The equations of the system and the expected sign of the various variables are summarized in Table 1.

[20] However, we must admit that the school rates constitute an indicator that should be used with caution because they are a rather inadequate measure of education levels and of the degree and structure of qualification of the labour force. But they are the only data allowing international comparisons.
[21] The data sources are reported in the Appendix A.

Table 1 :

y / x	**Cr**	**IDE**	**KH**	**ID**	**EXPORT**
Cr		+		+	
IDE	+		+	+/-	+
KH	+	+			
ID	+				
EXPORT	+				
CREDIT				+	
Déducation			+		
ENERGIE		+			
EPARGNE				+	
Inflation		-			
INTERET				-	
M2					
OUVERT		+			
TEL					+
TXCHANGE					+
URBAN			+		

The system of equations is overidentified, therefore the model can be solved. By implementing the method of the Two Stage Least Squares (2LS) to the system of equations, we aim at estimating together the magnitude of FDI, Education, Investment and Exports on growth, and the way FDI endogenously affects these growth determinants. Furthermore, the model sheds light on the factors explaining FDI inflows and their effects on growth in the South Mediterranean region. The Hausman tests[22] show that the fixed effects model is preferred to the random effects model. It is indeed more adapted to capture the unobserved specific effects of the countries, such as institutions, geographical characteristics, cultural norms, that could influence both FDI and economic growth.

To avoid the risk of fallacious regressions between dependent and explanatory variables, the Augmented Dickey-Fuller (ADF), Levin, Lin & Chu (LLC) and Im, Shin & Pesaran (ISP) (Im *et al.*, 2003) tests of stationarity have been applied to all the variables of the model [Appendix B][23]. These tests show that except for *GDPgrowth*, *Investment*, *EXPORT*, *INFLATION*, *INTEREST* and *TEL*, all other variables (*CREDIT*, *ENERGY*, *SAVING*, *FDI*, *EducSpend*, *OPEN*, *Education*, *M2*, *URBAN*, *EXRATE*) have a unit root but are stationary in first

[22] The results of the Hausman test are reported in Table 6
[23] The results of the stationarity test are reported in appendix.

difference[24]. Therefore, in the regressions, all the previous non stationary variables have been computed in first difference while the stationary variables remain in level. Moreover, the matrix of partial correlations reported in appendix C indicates that there are no serious problems of multicolinearity between the explanatory variables included in the regressions.

III. Results and comments

Only a limited bunch of works have tried to seize the FDI effects on growth at an aggregate level for MENA countries[25]. Bouklia and Zatla (2001) only find a weak significant effect of FDI on growth, while Darrat *et al.* (2005) and Meschi (2006) do not find any significant effect. Results are then deceptive regarding the expected effects of FDI on growth, and they converge even if the countries and time period coverage differ across studies. Note that among these works on MENA, Bouklia-Hassane and Zatla (2001) is the only one to articulate attraction and spillover effects, but they only proposes a sequential estimation strategy for these two relations, without any attempt to model endogenous FDI or attraction.

The results for the estimation of the structural model are fully reported in the Table 1 to 5 of Appendix D. For the sake of convenience, they have been summed-up in the following equations (Student's *t* and degrees of significance[26] are reported below each estimated coefficient):

(1) *GDPgrowth* = -0.17 *FDI* + 0.13 *Education* + 0.21 *Export* + 0.04 *Investment* – 11.99

(0.55) (4.14***) (3.65***) (0.68) (3.94**)

R2 = 0.51, F*** = 24.23

(2) *FDI* = 0.008 *GDPgrowth* +0.02*Education* +4.05E-06*Energy* + 0.09*Export*-0.004 *Inflation*-0.73

(2.22**) (5.26***) (1.81*) (2.37***) (1.79*) (2.53***)

R2 = 0.23, F***=18.48

(3) *Export* = 2.93 *FDI* + 4.98E-06 *Exrate* + 0.03 *Telephone* + 22.86

(3.37***) (1.86*) (2.02**) (4.83***)

R2 = 0.81, F***=46.55

(4) *Education* = 5.68 *FDI* + 0.52 *Urban* + 0.29 *Educspend* + 3.86

(4.91***) (6.70***) (5.70***) (1.01)

R2 = 0.88, F***=50.55

[24] Given that the results on the stationarity of variables sometimes diverge according to the method which is used (ADF or Levin, Lin & Chu or ISP, etc.), we consider that a variable is only stationary when at least two tests indicate that the variable does not have a unit root.

[25] The very few firm-level surveys made on MENA countries are generally not conclusive about the existence of significant productivity spillover from received FDI. Haddad & Harrison (1993), then Harrison (1996) found few empirical proofs of existence of technological spillover for local firms, even if at the same time the joint-ventures in Morocco were displaying higher productive performances than the local firms. Yet, Bouoiyour & Akhawayn (2005) more recently show on a panel of Moroccan industries that FDI has a significant spillover effect on the productivity of labour, and that this impact is proportional to the technological gap between foreign subsidiaries and domestic firms and increase with the openness of the export sectors.

[26] Conventionally, *** stands for 1% significance, ** for 5% and * for 10%.

(5) *Investment* = -0.30*GDPgrowth*+0.30 *FDI* -0.06*Interest* + 0.26 *Savings* + 0.07 *Credit*+16.68

(1.43*) (0.46) (1.34) (4.27***) (2.75***) (8.73***)

R2 = 0.58, F*** = 43.95

The comments are organized as follows. We oppose the direct and indirect effects of the structural factors of FDI attraction on growth (a). From them on, we test for the occurrence of crowding-in effects in the MENA countries (b), and we question the attraction of FDI in an endogenous framework (c).

(a) *The indirect effects of FDI on growth for MENA*

Results for the estimation of GDP growth are reported in Table 5 of Appendix D. According to them, it turns out that the coefficient for FDI is not significant so that it has no significant direct contribution to the economic growth in MENA countries.

Such a result could be puzzling in comparison to the theoretical literature that tends to take for granted the positive effect of FDI on host economies. But it actually confirms the studies on this region by Sadik and Bolbol (2001), Sekkat (2004), Darrat et al. (2005) and Elmawazini (2007) which generally fail to measure a significant impact of FDI on income growth. Obviously, the weakness of FDI flows towards these countries partly explains this result. But, as we do not control for the quality of foreign investments, the absence of any direct impact from FDI on growth in MENA countries could be explained by the poor ability of the investment received to produce the expected technological spillover. Sadik and Bolbol (2001) or Meschi (2006) thus explain the weakness of spillover effects by the very nature of the FDI received by MENA countries, since they are mostly made of primary and tertiary investments that produce few technological externalities. Microeconomic analysis (Kokko, 1994; Kokko *et al.*, 1996; Moran, 1998; Harrison, 1996; Görg & Hijzen, 2004) have shown that the impact of FDI on local production systems is tightly linked to the type of establishment (Greenfield or Merger Acquisition), the sector of activity, or the degree of competition or complementarities between foreign and local firms.

Yet, the works that have been dedicated to MENA countries up to now can only gauge the global effects of FDI on growth, without telling the difference between direct and indirect effects. The latter actually perform through the variables that cause together the attraction and growth of an economy. Our model enables us to distinguish direct and indirect effects and to assess more consistently the spillover effects. FDI has a positive and significant impact on education and export [Table 3 and Table 4 in Appendix D] and education and export have a similar impact on growth on their own [Table 5 in Appendix D]. Consequently, our results suggest that FDI is likely to have an indirect positive effect on growth through alleged engines of growth such as exports and human capital. They not only act as factors of attraction for FDI [Table 2 in Appendix D], but also as conditions for FDI to have significant effects on growth. In fact, they act as channels through which FDI has an effective impact on growth in the long run. In that double way, they are constitutive of the host country's capacity to absorb the technology and productivity gains from FDI.

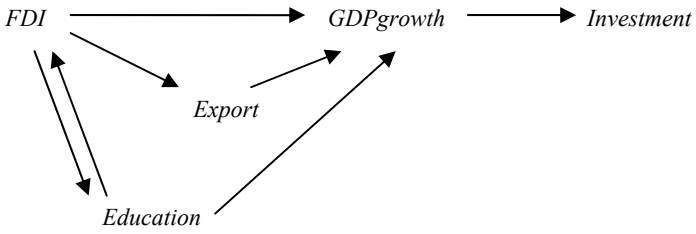
The indirect effects of FDI on growth can then be recomposed as reported in the following Figure 2. The values of the estimated coefficients that are used are taken from the Tables 1 to 5 in Appendix D.

The first link is the GDP growth elasticity to exports $\frac{\Delta GDPgrowth}{\Delta Export} = 0.21$ which can be read, ceteris paribus, as the impact of shock in the demand for exports on growth.

$\frac{\Delta Export}{\Delta FDI} = 2.93$ is the elasticity of exports to FDI and it can be seen as the measurement of the impact of a FDI shock on exports. The indirect effect FDI is likely to have on growth throughout trade intensification can then be recomposed as:

$$\frac{\Delta GDPgrowth}{\Delta FDI} = \frac{\Delta GDPgrowth}{\Delta Export} * \frac{\Delta Export}{\Delta FDI} = 0.21*2.93 = 0.61$$

Figure 2. Direct and indirect effects of FDI on growth (Calculations from the authors)



Then in the second linkage, $\frac{\Delta Education}{\Delta FDI} = 5.68$ is the elasticity of human capital to FDI and can be understood as the impact of a FDI shock on human capital formation, while $\frac{\Delta GDPgrowth}{\Delta Education} = 0.13$ is the elasticity of GDP growth to human capital and it can be seen as the measurement of the impact of a human capital shock on growth. Then we can similarly recompose the alleged indirect effect of FDI on growth via the formation of human capital as:

$$\frac{\Delta GDPgrowth}{\Delta FDI} = \frac{\Delta Education}{\Delta FDI} * \frac{\Delta GDPgrowth}{\Delta FDI} = 5.68*0.13 = 0.73$$

Consequently, it suggests that FDI has an indirect effect on growth through the exports and the skill promotion effects. Both those variables are together significant determinants of FDI attraction and catalyst factors for the FDI effects on growth. We can remark however that the indirect effect trough human capital formation is larger than the effect trough trade.

Therefore, failure of the previous studies to measure an effect of FDI on growth in MENA countries does not necessarily mean that spillover effects do not exist. A more appropriate model allows capturing some of these effects for MENA countries, without contradicting the more global result according to which the FDI variability does not explain significantly the growth variability between the different countries and the different years of the sample. If FDI affects growth in MENA countries, it could be through the indirect channel of the training and turn-over of the labour force and of the incitement to invest in human capital. But the wider access to the world market for local firms that become exporters is another channel through which the indirect effects of FDI on growth is expected to occur in the MENA countries.

(b) *Crowding-in or crowding-out?*

It is quite important to find out to what extent FDI can overthrow [« crowding out»] or spur [« crowding in »] the domestic investment. We must note that crowding-out effects of FDI were more frequently observed than the crowding-in in the context of developing countries

(Caves, 1996; Agosin and Machado, 2005). But there has not been any proper survey on this effect concerning MENA countries. This matter is addressed by the literature either by including the domestic investment directly into the growth equation *et al.*, 1998) or by estimating a domestic investment equation that incorporate FDI (Agosin & Mayer, 2000; Mc Millan, 1999, Agosin and Machado, 2005). Yet, the likely complementarities between foreign investment and domestic firms have been emphasized by Rodriguez-Clare (1996) or Markusen and Venables (1999). But crowding-out effects can result from the setting up of barriers to entry, thus discouraging the incoming of new firms and causing the exit of local entrepreneurs (Backer, 2002).

The results for equation (5) are reported in Table 6. They show that FDI does not have a significant effect on domestic investment in MENA countries. This can be explained by the absence of significant crowding-in effects generated by the settlement of foreign firms in the MENA economies, thus supporting the thesis of enclave formation by these very firms. Moreover, the variable that expresses the real interest rate is not significant, even though it bears the expected sign. Lastly, according to the model, it seems that the domestic credit, the savings and to a lesser degree the growth of GDP, take a significant part in the accumulation of domestic capital. Furthermore, the table 1 showed that the domestic investment does not seem to have a significant impact on the economic growth of MENA countries. This might be due to the predominance of the public sector in these countries.

(c) *Endogenous FDI attraction*

Regarding the Equation (2), all the variables are significant and have the appropriate sign. Education, economic growth and export seem to be the most deciding factors of FDI attraction in MENA countries. Not surprisingly, endowments in natural resources also explains FDI inflows in these countries, yet one could expect a much higher degree of significance given the rather high relative share of commodities and hydrocarbons in the trade structure of some of these countries. Inflation has a negative and significant sign at 10%, indicating that foreign investors are not insensitive to economic instability. Of course, the performance of MENA countries in attracting FDI is also particularly affected by the quality of legal institutions and administrative red-tape (Iqbal & Nabli, 2004; Benassy-Quéré *et al.*, 2005; Sekkat and Vaganzones-Varoudakis, 2007), but we could not control for it in estimations because of the time shortage in existing data on institutions.

In the peculiar context of our structural model, it has been shown that FDI inflows depend positively on the levels of education and the export performance of host economies. But these determinants of attraction are also fed by FDI in the way that they are enhanced by the higher inflows of FDI. From the equation (3), it turns out that FDI significantly explain exports from MENA countries, suggesting either that local firms benefit from the access to world markets of the foreign affiliates, or that a large number of subsidiaries settled in these countries could have adopted a vertical strategy and export their production towards their country of origin or their parent companies. But data on the structure of exports by firms would be required to qualify this assumption. In the same way, in their efforts to attract FDI, MENA countries have implemented measures such as the setting up of free zones, the abolition of hindrances to import and export, or tax incentives which could have contributed to the increase of trade between these countries and the rest of the world. The proxy for infrastructure (*Telephone*) is also significantly positive suggesting that infrastructure is a condition for the promotion of exports because it may reduce trade costs by making export easier and cheaper, for both national and foreign companies. Empirical studies have also underlined their significant impact on FDI inflows for MENA countries (Bouklia-Hassane & Zatla, 2001; Sekkat & Veganzones-Varoudakis, 2007). Exchange

rates depreciation seems to have had a positive and significant impact on exports for MENA countries as well, after years of overvaluation of their currencies in fixed exchange rates regimes.

Results from the estimation of equation (4) indicate that government spending in education robustly explains the accumulation of human capital in MENA countries. Unsurprisingly, the positive coefficient for urbanization also suggests that, next to the education expenses, belonging to urban areas enable to have an easier access to various key amenities (social, cultural, health, political, etc.) and accordingly stimulate the private accumulation of knowledge and the development of personal skills. But a less familiar result is that FDI also acts positively and significantly on the development of human capital. Because of their size and the advanced norms and technology they promote, it can be expected that the foreign subsidiaries take part in the improvement of the human capital in the host country through training activities, participation to R&D activities, etc[27]. But FDI is likely to raise the returns from skills as workers employed by subsidiaries of foreign firms benefit from higher wages than they would have benefited in local firms too. Increasing inflows of FDI can then produce additional incentives to invest in schooling and skill acquisition for young adults.

The ability for MENA countries to attract foreign investment is thus dependent on those structural factors that allow FDI to promote increases in productivity and aggregate growth. Increasing the potential for attraction of FDI through education and export promotion is a relevant policy choice because it also enhances the potential for spillover effects of foreign investment. But, we further show that these structural dimensions consequently act as catalyst factors through which FDI can exert an indirect effect on growth in the long run.

Conclusion

The FDI effects on growth are not easy to understand. Most probably, FDI and productivity gains have a two-way relationship (Görg & Greenaway, 2002) or the former has only indirect effects on the latter. Our results show that FDI has no significant direct effect on growth. But the structure of our model allows showing that FDI still play an indirect role in growth through their positive effects on the formation of human capital and the international integration in MENA countries.

Moreover, the relationship is likely to be cumulative as the efficiency gains in production are the consequence of spillover effects and pro-competing effects of incoming FDI, but they also act as a factor of attraction for new FDI inflows. This is especially true for vertical FDI and when the productivity gains rest partly on the gains linked to the concentration of investments (clusters). Economic policy must then be carried out in several directions that ought to be complementary. The empirical results obtained on MENA countries show that it is much more difficult to benefit from foreign investors than to convince them to come and settle in a host country, especially since these investors are not always settled where they are the most needed. We lessen this observation by showing that FDI can have a positive indirect effect on growth as long as they increase the local capacities of absorption via the training of human capital and allow a deeper integration of the local production system within the global market and value chains. Therefore, the biggest challenge for MENA countries is to know how to get advantage of the presence of MNC upon their territories and what to do to make them become drivers for growth and economic development.

[27] For OECD (2002), the presence of foreign firms could be a key factor for the development of new skills in the receiving developing economy, especially when knowledge cannot be codified. Indeed, the skills gained through working for a foreign firm can take the form of tacit know-how that is impossible neither to formulate nor to codify, the best way to pass them on being to imitate or adapt them in other firms.

The challenge for MENA countries is to improve their attraction to FDI through a series of more ambitious structural policies (openness to trade and regional integration, development of institutions and infrastructure). The point is that these reforms also contribute to the creation of an environment that is more favourable to spillover effects since they improve the social returns to domestic and foreign investments (Sadik & Bolbol, 2001; Hausmann & Rodrik, 2004). It is thus necessary for policy makers to address the questions of the attraction of FDI and their effects on growth in a simultaneous way.

Policy-makers in the MENA region should probably follow the two upcoming paths. Firstly, they should promote the international integration of MENA countries as it is recommended in the recent World Bank reports on MENA countries (World Bank, 2006; World Bank, 2007) And secondly, they should create more favourable conditions for vertical FDI (special zone, infrastructure, labour training). In this regard, several questions remain unanswered: are government interventions useful to negotiate with foreign investors and make them aware of their responsibilities to do better? Do the attraction policies followed by MENA countries over almost two decades produce social returns over their social and private cost? Sector-based analyses using disaggregated data according to the type of FDI could bring in more light on these questions. It could be accordingly interesting to carry out some cost/benefit analyses to justify the political choices that have been made.

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Appendix A. Stationnarity tests

	ADF		Levin, Lin & Chu		Im, Pesaran & Shin	
Variables	*In level*	*In first difference*	*In level*	*In first difference*	*In level*	*In first difference*
GDPgrowth	(46.42)***	-	(-1.82)**	-	(-4.54)***	-
FDI	(18.16)	(95.81)***	(-0.11)	(-7.53)***	(-0.63)	(-10.52)***
Export	(25.62)***	-	(-1.97)**	-	(-2.12)***	-
Education	(17.76)	(40.74)***	(-2.36)***	(-4.46)***	(0.62)	(-3.99)***
Investment	(27.67)***	-	(-2.60)***	-	(-2.47)***	-
Credit	(17.58)	(46.11)***	(-0.81)	(-3.27)***	(-0.54)	(-4.35)***
Energy	(12.14)	(40.97)***	(-0.36)	(-2.52)***	(0.71)	(-3.99)***
Educspend	(16.75)	(78.10)***	(-1.24)	(-6.45)***	(-0.04)	(-7.78)***
Openness	(12.44)	(65.82)***	(-0.24)	(-6.34)***	(0.30)	(-6.31)***
Interest	(22.45)*	-	(-2.85)***	-	(-1.85)**	-
Savings	(12.51)	(65.30)***	(3.69)	(-4.98)***	(0.03)	(-6.60)***
Telephone	(27.06)***	-	(-1.32)*	-	(-0.43)	-
Exrate	(12.99)	(39.15)***	(-0.42)	(-5.88)***	(-0.28)	(-3.96)***
Inflation	(19.67)	-	(-1.54)*	-	(-1.36)*	-
Urban	(3.53)	(15.75)	(0.47)	(-1.90)**	(-0.05)	(-4.09)***

***, **, * : stationnarity at 1%, 5% et 10%.

Appendix B. Data and sources

Variables	Source	Unit
GDPgrowth	WDI	%
FDI	UNCTAD	% GDP
Education	WDI	%net
Investment	WDI	%GDP
Export	CHELEM - CEPPI	%GDP
Credit	WDI	% GDP
Educspend	WDI	%GDP
Energy	WDI	Ton of Oil Equivalent
Savings	WDI	%GDP
Inflation	WDI	Index (%)
Interest	WDI	%
Openness	CHELEM - CEPPI	%
Telephone	WDI	Fixed line and mobile phone (1.000 subscribers)
Exrate	CHELEM - CEPPI	USD against the local currency
Urban	WDI	% total population

Appendix C. Correlation matrix

		GDP growth	Investment	Export	Inflation	Interest	Telephone	ΔCredit	Δ Energy	Δ Savings	ΔFDI	Δ Educspend	Δ Openness	Δ Schooling	ΔM2	Δ Urban	Δ Exrate
GDP growth	GDP growth	,00															
Investment	Investment	,13	,00														
Export	Export	0,02	,16	,00													
Inflation	Inflation	0,10	0,12	0,44	,00												
Interest	Interest	,19	0,10	,31	0,70	,00											
Telephone	Telephone	0,05	0,26	,14	,43	0,07	,00										
ΔCredit	ΔCredit	,03	,06	,04	0,13	,18	0,03	,00									
ΔEnergy	ΔEnergy	,11	,18	0,10	0,02	0,03	0,18	0,03	,00								
ΔSavings	ΔSavings	,05	0,06	,06	0,06	,02	0,02	0,01	,11	,00							
ΔFDI	ΔFDI	0,01	,01	,04	0,03	,02	,01	,00	0,07	0,12	,00						
ΔEducspend	ΔEducspend	0,19	0,03	,07	,12	0,03	,25	0,05	0,12	0,06	0,06	,00					
ΔOpenness	ΔOpenness	0,18	,02	,20	,12	0,15	,05	,01	0,07	0,07	,12	,09	,00				
ΔSchooling	ΔSchooling	,05	,15	,06	0,05	,02	0,02	0,03	0,01	,01	0,02	0,03	0,11	,00			
ΔM2	ΔM2	0,30	,01	,07	0,09	,15	,02	,29	,01	0,08	,01	,20	,00	0,07	,00		
ΔUrban	ΔUrban	0,09	,07	,08	,15	0,03	0,09	0,01	0,06	,07	0,05	,03	,09	0,07	0,03	,00	
ΔExrate	ΔExrate	0,13	0,09	,00	,32	,01	,49	0,09	0,06	0,03	,03	,31	,06	0,02	,13	0,03	,00

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