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# Foreign Direct Investment, Complementarities, and Economic Growth: The Case of MENA Economies

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## ABSTRACT

In this paper, we analyse the role played by foreign direct investment inflows in the long run economic growth of 16 economies in the MENA region, using the method of GMM estimation for dynamic panels. We find evidence that the FDI inflows and the economic growth are correlated positively but with a weak significance from 1996 to 2012. This result has been obtained after controlling the following variables: trade openness, financial sector development, investment in human capital, gross domestic investment, domestic inflation rate, and the quality of governance. The finding supports some recent ideas, which state that, FDI's contribution to increasing long run growth rates in MENA economies depends on a complementarities conditions (local conditions and policies) such as: sophisticated financial market, well developed human capital and good governance, among other local characteristics.

**Keywords:** Economic Growth, FDI Inflow, GMM panel, MENA Region

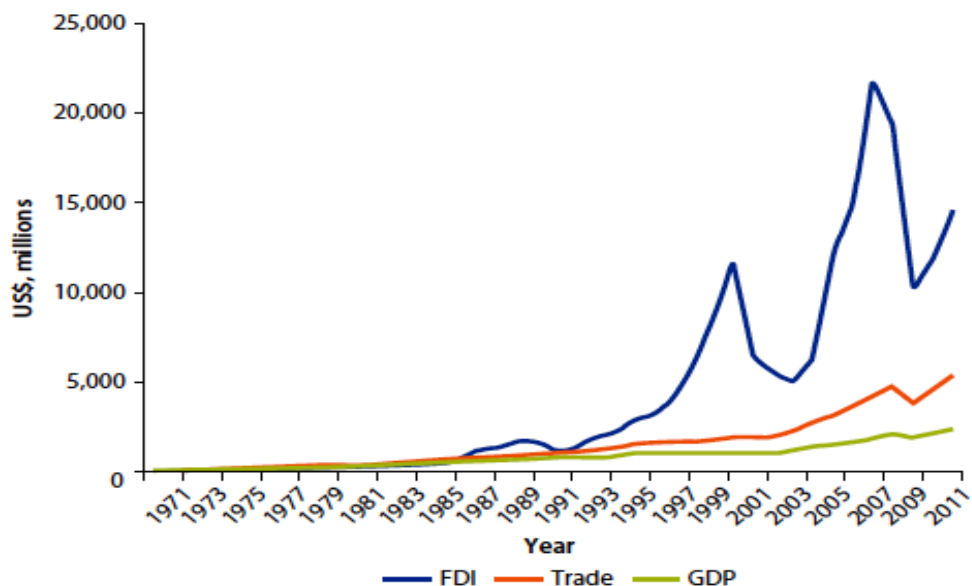
**JEL Classification:** F43, F21, C13

## INTRODUCTION

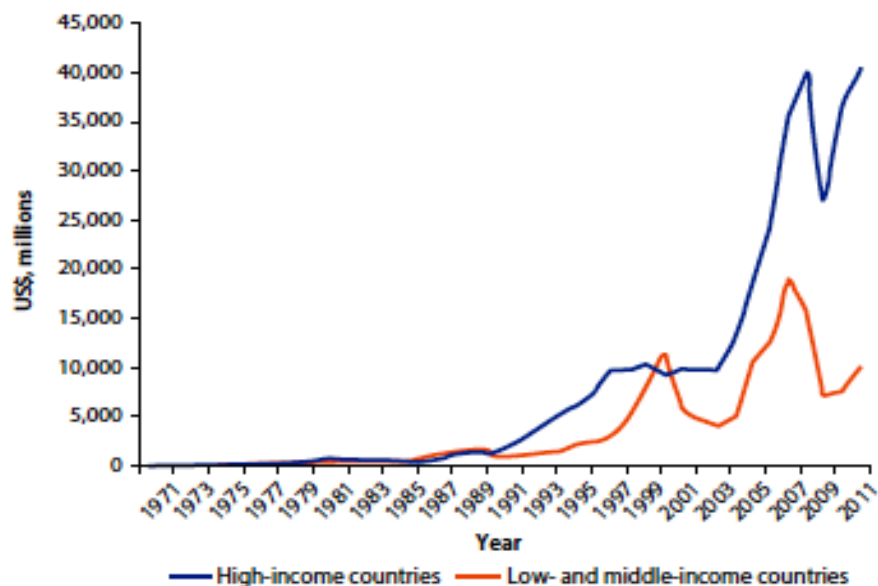
Policy makers and academics often argue that developing countries should attract foreign direct investment (FDI) as a means of generating higher economic growth by providing to domestic firms both a source of direct capital financing and valuable productivity externalities (Alfonso and Johnson, 2013). Anticipating such benefits, governments of developed and developing countries alike have over the past two decades not only reduced barriers to FDI, but also offered incentives calculated to attract foreign firms and foster relationships between multinational enterprises (MNEs) and local firms (especially suppliers). In 1998, for example, 103 countries offered tax concessions to foreign companies that established production or administrative facilities within their borders (Hanson, 2001). Sixty-eight of 81 developing countries interviewed for the 2005 Census of Investment Promotion Agencies reported offering tax, fiscal, or other incentives to foreign

investment (Harding and Javorcik, 2007)<sup>1</sup>. As a result of such incentives, along with the widespread liberalization of capital flows in recent decades, inflows of FDI have increased tremendously over the past generation. Between 1990 and 2011, global FDI flows expanded more than eight-fold, 250 percent faster than world gross domestic product (GDP) and more than 60 percent faster than world trade growth over this period (figure 1). Foreign affiliates of multinational corporations (MNCs) now employ 69 million workers and contribute US\$7

<sup>1</sup> Incentives designed to attract MNEs generally take one of two forms: fiscal incentives such as tax holidays and lower taxes for foreign investors, and financial incentives such as government grants, credits at subsidized rates, government equity participation, and government insurance at preferential rates. Other incentives include subsidized dedicated infrastructure or services, contract preferences or foreign exchange privileges, and even monopoly rights. Efforts to attract FDI can be broad-based or target-specific sectors.



**Figure1.** Global Growth of FDI, 1971–2011  
Source: Farole and Winkler. (2014)



**Figure2.** High-income versus low- and middle-income countries  
Source: Farole and Winkler. (2014)

million in value added (UNCTAD 2012), equivalent to more than 10 percent of all global output.

Industrialized countries still account for the majority of inward FDI stock, but the recent rapid expansion of global FDI flows has been driven by particularly strong growth of investment in developing economies (figure 2). FDI inflows to low- and middle-income countries (LMICs) expanded by 30 times in just 20 years (a compound

annual growth rate of 17.5 percent), almost six times faster than they did in high-income countries. As a result, the average annual share of inward global FDI flows in non-Organisation for Economic Co-operation and Development (OECD) countries rose from 16 percent during the 1970s and 1980s to reach 45 percent in 2010. This trend has been supported by liberalization in global trade and investment regimes and advances in transport

and communications. Together, these developments have allowed multinational firms to expand their market reach, exploit resource opportunities, and offshore activities across global production networks

What benefits do proponents expect a country to reap from FDI inflows? Because FDI usually flows as a bundle of resources including, as well as capital, production technology, organizational and managerial skills, marketing know-how, and even market access through the marketing networks of multinational enterprises (MNEs) that undertake FDI, it can benefit host economies through knowledge spillovers as well as linkages between foreign and domestic firms. Potential positive effects include productivity gains, technology transfer, exposure of domestic firms to new processes, managerial skills and know-how, enhancements to employee training, development of international production networks, and broader access to markets. These skills tend to spill over to domestic enterprises in the host country. Therefore, FDI can be expected to contribute to growth (more than proportionately) compared to domestic investments in the host country<sup>2</sup>.

There is now a body of literature that has analysed the effect of FDI on growth in inter-country frameworks and another analysing knowledge spillovers to domestic enterprises from MNEs (see, for example, De Mello, 1997; Kumar and Siddharthan, 1997; Saggi, 2000, for recent reviews of the literature). However, the mixed findings reached by these studies on the role of FDI inflows in host country growth and on knowledge spillovers from MNEs suggest that these relationships are not unequivocal. A major reason for expecting a more favourable effect of FDI on growth is the externality of MNE entry for domestic firms. But externalities such as spillovers may not take place in some cases because of poor linkages with the domestic enterprises or poor absorptive capacity, for example. FDI projects vary in terms of generation of linkages for domestic enterprises. There is also a possibility of MNE entry affecting domestic enterprises adversely, given the market power of their proprietary assets such as superior technology, appeal of brand names and aggressive marketing techniques. Therefore, FDI may crowd-out domestic investment and may thus be immiserizing (Fry, 1992; Agosin and Mayer, 2000). The crowding-out effect may be sharper when the technology gap between foreign and domestic firms is too wide to be bridged. Further, because FDI may be attracted to a country by high growth rates, among other factors, the observed relationships between FDI and growth rate may suffer from causality problems.

There may be two rounds of effects of MNE entry on domestic investment. The initial round may be felt by

domestic firms in the industry where the foreign entry has taken place. Because of a superior asset bundle brought by the foreign entrant, domestic enterprises may be affected adversely as their market share is eroded. The second round of effects may be more favourable, with domestic rivals absorbing spillovers of knowledge (demonstration-based learning) as well as diffusion of knowledge through vertical linkages with domestic enterprises. The net effect of FDI on domestic investments would depend on the relative weights of these two rounds of effects, and Blomstrom and Kokko's (2003) review of the literature leads them to conclude that spillovers are not automatic (not exogenous) because of the degree to which local conditions influence domestic firms' adoption of foreign technologies and skills.

Against this backdrop, this paper proposes to make some quantitative explorations into the nature of the relationships between FDI and growth, taking special note of the possible dynamic nature of the effects using a panel data set for 16 countries from Middle East and North Africa (MENA) for the period 1996-2012. The structure of the paper is as follows: Section 2 reviews the existing literature on the mechanism of impact of FDI on growth in countries. Recent findings on complementarities between FDI and local policies and conditions are discussed in section 3. In section 4, we discuss the methodology and the econometric specification. Section 5 presents results of quantitative explorations into the relationship between FDI and economic growth in this sample of countries.

## Literature Review

In the neo-classical model, growth results from technological progress, growth of the labour force – both of which are treated as exogenous – and capital accumulation that is subject to diminishing returns. However, new growth theories incorporate the role of knowledge or technology endogenously as a factor of production in its own right, and provide for the possibility of non-diminishing returns to capital (see Romer, 1994; Grossman and Helpman, 1991). The recognition of the role of knowledge in economic growth has also led to a renewed interest in the analysis of the role of FDI in growth. Romer (1993, p. 548) has argued that, by bringing new knowledge to their host countries, MNEs may help to reduce the 'idea gaps' between developed and developing countries that are sources of growth. Thus FDI's effect on growth in host countries could be more valuable than its direct generation of output, by complementing domestic investments. The indirect effect of FDI on growth in the host country may comprise the sum total of its externalities on domestic investments through knowledge spillovers and vertical linkages.

The externalities of FDI on a host economy include

<sup>2</sup> One robust finding is that productivity tends to be higher for MNEs than for domestic firms in the same sector (Arnold and Javorcik, 2009; Haddad and Harrison, 1993; Helpman et al., 2004).

positive as well as negative effects. Among the positive externalities are vertical linkages and knowledge spillovers for domestic enterprises. A foreign entrant may generate demand for intermediate goods and may crowd-in domestic investment to deliver it. It may also help to diffuse new skills and knowledge brought into the host economy. As observed earlier, FDI inflows are generally accompanied by inward transfer of valuable resources such as technology, organizational capability, managerial skills and marketing know-how. The knowledge spillovers associated with FDI could be classified into two broad categories, namely intra-industry spillovers and inter-industry spillovers. Intra-industry spillovers are absorbed by competitors of foreign entrants who are prompted to respond to new, improved processes or products introduced by technology-importing firms by upgrading their own technology. In certain cases the demonstration effect from foreign firms may speed up the diffusion of new technologies. Yet another source of spillovers could be through the increased competition from foreign entry which forces local firms to become more efficient users of existing technologies or to explore new ones. Among the mechanisms of technology spillovers of this sort are reverse engineering by competitors, increased rivalry through R&D and product development, and the mobility of employees trained in new technologies by foreign firms.

Another mechanism of diffusion of technology imported within the host economy is through the generation of vertical inter-firm linkages. The suppliers and customers of foreign firms may benefit from the knowledge brought in the course of their dealings with it. MNEs may demand higher specifications, retooling and technology updating from their component suppliers, forcing technology effort on their part. In quite a few cases they may actually be passing on new designs, drawings and specifications that may be significant sources of technology diffusion. Similarly, certain elements of knowledge may be passed downstream to customers of foreign firms by embodiment in products<sup>3</sup>. However, the most immediate externality of an MNE entry on domestic enterprises in the industry of the entrant is negative, as foreign entry erodes their market share (Markusen and Venables, 1997; Agosin and Mayer, 2000). In recent years, acquisition of domestic enterprises has become an increasingly popular form of MNE entry in some regions such as Latin America. In the case of acquisition, foreign entry can entirely crowd out domestic investment. Besides eroding the market share of domestic enterprise, foreign entry could have an adverse effect on domestic investment in the industry by its entry-raising conduct. It has been argued that MNE affiliates, with their dowry of intangible assets such as internationally-known brand names, captive access to

technology and reservoirs of technical, managerial and organizational skills, are likely to pursue non-price modes of rivalry to maximize the revenue productivity of these assets. With the greater emphasis on product differentiation and other modes of non-price rivalry, the entry of new domestic firms to the industry is impeded by the 'contrived entry barriers' (see Kumar, 1990, 1991, for evidence). Therefore, MNE entry may crowd-out domestic investment in the industry of the entrant more than by merely eroding the market share of existing firms<sup>4</sup>.

That the extent of externalities generated by FDI depends on the nature of the project has been recognized elsewhere (Fry, 1992; De Mello, 1997). Kumar (2002) argues that MNE entry in modern-knowledge intensive or intermediate goods industries may generate more favourable externalities for the host economy than those in matured consumer goods industries. Similarly, he expects export-orientated investments by MNEs, especially those having product mandates to serve third-country markets, to have more favourable externalities than do domestic market-orientated activities. He finds such so-called 'quality' FDIs more concentrated in fewer countries than FDI in general.

FDI can further a host country's development not only through technological improvements but also via factor accumulation – that is, by expanding its stock of physical or human capital, or both. Foreign capital injected into a host economy can contribute to physical capital formation, employee training, or skill development. The rationale advanced by some policy makers that foreign investment can add to scarce capital for new investment in developing countries is based on the assumption that foreign investors who establish new enterprises in local markets bring in additional capital with them. But Kindleberger (1969), Graham and Krugman (1991), and Lipsey (2002) show that investors often fail to fully transfer capital upon taking control of a foreign company, tending instead to finance an important share of their investment in the local market. Increasing volatility in exchange rates, moreover, has prompted many foreign investors to hedge by borrowing from local capital markets, which can exacerbate financing constraints on domestic firms by effectively crowding them out of domestic capital markets. This latter effect has been tested by Harrison and McMillan (2003), a country case study that analyzed the behavior of mostly French multinationals operating in Cote d'Ivoire, found that, in a context characterized by market imperfections and rationed access to credit, foreign investors did, indeed,

<sup>3</sup> The diffusion of knowledge through this channel could be particularly significant in the case of equipment manufacturers.

<sup>4</sup> Alfaro and Charlton's (2007) analysis of specific sectors targeted by OECD countries between 1985 and 2000 revealed the most targeted sectors to include machinery, computers, telecommunications, and transportation equipment. Heavily targeted sectors in developing countries include wholesale trade and petroleum as well as transportation equipment (Harding and Javorcik, 2007).

crowd domestic enterprises out of local credit markets. On the other hand, Harrison et al. (2004), which examined company-level data across a panel of countries that varied in the strength of their credit markets, found that the amount of credit available to domestically owned firms increased with foreign investment. These contrasting results point to the important role played by policy complementarities such as strong financial institutions, which are discussed at length in the following section.

With respect to human capital, FDI could have ambiguous effects. If skilled labor is scarce, and since MNEs typically hire relatively skilled workers, FDI could reduce the stock of human capital for domestic firms. More positively, though, FDI could improve the national welfare if the wages paid by MNEs were higher than those paid by domestic firms<sup>5</sup>. Harrison and Rodriguez-Clare (2011) survey the literature on FDI and wages and find that the 'unconditional' wage gap, or the gap between wages in foreign and domestic firms with no controls for biases, is as high as 50%. However, after adjusting for firm and worker characteristics, they conclude that foreign firms pay a small wage premium of between 5% and 10% higher than those paid by domestic firms. Furthermore, anecdotal evidence suggests that FDI can contribute to skill upgradation for domestic workers, as MNEs often make substantial efforts to educate local workers and provide more training opportunities for technical workers and managers than do local firms (Alfonso and Rodriguez – Clare, 2004; Alfonso et al., 2009)<sup>6</sup>. An empirical analysis of a panel of countries by Te Velde and Xengoiani (2007), however, found FDI to enhance skill development (particularly secondary and tertiary enrollment) only in countries already relatively well endowed skills-wise. The finding that FDI's contribution to skill development is conditional on the a priori presence of a threshold of human capital.

Although a number of studies have analysed the relationship between FDI inflows and economic growth, the issue is far from settled in view of the mixed findings reached. These studies have typically adopted a standard growth accounting framework to analyse the effect of FDI inflows on the growth of national income, along with other factors of production. A number of early studies generally reported an insignificant effect of FDI on growth in developing host countries. For example, Singh

(1988), who found FDI penetration to have a little or no consequence for economic or industrial growth in a sample of seventy-three developing countries, or Hein (1992) reporting an insignificant effect of FDI inflows on medium term economic growth of per capita income for a sample of forty-one developing countries.

Fry (1992) examined the role of FDI in promoting growth in the framework of a macro model for a pooled time series cross-section of sixteen developing countries for the period 1966–88. The countries included in the sample are Argentina, Brazil, Chile, Egypt, India, Mexico, Nigeria, Pakistan, Sri Lanka, Turkey, Venezuela, Indonesia, Korea, Malaysia, the Philippines and Thailand. For his sample as a whole he did not find that FDI exerted a significantly different effect from domestically-financed investment on the rate of economic growth, as the coefficient of FDI, after controlling for the gross investment rate, was not significantly different from zero in statistical terms. FDI had a significant negative effect on domestic investment, suggesting that it crowds-out domestic investment. Hence FDI appears to have been immiserizing. However, this effect varies across countries, and in the Pacific Basin countries FDI seems to have crowded-in domestic investment.

Blomström, Lipsey and Zejan (1994) found that FDI inflows had a significant positive effect on the average growth rate of per capita income for a sample of seventy-eight developing and twenty-three developed countries. However, when the sample of developing countries was split between two groups based on level of per capita income, the effect of FDI on the growth of lower-income developing countries was not statistically significant, although still with a positive sign. They argue that least-developed countries learn very little from MNEs because domestic enterprises are too far behind in their technological levels to be either imitators or suppliers to MNEs. Borensztein, De Gregorio and Lee (1995) for a sample of sixty-nine developing countries for the period 1970–89 find that the effect of FDI on host-country growth is dependent on the stock of human capital. They infer from it that the flow of advanced technology brought by FDI can increase the growth rate only by interacting with a country's absorptive capability. They also find that FDI stimulates total fixed investment more than proportionately. In other words, FDI 'crowds-in' domestic investment. However, the results are not robust across specifications. Balasubramanyam, Salisu and Sapsford (1996) find the effect of FDI on average growth rate for the period 1970–85 for a cross-section of forty-six countries as well as the sub-sample of countries that are deemed to pursue export-orientated strategies to be positive and significant, but not significant and sometimes negative for the sub-set of countries pursuing inward-orientated strategies. Pradhan (2001) finds a significant positive effect of lagged FDI inflows on growth rates only for Latin American countries in a panel data estimation

<sup>5</sup> Moreover, were MNEs to pay market wages, they would entirely capture any increase in GDP and the national welfare would, hence, not be improved. But there is ample evidence that MNEs pay above-market wages, and it is thus likely that higher productivity is to some degree shared between the firms and their workers (Aitken et al., 1996; Haddad and Harrison, 1993; Lipsey, 2002).

<sup>6</sup> Such training is sometimes provided in cooperation with host country institutions, as in the case of Intel in Costa Rica contributing to local universities and Singapore's Economic Development Board collaborating with MNEs to establish and improve training centers (Spar, 1998).

covering the 1975–95 period for seventy-one developing countries. The effect of FDI was not significantly different from zero for the overall sample and for other regions.

De Mello (1999) has conducted time series as well as panel data estimation for a sample covering fifteen developed and seventeen developing countries for the period 1970–90 of the relationships between FDI, capital accumulation, output and productivity growth. The time-series estimations suggest that the effect of FDI on growth or on capital accumulation and total factor productivity (TFP) varies greatly across countries. The panel data estimation suggests a positive impact of FDI on output growth for developed and developing country sub-samples. However, the effect of FDI on capital accumulation and TFP growth varies across developed (technological leaders) and developing countries (technological followers). FDI has a positive effect on TFP growth in developed countries and a negative effect in developing countries, but the pattern is reversed in the case of the effect on capital accumulation. De Mello infers from these findings that the extent to which FDI is growth-enhancing depends on the degree of complementarity between FDI and domestic investment. The degree of substitutability between foreign and domestic capital stocks appears to be greater in technologically-advanced countries than in developing countries. Developing countries may have difficulty in using and diffusing new technologies of MNEs. Findings of Xu (2000) for US FDI in forty countries for the period 1966–94 also corroborate the finding of De Mello, that technology transfer from FDI contributes to productivity growth in developed countries but not in developing countries, which he attributes to a lack of adequate human capital.

Finally, Agosin and Mayer (2000) analyse the effect of lagged values of FDI inflows on investment rates in host countries, to examine whether FDI crowds-in or crowds-out domestic investment over the 1970–95 period. They find that FDI crowds-in domestic investment in Asian countries and crowds it out in Latin American countries, while in Africa the relationship is neutral (or one-to-one between FDI and total investment). Therefore, they conclude that the effects of FDI are by no means always favourable, and simplistic policies are unlikely to be optimal. These regional patterns tend to corroborate the findings of Fry (1992), who also reported East Asian countries to have a complementarity between FDI and total investment.

### **Complementarities**

Recent literature on the link between FDI and growth has emphasized complementarities, that is, local policies and conditions prerequisite to the benefits of FDI materializing. That not all countries enjoy these 'preconditions' may help to explain the ambiguity in the

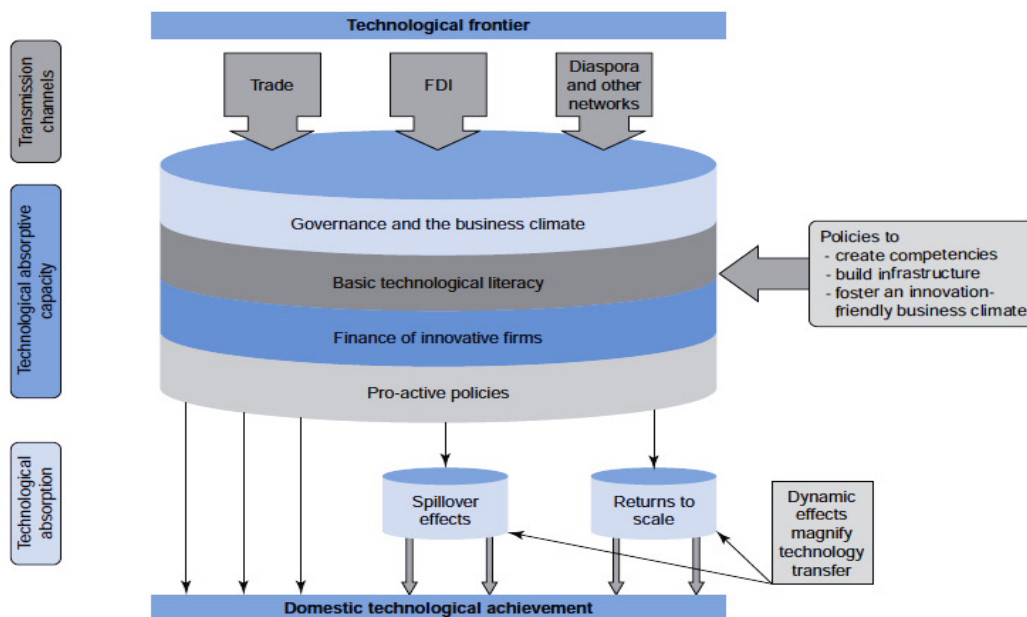
findings regarding the relationship between FDI and growth. Spillovers from foreign to domestic firms depend on domestic firms' ability to respond successfully to new entrants, new technology, and new competition, which – as the hypothesis goes – is to some extent determined by the strength of local institutions, the level of human capital, and the development of domestic financial markets, among other local characteristics.

Weaknesses in these areas can reduce domestic industries' capacity to absorb new technologies and respond to the challenges and opportunities presented by foreign entrants. Studying variation in such 'absorptive capacities' of countries (and industries within countries) offers a potentially appealing synthesis of the conflicting results reported in the literature.

What is the evidence of such complementarity between FDI and other policies? At the macro level, the literature presents evidence not of an exogenous positive effect of FDI on economic growth, but of positive effects conditional on local conditions and policies (figure 3).

Moran (2007) emphasizes the role of a competitive environment (i.e., one that embraces trade rather than pursues import substitution type policies), and, indeed, Balasubramanayam et al. (1996) find FDI flows to be associated with faster growth in countries that pursue outward-oriented trade policies. Many of the first- and second-generation panel studies on FDI and growth that found primarily orthogonal or negative relationships examined countries that were pursuing inward-oriented policies (e.g., India, Morocco, and Venezuela). Aitken and Harrison's (1999) finding that the overall effect of foreign investment in Venezuela was small was based on data collected during the years 1976–89, a period characterized by inward-oriented policies. The presence of reasonable competitive conditions is but one of many complementarities found in the literature. Others include human capital (Borensztein et al., 1998), local financial markets (Alfaro et al., 2004, 2009, 2010), and market structure (Alfaro et al., 2010).

Borensztein et al. (1998), using a dataset of FDI flows from industrialized countries to 69 developing countries, find FDI to be an important vehicle for transferring technology and higher growth only when the host country has a minimum threshold of human capital. Xu (2000), using data on US MNEs, provides corroborating evidence that a country needs to reach a minimum human capital threshold to benefit from technology transfer from MNEs, and that most developing countries do not meet this threshold. In a cross-country analysis, Alfaro et al. (2004) argue that lack of development of local financial markets can limit an economy's ability to channel the contributions of FDI to economic growth and take advantage of potential FDI spillovers. In a later study, Alfaro et al. (2009) investigate whether the effects of FDI on growth operate via capital accumulation or total factor productivity (TFP). Their



**Figure 3.** Complementarities  
Source: World Bank. (2008).

results suggest that the interaction of FDI and financial development has no significant effect on capital accumulation – physical or human – but that it positively and significantly affects TFP growth.

Beside the above conditions, absorptive capacity of FDI externalities also depends on the levels of basic technological literacy and advanced skills found in the country, which together dictate the country's capacity to implement technologies on the one hand and to do the research necessary to understand, implement, and adjust imported technologies accompanied FDI on the other hand. Also important are government actions designed to help overcome market failures that might limit the financing of innovative activity, plus actions that focus technology policy on adapting and adopting those existing technologies for which there is a market and for which adequate domestic competencies exist. Critical here are outreach and dissemination policies, which need to serve as a two-way conduit, both informing the population about technological solutions and providing feedback to providers concerning the usability of and demand for proposed solutions. Taken together, these factors act as filters (the rings in the drum) that dictate how much of the potential technological FDI flow is actually absorbed domestically.

## METHODOLOGY

In this paper we will try to study and evaluate empirically the triangular relationship between governance, FDI and economic growth in 16 countries of the MENA region over the period 1996–2012.

We use the method of GMM estimation for dynamic panels developed by Holtz-Eakin, Newey and Rosen (1990), Arellano and Bond (1991) and Arellano and Bover (1995). The data used in this study were extracted from the database of the World Bank (2013), world development indicators and worldwide governance indicators (the world bank group). Our model is written as follows:

$$Y_{i,t} = \beta_0 + \beta_1 FDI_{i,t} + \beta_j \sum_{j=1}^n Z_{i,t} + \varepsilon_i$$

Where  $i$  is the country subscript,  $t$  is the time subscript,  $N$  is the number of observations,  $\beta_0$  is the constant,  $\varepsilon$  is an error term,  $Z_{i,t}$  is the control variables and  $Y_{i,t}$  is the growth rate of real GDP per capita.

To control temporal and individual-specific effects well as to palliate the endogeneity problem of variables, we will use the Arellano and Bond (1991) estimator which consists in taking for each period the first difference equation to eliminate the specific effects of each country and instrumenting lagged explanatory variables. In our model the lagged variable is  $Y$ . Our model can be written as follows:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_2 GOV_{i,t} + \beta_3 FDI_{i,t} + \beta_4 OPEN_{i,t} + \beta_5 INF_{i,t} + \beta_6 FIND_{i,t} + \beta_7 HC_{i,t} + \beta_8 INVY + \beta_9 (FDI_{i,t} \times FIND_{i,t}) + \beta_{10} (FDI_{i,t} \times HC_{i,t}) + \varepsilon_i$$

Where  $i$  is the country subscript,  $t$  is the time subscript,  $\beta_0$  is the constant,  $\varepsilon$  is an error term,  $\beta_i$  are the coefficients associated with different variable,  $Y_{i,t}$  is the growth rate of real GDP per capita,  $Y_{i,t-1}$  is the growth rate of real GDP per capita lagged, FDI is foreign direct investment inflows as a percentage of GDP, GOV is the Governance Index which includes the various governance indicators (political stability and the absence

**Table1.** Correlation coefficients for the explanatory variables of economic growth

	GDP	GOV	FDI	OPEN	INF	FIND	HC	INVY
GDP	1.0000							
GOV	-0.1487	1.0000						
FDI	0,0889	0.1596	1.0000					
OPEN	-0,1907	0,5376	0,4079	1.0000				
INF	0.0789	-0.2255	-0.0430	-0.1659	1.0000			
FIND	0.0486	0.0427	0.5492	0.0504	-0.1827	1.0000		
HC	-0.1546	0.4005	0.2593	0.4733	-0.1503	0.0749	1.0000	
INVY	0.1064	0.0468	0.2112	-0.0392	0.0993	0.2209	0.0124	1.0000

of violence, the regulatory quality, the rule of law, the voice and accountability, the corruption and bureaucratic red tape, the government effectiveness), OPEN is the openness of the economy (measured by total exports and imports relative to GDP), FIND is the financial development measures the degree of financial sector development (Money and quasi money (M2) as a percentage of GDP), HC is the human capital (measured by the school enrollment rate at the secondary level), INVY is a variable measuring the level of domestic investment. Finally,  $(FDI_{i,t} \times DFIN_{i,t})$  and  $(FDI_{i,t} \times HC_{i,t})$  are two interactive variables.

## EMPIRICAL RESULTS

### Multicollinearity test

Before proceeding to estimate the model, it should verify the existence of multicollinearity problem in the data. Multicollinearity refers to a situation in which two or more explanatory variables in a multiple regression model are highly linearly related. We have perfect multicollinearity if, for example as in the equation above, the correlation between two independent variables is equal to 1 or -1. According to the limited traced by Kerwin, 1992, if the correlation coefficient is greater than 0.7 we can conclude that the problem of multi collinearity is present. A strong correlation leads to poor estimates of the coefficients.

Table 1 gives the various correlation coefficients for the explanatory variables of economic growth. The results of the table show that the different coefficients of correlation are lower than the boundary emitted by Kerwin (1992) which indicates the absence of multi collinearity between the explanatory variables

### Interpretation of results

We start by testing the heteroscedasticity<sup>7</sup> through the Breusch Pagan test proposed by Trevor Breusch and Adrian Pagan (1979) (see Appendix 1) which gave us a statistical Fischer equal to 3.15, since the p-value calculated (0.0013) is less than alpha (1%), while the null

hypothesis of homoscedasticity<sup>8</sup> is rejected. To determine the shape of the inter-individual heteroscedasticity, we tested the specific homoscedasticity cross-country. Statistics obtained is a Wald chi 2 (1) = 18.06, since the calculated p-value (0.0000) is greater than alpha (1%) therefore the null hypothesis is accepted which means that the variation of the residues is the same for each country.

Finally, it remains to test the correlation inter-individual and intra-individual. To test the presence of inter-individual errors correlation, we cannot use the Breusch-Pagan test since the number of observations (N = 240) is greater than the number of years (T = 19), and because the correlation matrix residue is singular. So, we are obliged to use tests Pesaran (2004), Friedmann and Frees (see Appendix 2) that are designed for cases where the number of observations is greater than T. Indeed, the Pesaran test is approximately 2.376, Pr = 0.01, the average absolute value of the elements below the diagonal is around 0.236, which is a very high value. Therefore, there is sufficient evidence to suggest the presence of a dependence of residues between individuals. Friedmann test is of the order of 26 569, Pr = 0.0000 and Frees test is of the order of 0.172, which means that the null hypothesis that stipulates the independence of residues between individuals is rejected. To test the correlation of intra-individual errors, we will check if the errors are auto-correlated,  $E(e_{it}e_{is}) \neq 0$  for  $t \neq s$  of autoregressive form (AR1) (see Appendix 3: heteroscedasticity test intra-individual). Statistics found is an F (9, 231) = 2,59, as long as the p-value (0.0072) is less than alpha (1%), then the null hypothesis is rejected, which means that there are auto regressive correlation).

The result of estimating the growth function by GMM dynamic panel with STATA 11.0 software appears in the following table:

Overall, the estimated variables are significant and they have signs consistent with those developed by the economic literature in the growth model. Indeed, the

<sup>7</sup> We talk about heteroscedasticity when the variances of the variables examined are different.

<sup>8</sup> We talk about homoscedasticity when the variance of the stochastic errors of the linear regression is the same for each country i (from 1 to 16 observations).



**Table 2.** FDI and economic growth in dynamic panel

Variables	Coefficient	Std, Err	Z	P> Z
GDP				
(GDP <sub>t-1</sub> )	0.1011909	0.066364	1.52	0.100*
DI	0.2138931	0.0764675	2.80	0.005***
FDI	1.138806	0.5983947	1.90	0.057**
OPEN	0.010573	0.0252831	0.42	0.676
INF	-0.0424455	0.0397822	-1.07	0.286
FIND	0.0644727	0.0300569	2.15	0.032**
HC	0.05302991	0.0387876	1.37	0.109*
INVY	0.0469689	0.080335	0.58	0.559
FDI*FIND	0.0052102	0.0018728	2.78	0.005***
FDI*HC	-0.0180501	0.0067347	-2.68	0.007***
cons	-9.889214	5.265597	-1.88	0.060**
Wald chi2 (7)				30.51
Prob > chi2				0.0007
Nb of instruments				130
Nb of observations				240
Nb of groups				16

growth rate of real GDP per capita of the year (t). Depend positively and significantly from that of the year (t-1).

For control variable trade openness (OPEN), which is positively insignificant, its effect is dependent on the estimation method and the variables that are included in the estimate. Zagha et al (2006) have argued that trade reforms depend on the specific conditions in each country and the way in which process of liberalization is implemented. For these authors trade openness is an opportunity and not a guarantee and it is naive to think that the simple opening of an economy or reducing tariffs and automatically leads directly to economic growth.

However, the coefficient related to the level of FDI and the growth rate of real GDP per capita is positive and weakly significant. It is important to indicate that the FDI implanted in the MENA region are rather directed to the extraction of raw materials or to manufacturing, claiming unskilled labor and relatively low paid compared to that of developed countries claiming unskilled labor and paid relatively little compared to developed countries. It is also interesting to note that this result can explain the continued interest of most countries in the MENA region to attract FDI that can be an alternative source for financing their business given the weakness of their domestic savings and the burden of their debts.

In contrast, the inflation rate INF is a negative effect on the growth rate of real GDP per capita. Inflation can lead when it is strong to a reduction in economic growth, the overall product, and a deterioration of employment. to a reduction in economic growth, the overall product, and a deterioration of employment. It disrupts the income macroeconomic distribution, and limited the attractiveness of the economy and the competitiveness of domestic firms. Inflation contributes identically to make the future more uncertain. This encourages the governments of MENA countries to realize a stable political and economic environment.

The financial development variable (DFIN) is positively correlated with the dependent variable (Y), the more a country has a well developed financial system more it tends to attract more FDI and hence promote economic growth since this variable is a measure type of financial depth and thus the overall size of financial intermediation. In the MENA region the high level of financial repression and a weak stock market does not reach a threshold that will enable them to contribute to economic growth, because the financial markets in these countries are unable to support sustainable economic development in MENA region.

The governance index that encompasses the six governance indicators mentioned above is generally positive and significant with the dependent variable. And subsequently more countries in the MENA region are more stable politically more effective in their governments less corrupt, the more they are able to improve their economic growth.

In the end, the human capital variable (HC) is positively correlated with economic growth, but not significant. This may reflect the inability of governments of MENA countries to provide and implement policies and regulations promoting the development of human capital. This result is inconsistent with some theoretical and empirical work like Bashir (1999) which report a negative correlation between human capital and growth economic through its study on a number of countries in the MENA region. Similarly, Nyatepe Coo (1998) from its study on a number of developing countries found a significant negative correlation between (HC) and economic growth. For some economists, the different results may be due to the absence of consensus on the best indicator that measures the level of human capital.

The results of our estimation also show that the level of domestic investment affects positively and not significantly the growth rate of real GDP per capita. This

result can be explained by the fact that the majority of MENA countries are rentier states and subsequently their economies are very fragile and strongly linked to oil revenues.

Finally, table 2 shows that the net impact of FDI on economic growth when taking into account the presence of an interaction between FDI and financial development is equal to 0.05, which means that the positive impact of FDI on economic growth will decrease if financial development increases over time, since the net impact of FDI in the presence of this interactive variable is positive but less valuable compared to the impact of FDI without interaction with financial development (approximately 1.13). This result is due to the lack of development of local financial markets which can limit an economy's ability to channel the contributions of FDI to economic growth and take advantage of potential FDI spillovers. We can also see the net impact of FDI in the presence of the interaction between FDI and human capital has become negative. This result can be interpreted by the fact that most countries in the region do not meet a minimum human capital threshold to benefit from the positive impact of FDI.

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