The nexus between foreign investment, domestic capital and economic growth: Empirical evidence from the MENA region

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Abstract

The objective of this paper is to estimate an econometric model for analyzing the interrelationship between foreign direct investment and domestic capital and economic growth in 13 MENA countries by using a 'growth model' framework and simultaneous-equations models estimated by the Generalized Method of Moments (GMM) during the period 1990–2010. Our empirical results show that there is bi-directional causal relationship between foreign investment and economic growth, between domestic capital and economic growth, and there is uni-directional causal relationship from foreign direct investment to domestic capital for the region as a whole.

1. Introduction

The nexus between economic growth and foreign investment, as well as economic growth and domestic capital, has been a subject of large academic researches over the past few decades. These researches can be categorized into three strands. The first strand has examined the impact of foreign investment and domestic capital on the gross domestic product (GDP) (see, Anwar and Sun, 2011; Soltani and Ochi, 2012; Borensztein et al., 1998). The advent of endogenous growth Barro and Sala-i-Martin (1995) has encouraged research on the transmission channels of FDI on economic growth in the long run. According to neoclassical growth models, the long-run growth in per capita income is zero or equal to the rate of technical progress, which is exogenous. The FDI can only affect economic growth in the short term on condition that the marginal productivity of capital decreases, the host economy converges to a steady-state and the FDI has no permanent impact on economic growth. It is only through permanent technology shocks that FDI affects economic growth of the host country.

For example, based on the following periods 1970–1979 and 1980–1989, Borensztein et al. (1998) examine the effect of FDI on economic growth. They found that FDI positively influence economic growth and that FDI and domestic investment were complementary. By using panel data of 18 countries in Latin America, Bengoa and Sanchez-Robles (2003) conclude that the effect of FDI on economic growth is positive only when these countries have adequate human capital, economic stability and liberalized markets. By making use of the data for the period 1975–2009, Soltani and Ochi (2012) considered the causal relationship between FDI and economic growth in Tunisia. They found that FDI causes significantly economic growth. Then, De Mello (1997) found that the impact of FDI on economic growth of the host country depends on the degree of efficiency of domestic firms. The long-term growth depends on the rate of time preference, and on the productivity of domestic capital and

the degree of complementarily between domestic and foreign capital. Anwar and Sun (2011) have also shown that foreign direct investment and domestic capital have a positive significant impact on economic growth. Therefore, Adams (2009) analyzes the impact of foreign direct investment on economic growth in Sub-Saharan Africa and found that FDI is positively and significantly correlated with economic growth. Recently, Azman-Saini et al. (2010) explored the systemic link between foreign direct investment (FDI) and economic growth approved that FDI by itself has no direct (positive) effect on the output growth. In contrast, Tang et al. (2008) determined that there is one-way causality from FDI to economic growth in China, while the causal link between domestic capital and economic growth is bilateral.

The second strand of studies has examined the impact of economic growth and foreign direct investment on the domestic capital. This area is relatively less researched and can be considered as nascent. Based on panel data for the period 1970–1990 involving OECD and non-OECD countries, De Mello (1997) examined the impact of FDI on capital accumulation, output and total factor productivity growth. He suggests that FDI provides a boost for economic growth in the long run through technological progress and knowledge spillovers. However, he underlines that the FDI-led growth depends on the degree of complementarily and substitution between FDI and domestic investment. By using panel data of 69 developing countries, Borensztein et al. (1998) found that there is bi-directional relationship between foreign direct investment and domestic capital.

The third strand of studies has examined the impact of economic growth and domestic capital on foreign direct investment. In addition, Nguyen and Nguyen (2007) have identified the two-way linkage between FDI and economic growth in which FDI promotes economic growth and, in turn, economic growth is viewed as a tool to attract FDI. Tsai (1994) employed a simultaneous equation system to test two-way linkages between FDI and economic growth

for 62 countries between 1975–1978 and 51 countries for the period 1983–1986. His work supports the view that two-way linkages exist between FDI and growth. Besides, Anwar and Nguyen (2010) study the two-way linkage between economic growth and FDI in 61 provinces of Vietnam over the period 1996–2005. They support the view that, in overall terms, reinforcing two-way linkage between FDI and economic growth exists in Vietnam and explored the link between FDI and economic growth across seven regions of Vietnam. The empirical analysis reveals that a two-way linkage between FDI and economic growth exists only in four regions.

Finally, based on the three previous strands of research we can see that higher economic growth requires more domestic capital. It has also been found that domestic capital plays a determinant role in the increase of FDI inflows. It is therefore worthwhile to investigate the nexus between FDI, domestic capital and economic growth by considering them simultaneously in a modeling framework. Therefore, the objective of the present study is to examine the causality links between the above three variables for 13 MENA countries by using a 'growth model' framework and simulataneous-equations models estimated by the generalized method of moments (GMM) during the period 1990–2010.

The present study is different from the previous studies in the following ways. First, this paper used dynamic simultaneous-equations modeling to study the three-way linkages between FDI inflows, capital stock and economic growth for a panel consisting of 13 MENA countries. However, to the best of our knowledge, none of the empirical studies have focused to investigating the three-way linkages between FDI-capital stock-growth by using simultaneous-equations modeling with 'growth model' framework. The model allows to examine at the same time the interrelationship between economic growth, foreign direct investment and domestic capital. Specifically, this study uses a three equations structural model that allows to simultaneously examining the impact of (i) the foreign and domestic

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capital on economic growth (ii) the economic growth and domestic capital on FDI inflows (iii) the economic growth and foreign investment on domestic capital. Second, we use a simultaneous equation model which follows the spirit of the conventional 'growth model' framework. Growth models, because they only depict short-run impacts, cannot be modeled within a cointegrating framework. The reason is simple. All variables in a growth form model are stationary, while cointegration (long-run impacts) demands that all variables, as a pre-requisite, need to be non-stationary. Our approach in this study is to estimate the short-run elasticities and not to estimate the long-run elasticity given our growth form modeling approach. There is a strong motivation for us to apply a growth form approach to analyze the interrelationship between foreign investment, domestic capital and economic growth. Third, with regard to emerging economies, our literature survey typically suggests that few studies have carried out the interrelationship between growth-foreign investment-domestic capital. They mainly consider the major Asian and Latin American countries and less attention has been given to smaller emerging countries, especially, in the Middle East and North Africa (MENA) region (see, De Mello, 1997; Borensztein et al., 1998; Anwar and Nguyen, 2010; Anwar and Sun, 2011).

The paper is organized as follows. The next section describes the used data and the econometric model. Section 3 presents the main results. Section 4 presents the concluding remarks and policy implications.

3. Data and model specification

In this paper, we examine the three-way linkages between foreign investment, domestic capital and economic growth for 13 MENA countries, namely Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saoudi Arabia, Tunisia, and UAE. The data are obtained from the World Development Indicators produced by the World Bank.

Foreign investment, domestic capital, and economic growth are in fact endogenous. As mentioned earlier, most existing literature suppose that economic growth is likely to lead to changes in foreign investment and domestic capital. It has also established that these two variables are often a key determinant of economic growth. It is therefore worth investigating the interrelationships between the three variables by considering them simultaneously in a modeling framework.

The interrelationship between these three variables can be examined by making use of the aggregate production function as follows.

$$Y_{it} = A_{it} K_{it}^{\alpha_{1i}} (FDI)_{it}^{\alpha_{2i}} L_{it}^{1-\alpha_{1i}-\alpha_{2i}}$$

(1)

Where the subscript i=1, ….., N denotes the country and t=1, …..., T denotes the time period. Y is the real GDP; K is the real domestic capital stock [1]; FDI is the stock of foreign direct investment; L is the number of workers employed; A is the total factor productivity (TFP); a_1 and a_2 respectively are the production elasticities.

We recall that our goal in this paper is to analyze the interrelationship between economic growth, the stock of foreign direct investment and the stock of domestic capital in 13 MENA countries. These variables are in fact endogenous. It is well known that foreign direct investment depends on the GDP and the stock of domestic capital along with other variables (Anwar and Nguyen, 2010). Then, it can be argued that the stock of domestic capital depends on GDP, foreign direct investment and other variables (Fielding, 1997; and Anwar and Sun, 2011). However, it is found that the GDP depends on both the stock of foreign investment and the stock of domestic capital and other variables (De Mello, 1997). We believe that a

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[1] $K_t = (1 - 0.05) GFCF_{t-1} + GCF_t$; $GFCF_t$ is gross fixed capital formation, GCF_t is gross capital formation. According to Ang (2007), the capital stock is determined through the accumulation gross investment (using a depreciation rate of 5%).

simultaneous equations model can yield more appropriate to treat economic growth, foreign direct investment and domestic capital as endogenous.

We write Eq. (1) in growth form with a time series specification, as follows:

$$g(\frac{GDP}{L})_{it} = g(A)_{it} + \alpha_{1i} g(\frac{K}{L})_{it} + \alpha_{2i} g(\frac{FDI}{L})_{it} \tag{2}$$

Some studies have used Eq. (2) to estimate TFP. The determinants of TFP are presented by the third regression model:

$$g(A)_{it} = \beta_0 + \beta_{1i} g(HCP)_{it} + \beta_{2i} (CPI)_{it} + \beta_{3i} (OPS)_{it} + \beta_{4i} (\frac{CRD}{GDP})_{it} + \beta_{5i} (\frac{GE}{GDP})_{it} + \varepsilon_{it} \tag{3}$$

Where HCP represents the growth rate of the real spending on higher education. In Blankenau and Simpson (2004) have suggested that state maintains a crucial role in human capital accumulation by providing funds for formal schooling. Therefore, it's sure that public education expenditures positively affect human capital accumulation and consequently influence growth (Anwar and Sun, 2011). *CPI* represents the consumer price index, an increase in this variable has a negative effect on the TFP. *OPS* represents a measure of the openness of the economy, determined by the total of exports and imports as a proportion of GDP. A higher openness can increase TFP, however, its effect on TFP in the developing countries can also be negative. *CRD* represents the total credit of the private sector (as a percentage of GDP) and *GE* is government expenditure (as a percentage of GDP). An increase in the quantity of credit to the private sector will probably have a positive effect on TFP. Thus, the growth of private credit increases investment and promoting economic growth (Ang, 2010). The effect of government expenditure (as a percentage of GDP) on TFP in developing countries is generally negative; this is relative to the inefficiency of the public sector. However, public investment in infrastructure and human capital development can positively affect economic growth (Durham, 2004).

By replacing Eq. (3) into (2), the following equation can be derived where the lagged value of the dependent variable is added to the right hand side, which is a common practice in the empirical growth models.

$$g(\frac{GDP}{L})_{it} = \pi_0 + \pi_{1i} g(\frac{K}{L})_{it} + \pi_{2i} g(\frac{FDI}{L})_{it} + \pi_{3i} g(HCP)_{it} + \pi_{4i}(CPI)_{it} + \pi_{5i}(OPS)_{it} + \pi_{6i}(\frac{CRD}{GDP})_{it}$$
$$+ \quad \pi_{7i}(\frac{GE}{GDP})_{it} + \pi_{8i} g(\frac{GDP}{L})_{it-1} + \varepsilon_t \tag{4}$$

We can also specify the determinants of the stock of the domestic capital and foreign investment per-unit of labor as follows:

$$g(\frac{K}{L})_{it} = \lambda_0 + \lambda_{1i} g(\frac{GDP}{L})_{it} + \lambda_{2i} g(\frac{FDI}{L})_{it} + \lambda_{3i}(\frac{CRD}{Y})_{it} + \lambda_{4i}(\frac{GE}{Y})_{it} + \varepsilon_{it} \tag{5}$$

$$g\left(\frac{FDI}{L}\right)_{it} = \theta_0 + \theta_{1i} g\left(\frac{FDI}{L}\right)_{it} + \theta_{2i} g\left(\frac{K}{L}\right)_{it} + \theta_{3i}(HCP)_{it} + \theta_{4i}(OPENES)_{it} + \theta_{5i}(RER)_{it}$$
$$+ \theta_{6i} g(GDP)_{it} + \varepsilon_{it} \tag{6}$$

Eq. (4), allows examine the impact of domestic capital and foreign direct investment on economic growth. An increase in the domestic capital is likely to increase the GDP (De Mello, 1997). An increase in the FDI can increase the GDP and the stock of human capital is likely to positively affect the GDP (Bengoa and Sanchez-Robles, 2003). An increase in the consumer price index (CPI) is likely to decrease GDP (Anwar and Sun, 2011). Then, a greater openness is likely to increase GDP (Kahouli and Kadhraoui, 2012). Financial development as measured by the total credit as a fraction of GDP, can affect GDP per worker. A negative relationship between the government expenditure and economic growth has been shown (Anwar and Sun, 2011).

Eq. (5) examines the determinants of the domestic capital per worker. An increase in GDP per worker will probably increase the national capital stock (Fielding, 1997). An Increase in the stock of foreign direct investment is likely to increase national capital stock, as the two are complementary or substitutable. The level of financial development measured by the total

credit to private sector as a proportion of GDP may influence private investment and consequently the stock of domestic capital (Ang, 2009). A negative correlation between government expenditure and national capital stock per worker suggests that national public expenditure is disadvantageous to national capital accumulation (Fielding, 1997).

Eq. (6) examines the determinants of the stock of foreign direct investment per worker. We note that productivity, which is measured as the growth rate of real GDP per worker, has a positive impact on FDI per worker. In addition, the domestic capital per worker may have a positive impact or a negative effect on FDI per worker and whether the two variables are substitutes or complements (Lucas, 1993). The stock of human capital is likely to positively affect the stock of FDI (Anwar and Nguyen, 2010; Anwar and Sun, 2011). An appreciation in the real exchange rate (RER) should reduce FDI. A greater openness is likely to FDI. The same applies also to increase of the size of the economy (Y) as measured by the growth rate of real GDP.

The above simultaneous equations are estimated by the generalized method of moments (GMM)[2]. In what follows, we only report the results of GMM. However, the GMM estimation results were generally found to be statistically more robust. Based on the above discussion, the expected signs of the estimated coefficients are described in Table 1.

Table 1
The expected signs of the estimated coefficient

	Dependent variables		
	Y/L	K/L	FDI/L
Y/L	n.a	+	+
K/L	+	n.a	+
FDI/L	+	+	n.a
CRD/Y	+	+/-	n.a
GE/Y	-	-	n.a
OPS	+/-	n.a	+
HCP	+	n.a	+
RER	n.a	n.a	-
CPI	-	n.a	n.a

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[2] Liu and Hsu (2006) have also used GMM estimation.

4. Analyzes and results

Our simultaneous equations are estimated by making use of two-stage least squares (2SLS), three stage least squares (3SLS) and the generalized method of moments (GMM). What follows, we only report the results of GMM estimation. While the parameter estimates remained similar in magnitude and sign, the GMM estimation results were generally found to be statistically more robust.

We estimate the three-way linkage between stock of domestic capital, FDI and economic growth, the others variables were used as instrumental. To do this, we used panel data from 13 MENA countries between 1990–2010.

The correlation between the dependent and independent variables are presented in Table 2. The correlation coefficients suggest that the reported regression models will not be seriously distorted by multicollinearity. This table shows that economic growth correlates positively with the stock of foreign investment, the stock of domestic capital and with human capital. The real GDP also correlates negatively with the openness and with the government expenditure. Then, FDI positively correlates with the trade openness, with the stock of human capital and negatively with the domestic capital and the real exchange rate. Finally, the domestic capital correlates positively with banking credit and negatively with government expenditure.

Based on simultaneous equations GMM-estimation, the empirical results of Eq. (4), (5) and (6) are presented respectively in columns 2, 3 and 4 of table 3. Before running GMM estimation, some tests have been audited. According to Newey (1985) and Smith and Blundell (1986), two important specification tests for simultaneous-equations regression models : test of endogeneity/exogeneity and test of overidentifying restrictions. First, the Durbin-Wu-Hausman test was used to test the endogeneity for all three equations. The null hypothesis of the DWH endogeneity test is that an ordinary least squares (OLS) estimator of

the same equation would yield consistent estimates: that is, an endogeneity among the regressors would not have deleterious effects on OLS estimates. A rejection of the null indicates that endogenous regressors' effects on the estimates are meaningful, and instrumental variables techniques are required. Second, we may test the overidentifying restrictions in order to provide some evidence of the instruments' validity. The instruments' validity is tested using Hansen test which cannot reject the null hypothesis of overidentifying restrictions. That is, the null hypothesis that the instruments are appropriate cannot be rejected.

Table 2
Correlations between the various variables used in the regression models

	1	2	3	4	5	6	7	8	9
1 g (GDP/L)	1								
2 g (K/L)	.61	1							
3 g (FDI/L)	.55	-.66	1						
4 g (HCP)	.32	.47	.45	1					
5 (CPI)	.12	.05	.28	.23	1				
6 (OPENS)	-.34	.41	.66	-.33	.32	1			
7 (CRD/GDP)	.21	.53	.08	.07	.27	.05	1		
8 (GC/GDP)	-.09	.43	-.36	.29	-.46	-.16	.47	1	
9 (RER)	.15	-.63	.52	.11	.33	.52	-.33	.42	1

Eq. (4) shows that the effect of the stock of foreign direct investment and the stock of national capital on economic growth in MENA countries is positive and statistically significant. This implies that the higher these variables are, more important the economic growth is. This confirms the results showed by Borensztein et al. (1998) and Soltani and Ochi (2012). As expected, human capital is positively and significantly related to economic growth. This result is consistent with literature that indicates that human capital proxied by spending on higher education has a positive effect on economic growth (e.g. Blankenau and Simpson, 2004; Anwar and Sun, 2011). Then, rising inflation creates uncertainty which negatively affects economic growth. In other words, inflation tends to exert an adverse impact on the real growth. The impact of the degree of openness of the economy is positive (e.g., Kahouli and

Kadhraoui, 2012). This means that trade openness through export and import transactions has succeeded in supporting economic growth. What is not expected, however, is the effect of financial development on economic growth is statistically insignificant. Finally, the effect of government expenditure on economic growth in MENA region is negative and statistically insignificant. This is due to the incapacity of the governments to control the funds use. This is the case of most of the developing countries which are suffering from a high-level corruption and misallocation of resources. From these results, it is clear that the governments of the MENA region should orient their economic policies to changes and promotes the government expenditure, the stock of human capital and inflation targeting.

Eq. (5) shows that both GDP growth and the stock of foreign direct investment have a positive and statistically significant effect on domestic capital growth in MENA region. This implies that the higher these variables are, more important the stock of domestic capital is. As expected, the impact of government expenditure is negative but statistically insignificant. Hence, the impact of financial development (i.e., credit growth) on the stock of the domestic capital is positive and statistically significant. From these results, it can be argued that the growth of the public spending has a negative impact on both the stock of domestic investment and economic growth.

Eq. (6) shows that GDP growth has a positive impact on the foreign direct investment. Then, human capital is positively and significantly related to FDI. This confirms, for example, the results showed by Coe et al., (1997) and Edwards (1998), where human capital is capable of assimilating foreign technology. Along the same lines, it has been recognized for the work of Findaly (1978) and Lucas (1988), that the HCP plays an important role in attracting FDI. When the HCP level is high, it allows domestic companies to easily understand the technical configurations of technologies adopted by foreign companies and there by facilitates the process of initiation and learning. Then, the degree of openness and the real exchange rate

produce a significant impact on the stock of foreign direct investment in MENA region. This result supports the idea that openness policy through the abolition of trade barriers and free movement of capital flows is a source of FDI attractiveness. This confirms the results showed by Kahouli and kadhraoui (2012) and Ang (2008). What can be learned from these results is that foreign direct investment contributes to the growth of the domestic capital stock but growth in the domestic capital stock is not making a significant contribution to the stock of FDI in MENA region.

Table 3
GMM estimation of simultaneous equations

	Eq. (4)	Eq. (5)	Eq. (6)
	Dependent variables		
	Economic growth	Domestic capital	Foreign direct investment
$g(GDP/L)$	-	.237 (.031)**	.104 (.004)*
$g(K/L)$	.336 (.000)*	-	-.333 (.286)
$g(FDI/L)$	.109 (.003)*	.568 (.000)*	-
$g(HCP)$	.195 (.075)***	-	.136 (.027)**
(CPI)	-.484 (.001)*	-	-
$(OPENS)$	.191 (.015)**	-	.721 (.000)*
(CRD/GDP)	.058 (.423)	.189 (.027)**	-
(GE/GDP)	-.388 (.001)*	-.241 (.022)**	-
(RER)	-	-	-.436 (.000)*
$g(GDP)$	-	-	1.075 (.403)
$g(GDP/L)_{t-1}$	-.012 (.000)*	-	-
Constant	.164 (.072)***	.305 (.011)*	-.149 (.057)***
Hansen j-test (p-value)	15.224 (.114)	14.331 (.143)	11.819 (.211)
DWH test (p-value)	4.009 (.000)	3.278 (.048)	3.666 (.025)

Notes:
Values in parenthesis underneath the estimated coefficients are the estimated p-values.
* Coefficient significant at 1% level; **Coefficient significant at 5% level; ***Coefficient significant at 1% level.
Hansen J-test — overidentification test of restrictions in GMM estimation.
DWH test—Durbin-Wu-Hausman endogeneity test.

Therefore, according to the overall results, we can conclude that: (1) there is bi-directional causal relationship between foreign investment and economic growth; (2) there is uni-directional causal relationship from foreign investment to domestic capital and (3) there is bi-directional causal relationship between domestic capital and economic growth for the region as a whole. Fig. 1 summarizes the GMM panel data results of Table 3. These results corroborate the three-way linkage between foreign investment, domestic capital and economic growth over the study period of 1980-2010.
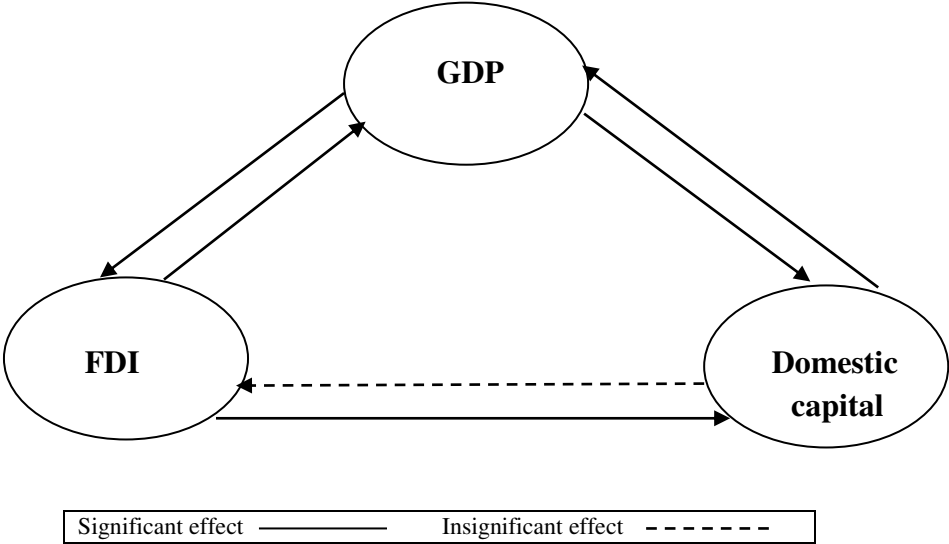

Fig. 1 Interrelationship between FDI, domestic capital and GDP for MENA countries.

5. Conclusion and implications

While the literature on the causality links between domestic capital, FDI and economic growth for individual countries and for panels of countries has increased over the last few years, there is no study that examines this interrelationship using a growth framework and simultaneous equations models. The objective of the present work is to fill this research gap by examining the above interaction for 13 MENA countries over the period 1990-2011.

Our analysis suggests that (i) there is bi-directional causal relationship between foreign investment and economic growth; (ii) there is uni-directional causal relationship from foreign investment to domestic capital; and (iii) there is bi-directional causal relationship between domestic capital and economic growth for the region as a whole. We find also that there is an indirect effect of financial development in MENA region on economic growth via the stock of domestic capital, i.e., the financial development significantly affects their stock of national capital which contributes to economic growth. Therefore, an increase in the stock of human capital promotes economic growth but growth in the government expenditure reduces economic growth and its effect on the stock of domestic capital is also negative. The foreign direct investment is contributing to the growth of the domestic capital stock but growth in the domestic capital stock does not significantly contribute to the stock of FDI in MENA region. Finally, the degree of openness and the real exchange rate produce a significant impact on the stock of foreign direct investment in MENA region. This result supports the idea that openness policy through the abolition of trade barriers and free movement of capital flows is a source of FDI attractiveness

From the results presented in this paper, it can be argued that (i) the MENA countries should orient its economic policies to changes and improve the government consumption and the stock of human capital to support a sustainable economic growth because increased spending on advanced education and training contributes to economic growth by easing the adoption of foreign technologies ; (ii) governments are unable to take full advantage of foreign direct investment inflows because : their financial market is insufficiently developed, the spending on education is insufficient, and technology gap between the foreign and domestic firms is too large. Therefore, governments must improve political stability, law and order, socioeconomic conditions and the investment profile and must reduce the level of corruption to attract more FDI and domestic investment because the generated value added in

many sectors and reduced unemployment rate ; (iii) the financial sector should provide sufficient resources by creating new instruments, institutions and organizations for the demand of real sector with the economic growth leads development of the financial sector; (iv) more prudent policies might involve removing barriers that prevent local firms from establishing adequate linkages, improving local firms' access to inputs, technology, and financing, and streamlining the procedures associated with selling inputs. But we might also seek to improve domestic conditions, which should have the dual effect of attracting foreign investment (Alfaro et al., 2006) and enabling host economies to maximize the benefits of such foreign investment.

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