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Does FDI Affect Growth in MENA Countries?
A Semi-Parametric Fixed-Effects Approach

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Abstract

It is often asserted with confidence that foreign direct investment (FDI) is beneficial for economic growth especially in the host developing economy. Nevertheless, there is no empirical consensus on a positive effect of FDI on host-country growth, nor on the direction of causation. One of the reasons behind the lack of consensus is likely the presence of nonlinearities in FDI and growth relationship. Most of the previous studies either used the linear empirical growth model or tried to bypass the nonlinearity issue by using ad hoc procedures. However, it is also true that growth theory provides little guidance about the exact nature of nonlinearity. Consequently, it is almost impossible to determine the exact form of nonlinear specification that would be appropriate for all data sets and data ranges. Our paper investigates this challenging question in empirical growth literature that is the impact of FDI in promoting economic growth in developing economies without adopting any ad hoc procedure to capture the nonlinearity in FDI-growth relationship. Based on a dualistic growth framework originally developed by Feder (1982) and partial linear regression approach, we are able to separate measure for sector externality and factor productivity effects between the two sectors (exports and non-exports sector). We define sectoral externality, as a function of real FDI stocks per capita. Thereby, our theoretical framework allows us to capture both direct and as well as indirect effects of FDI on economic growth across 8 MENA countries during the period 1990-2016.

Keywords: FDI, Growth of Developing Countries, Semiparametric and Nonparametric Methods
JEL Classification Codes: F21, O11, C14

1. Introduction

Along with the deepening international economic and financial integration, the last two decades saw a significant increase in foreign direct investment (FDI) to the Middle East and North African (MENA) countries. Between the period 2002 and 2017, total FDI inflows to MENA countries increased by 270%, from $11.8 billion to $43.7 billion, as a result of changes in the FDI regimes and improvements in the investment environment (UNCTAD, 2018). Nonetheless, after almost a decade of strong FDI growth, inflows started falling in 2009, following the global economic slowdown and financial crisis that started in the end of 2007. They subsequently hit an all-time low in 2017 following the political upheavals and wars in the region. These events have had a significant negative spillover effect on the FDI attractiveness of the entire region with some investors suspending their operations, downscaling their commitments or withdrawing their investments all-together in some countries (OECD, 2014).

Since 2009, the situation in the MENA region differs significantly from that of other developing regions, where FDI inflows resumed as of 2010. In developing economies, inflows increased by 6.7% between 2010 and 2017, while, in contrast, the MENA region experienced a 47% decrease in FDI inflows in those same years. Similarly, the MENA region only captured 6.5% of total FDI inflows to developing countries in 2017, compared to 19% in 2008 (Figure 1). Yet an enhanced level of FDI is necessary to rapidly expand exports, employment and revenue base in many countries of the region.

Downward pressure on FDI in MENA countries remains a matter of concern for policymakers who often perceive attracting FDI and multinational enterprises as a privileged channel of introducing high-capability firms into relatively low-capability industrial settings. Based on the assumption of automated diffusion mechanisms or knowledge spillover, the idea is that advanced production technology, managerial knowledge, and working practices will be transferred from foreign investors to local firms, boosting the productivity of local producers and consequently the growth in the host country. FDI is then considered as a vehicle for growth, and any drop in the former is perceived as a direct threat to the country's development outlook.

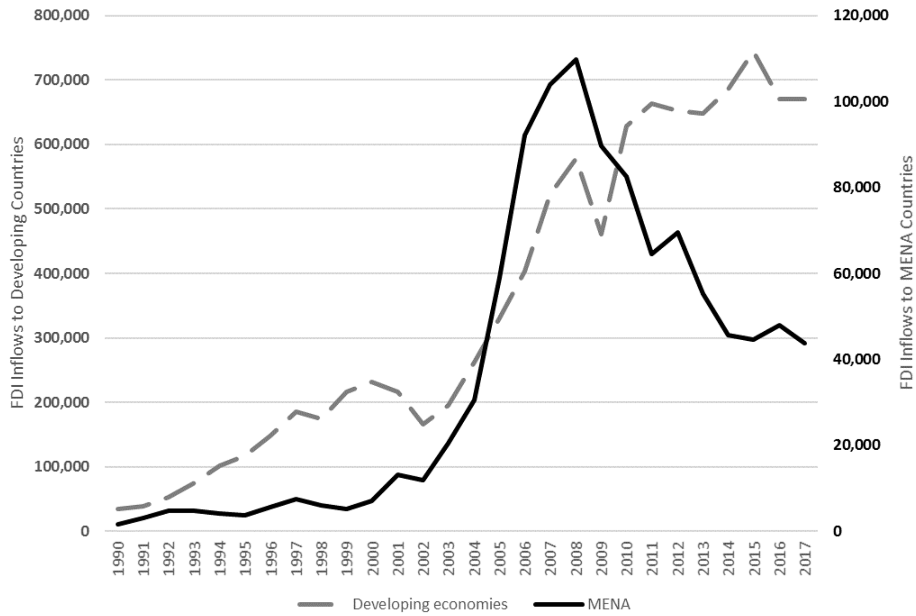

Figure 1. FDI Inflows (Millions of USD) to MENA[1] and Developing Countries

A review of the abundant empirical literature related to the impact of FDI on the economic growth highlights the diversity of the scenarios adopted and provides mixed results. The impact of FDI on growth on cross sections and panel of developed, developing and MENA countries as well as for individual economies has been assessed in this literature.

A number of studies reported support for the theory that FDI benefits growth. The following studies conclude that the link between FDI and growth is positive and significant: Walz (1997), Reisen and Soto (2001), Choe (2003), Mullen and William (2005), Yao (2006), Basu and Guariglia (2007), Ekanayake and Ledgerwood (2010), Azam and Ahmed (2014), Tan and Tang (2016), Williams (2017) and Begum et al. (2018) among others. Razzak and Bentour (2013) found that real GDP is fairly sensitive to small changes in FDI in five MENA countries, more so than the Asian countries considered in their paper[2]. They also found significant nonlinear effects of FDI and the product of FDI and human capital on the level of GDP per capita.

Several other studies find growth positive effects of FDI conditional on the host country environment or strategy. Balasubramanyam et al. (1996) examined the effect of FDI on average

[1] In this figure, MENA region refers to the following 20 countries: Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, State of Palestine, Sudan, Syria, Tunisia, Turkey, UAE and Yemen.

[2] The considered MENA countries are Algeria, Egypt, Jordan, Morocco, and Tunisia.

growth rate for 46 countries over the period 1970–85. They found that FDI has a positive effect on economic growth in only host countries that have an export promoting strategy. Borensztein, De Gregorio, and Lee (1998) argue that FDI boosts growth via technology diffusion, if the host economy disposes of sufficient absorptive capacity proxied by the human capital. Durham (2004) finds in a large multicountry study that FDI is not significantly correlated with growth, interpreting this as evidence of needed absorptive capacity of the host economy. So developed economies with greater human capital should benefit more from FDI. This interpretation is supported by Prasad, Rajan, and Subramanian (2007) and Batten and Vo (2009).

In contrast, Bornschier, Chase-Dunn, and Rubinson (1978) conclude that FDI has a negative impact on the growth of developing countries. Fry (1993) confirms by reporting that in eleven countries FDI exerts a negative impact on growth. Kherfi and Soliman (2005) main findings suggest that the effect of FDI on economic growth is generally negative or statistically insignificant in MENA. Nair-Reichert and Weinhold (2001) report causality running from FDI to economic growth, Hansen and Rand (2006) concur and report strong causality from FDI to growth regardless of development level. Carkovic and Levine (2005) criticize earlier studies on the effect of FDI on growth due to endogeneity. The authors perform a multicountry test using the generalized method of moments and find no robust boost of growth from FDI. Alagoz et al. (2008), Yaoxing (2010) and Roy and Mandal (2012) come to the same conclusion while adopting diverse empirical methodologies for different regions of the world.

In sum, despite the seemingly general agreement among policy-makers in many developing regions, including MENA countries, regarding the productivity and growth effects from FDI, there is no empirical consensus on a positive effect of FDI on host-country growth, nor on the direction of causation. One of the reasons behind the wide range of contradictory empirical results is likely the presence of nonlinearities in FDI and growth relationship. Most of the previous studies either used the linear empirical growth model or tried to bypass the nonlinearity issue by using ad hoc procedures such as adding the quadratic or interaction terms in the linear regressions. However, it is also true that growth theory provides little guidance about the exact nature of nonlinearity. Consequently, it is almost impossible to determine the exact form of nonlinear specification that would be appropriate for all data sets and data ranges.

Under certain circumstances, the researcher might feel more confident about the functional form of some parts of the regression equation, but be less assertive about the form of the other parts. Then combining the parametric and non-parametric techniques could help obtain the consistent estimates of the parameters of interest.

We investigate the challenging question in empirical growth literature that is the impact of FDI in promoting economic growth in developing economies without adopting any ad hoc procedure to capture the nonlinearity in FDI-growth relationship. Based on a dualistic growth framework originally developed by Feder (1982) and semi-parametric regression approach, we are able to separate measure for sector externality and factor productivity effects between the two sectors (exports and non-exports sector)[3]. We define sectoral externality, as a function of FDI stocks. Thereby, our theoretical framework allows us to capture both direct and as well as indirect effects of FDI on economic growth across 8 MENA countries during the period 1990-2016.

We contribute to the existing literature in two ways. Firstly, the linearity constraint in examining the role of FDI on economic growth is released by using a nonlinear econometric model. The latter allows economic growth to respond to its nonlinear determinants differently in different countries. Secondly, the adoption of the dualistic growth model framework allows identifying the spillover effects of FDI from a different angle.

The rest of the paper is organized as follows. Section 2 presents an extension of the dualistic growth model to evaluate the impact of FDI and human capital on economic growth. Section 3 briefly exposes the econometric framework. Data set and empirical results are discussed in Section 4. Section 5 concludes the paper.

2. Dualistic Growth Framework

In order to stress the relationship between foreign direct investment, exports and growth process, we start with the original Feder (1982) dualistic two-sector spillover growth model and the extension proposed by Aurangzeb and Stengos (2014). The economy is composed of two mutually

[3] A partial linear model is a model, part of which takes a parametric from, and the remaining part is non-parametric. This type of model assumes little about the shape of the regression function beyond some degree of smoothness. It constitutes an important advantage to deliver estimators and inferences that are less dependent on the assumptions about the functional from.

exclusive and exhaustive sectors. One sector produces only for the domestic market (D) and the other produces only for the international market (X). The two sectors have general technologies employing both homogeneous physical domestic capital (K) and human capital (H) as inputs. The multinational enterprise considers the host economy as an export platform for serving its home market as well as other markets. Consequently, the exports sector benefits from the foreign capital stock (F) as an additional production input. This sector is also supposed to have external effects on real domestic sector production. Thus, the respective production functions for the domestic-oriented sector and the export sector are:

$$\mathrm{D(t) = D(H_D(t), K_D(t); X(t))} \tag{1}$$

$$\mathrm{X(t) = X(H_X(t), K_X(t), F(t))} \tag{2}$$

In equation (1), *X* represents externalities rather than an input since firms in the real domestic goods sector are supposed to ignore exports sector outputs in their profit maximizing decisions. D(.) and X(.) are assumed to be constant-returns-to-scale production functions.

The factor endowment constraints are given by:

$$\mathrm{H(t) = H_D(t) + H_X\,(t)} \text{ and } \mathrm{K(t) = K_D(t) + K_X(t)} \tag{3}$$

Domestic output is defined as:

$$\mathrm{Y(t) = D(t) + X(t)} \tag{4}$$

The model allows the values of the marginal productivities of both human capital $(\partial \mathrm{X}/\,\partial \mathrm{H_X} \equiv \mathrm{X_H}, \partial \mathrm{D}/\,\partial \mathrm{H_D} \equiv \mathrm{D_H})$ and capital $(\partial \mathrm{X}/\,\partial \mathrm{K_X} \equiv \mathrm{X_K}, \partial \mathrm{D}/\,\partial \mathrm{K_D} \equiv \mathrm{D_K})$ to differ across sectors by a constant uniform proportion δ:

$$\mathrm{X_H(t)/D_H(t) = X_K(t)/D_K(t) = 1 + \delta} \tag{5}$$

δ measures the productivity differential between export and non-export sector. The model does not impose the existence of any productivity differentials. Instead, it is set up with the possibility of testing for them[4]. However, the formulation (5) assumes, in an ad-hoc manner, that the productivity differential between the two sectors is the same for all inputs.

FDI coming to the exports sector is assumed to introduce some new technologies and this will translate into higher productivity of the foreign capital compared to domestic capital. It follows:

$$\partial X(t)/\partial F(t)/\partial X(t)/\partial K_X(t) \equiv X_F(t)/X_K(t) = \lambda > 1 \tag{6}$$

By differentiating aggregate output identity (4) with respect to time (omitted for simplicity), substituting from (1) into (3), and making use of (5) and (6), the following equation can be derived:

$$\dot{Y} = D_H\dot{H} + D_K\dot{K} + \left(\frac{\delta}{1+\delta} + D_X\right)\dot{X} + \lambda D_K\dot{F} \tag{7}$$

where "$\cdot$" denotes change over time and $D_X \equiv \partial D/\partial X$.

The exports sector output is supposed to affect the production of the domestic sector output by some non-constant parameter θ formulated as a function of the host country's ability (z) to absorb new incoming investment from a foreign country; accordingly, the real domestic goods sector's output could be reformulated as follows:

$$D = X^{\theta(z)} d(H_D, K_D) \tag{8}$$

The function θ(.) denotes the degree of export output externalities. We suppose that z is a function of FDI stocks in the host country and is considered as exogenous.

Using (8), equation (7) can be rewritten in the following form:

$$\dot{Y} = D_H\dot{H} + D_K\dot{K} + \left(\frac{\delta}{1+\delta} - \theta(z)\right)\dot{X} + \theta(z)Y\frac{\dot{X}}{X} + \lambda D_K\dot{F} \tag{9}$$

or equivalently:

$$\frac{\dot{Y}}{Y} = D_H\frac{H}{Y}\frac{\dot{H}}{H} + D_K\frac{\dot{K}}{Y} + \left(\frac{\delta}{1+\delta} - \theta(z)\right)\frac{\dot{X}}{Y} + \theta(z)\frac{\dot{X}}{X} + \lambda D_K\frac{\dot{F}}{Y} \tag{10}$$

[4] According to Feder's original model, exporting activities encourage producers to improve their technology and adopt more efficient process management to face foreign competition. Moreover, foreign competition generates a sort of natural selection mechanism among firms, and throughout this mechanism, less efficient firms are constrained to adapt or to leave the market. At the end of this mechanism, the remaining firms are those whose marginal factor productivity is higher.

The most straightforward way of considering human capital (H), as an input in the production of Y, in a manner that is consistent with the large literature on schooling and wages is to use the following exponential formulation:

$$H = e^{\omega s}L\,,\ \omega > 0 \tag{11}$$

where L is the number of workers, s denotes the time spend in accumulating human capital or equivalently the average years of schooling and ω represents the rate of returns to education (supposed to be constant).

By assuming a linear relationship between marginal productivity of human capital and average output per skilled worker ($D_H = \alpha\frac{Y}{H}$) and taking into account (11), equation (10) could be rewritten as follows:

$$\frac{\dot{Y}}{Y} = \alpha\frac{\dot{L}}{L} + \alpha\omega\dot{s} + D_K\frac{\dot{K}}{Y} + \frac{\delta}{1+\delta}\frac{X}{Y}\frac{\dot{X}}{X} + \lambda D_K\frac{\dot{F}}{Y} + \theta(z)\frac{\dot{X}}{X}\left(1-\frac{X}{Y}\right) \tag{12}$$

or equally:

$$\frac{\dot{Y}}{Y} = \underbrace{\alpha\frac{\dot{L}}{L} + \beta\dot{s} + \gamma\frac{I}{Y} + \kappa\frac{FDI}{Y}}_{\text{parametric component}} + \underbrace{\left(\frac{\delta}{1+\delta} - \theta(z)\right)\frac{X}{Y}\frac{\dot{X}}{X} + \theta(z)\frac{\dot{X}}{X}}_{\text{nonparametric component}} \tag{13}$$

where $\beta = \alpha\omega$, $\gamma = D_K$, $\kappa = \lambda D_K$, $\dot{K} = I$ denotes net domestic investment, $\dot{F} = FDI$ inward flows and $\frac{\dot{Y}}{Y}$ represents the real GDP growth.

The nonparametric component of (13) can be formulated as a general unknown function:

$$\phi(z) \equiv \underbrace{\left(\frac{\delta}{1+\delta} - \theta(z)\right)\frac{X}{Y}\frac{\dot{X}}{X}}_{\phi_1(z)} + \underbrace{\theta(z)\frac{\dot{X}}{X}}_{\phi_2(z)}\,,$$

where the functional form of ϕ(.) is unspecified. This unknown function is supposed to capture the indirect effect of FDI on economic growth in the host country. It refers, as mentioned above, to a host country's ability to absorb and capitalize on knowledge spillover resulting from FDI.

3. Econometric Framework

Equation (13) will represent the basis for the empirical investigation carried out in this paper in order to evaluate the direct as well as indirect effects of FDI on economic growth. It belongs to the following general class of partially linear semi-parametric model:

$$y_{it} = \rho_0 + W_{it}\rho + \phi(z_{it}) + \varepsilon_{it},\ i = 1,..,\text{N and } t = 1,\dots,\text{T} \tag{14}$$

where the dependent variable y_{it} is the value taken by the real growth rate of GDP for country *i* in year *t*, $W_{it} = \left\{\frac{\dot{\text{L}}}{\text{L}}, \dot{\text{s}}, \frac{\text{I}}{\text{Y}}, \frac{\text{FDI}}{\text{Y}}\right\}$ a vector of dimension 4, ρ is a 4x1 vector of unknown parameters, the variable z is an explanatory variable that enters the equation nonlinearly according to a non-binding function $\phi(.)$ and ε_{it} is the random error term assumed to have zero mean and constant variance.

A flexible and attractive approach to investigate the possible non-linearity in (13), while allowing for the linear effect of other conditioning variables, follows the semi-parametric fixed effects approach proposed by Baltagi and Li (2002). This approach is based on the general form of semi-parametric panel data model defined as follows (Libois and Verardi, 2013):

$$y_{it} = X_{it}\theta + \phi(z_{it}) + \alpha_i + \varepsilon_{it},\ i = 1,..,\text{N and } t = 1,\dots,\text{T} \tag{14)'$$

where y_{it} is dependent variable and $X_{it}\theta$ is parametric section of the model contain ordinary variables and $\phi(z_{it})$ is second part which is non-parametric piece that reflect the impact of real inward FDI stocks per capita.

To eliminate the fixed effects, α_i, a common procedure is to difference (14)' over time which leads to the following equation:

$$y_{it} - y_{it-1} = (X_{it} - X_{it-1})\theta + \big(\phi(z_{it}) - \phi(z_{it-1})\big) + \varepsilon_{it} - \varepsilon_{it-1} \tag{15}$$

The above equation raises the problem of estimating consistently the unknown function of $z \equiv \Phi(z_{it}, z_{it-1}) = \phi(z_{it}) - \phi(z_{it-1})$. The solution proposed by Baltagi and Li (2002) is to approximate $\phi(z)$ by series $p^k(z)$ defined as the first k term of a sequence functions $(p_1(z), p_2(z), \dots)$. Equation (15) therefore boils down to the following expression:

$$y_{it} - y_{it-1} = (X_{it} - X_{it-1})\theta + \Big(p^k(z_{it}) - p^k(z_{it-1})\Big)\gamma + \varepsilon_{it} - \varepsilon_{it-1} \tag{16}$$

which can be estimated consistently using ordinary least squares. Having estimated $\hat{\theta}$ and $\hat{\gamma}$, it is easy to fit the fixed effects $\widehat{\alpha_i}$ and go back to (14)' to estimate the error component residual defined as follows:

$$\hat{u}_{it} = y_{it} - X_{it}\hat{\theta} - \hat{\alpha}_i = \phi(z_{it}) + \varepsilon_{it} \tag{17}$$

The curve ϕ can be fitted by regressing $\hat{u}_{it}$ on z_{it} using some standard non-parametric regression estimator. Afterwards $\phi(z_{it})$ is estimated via a B-spline (Basis Spline) regression model. Splines are generally defined as curves which consist of individual segments which are joined smoothly. The segments are given by polynomials of certain degree in a variable *z* (in our case the natural logarithm of real inward FDI stocks per capita), and the points at which they join are referred to as knots. B-splines yield the same fit as splines based on truncated power functions, but have better numerical properties.

4. Empirical Results

The empirical implementation amounts to estimating the semi-parametric partially linear relationship (14) by adopting Baltagi and Li (2002) semi-parametric fixed effects regression approach presented previously. The dependent variable is the real GDP growth, $W = \left\{\frac{\dot{\mathrm{L}}}{\mathrm{L}}, \dot{\mathrm{s}}, \frac{\mathrm{I}}{\mathrm{Y}}, \frac{\mathrm{FDI}}{\mathrm{Y}}\right\}$ representing growth rate of employment, average years of schooling of adults' variation, gross domestic investment to GDP ratio and inward FDI flows to GDP ratio, respectively.

The dataset consists of a panel data of selected MENA countries and comprises measures for FDI and for other determinants of economic growth between 1990 and 2016. The country sample includes Algeria, Egypt, Iran, Jordan, Morocco, Sudan, Tunisia and Turkey. Three sources were used to construct the data. The FDI (stock and flows), merchandise exports, export and consumer price indices series are obtained from the United Nations Cooperation on Trade and Development data set (UNCTADstat). The mean years of schooling (males aged 25 years and above) data comes from UNESCO Institute for Statistics based on methodology from Barro and Lee. The data for real GDP, gross domestic capital formation, employment and population are obtained from the Conference Board Total Economy Database.

The xtsemipar Stata command, coded by Libois and Verardi (2013), is implemented to fit Baltagi and Li's semi-parametric fixed effects estimator where a unique variable, the natural logarithm of real inward FDI stocks per capita, enters the model nonparametrically. The non-parametric fits are obtained from Bsplines Stata modules (Newson, 2000).

The empirical analysis starts with the estimation of the basic Feder's dualistic growth model by assuming a linear parametric specification and using fixed effects estimation procedure. The aim is to confirm or refute the presence of dualistic growth phenomenon in the considered sample of countries. The results are reported in Table 1 column (1) provide support to the presence of dualistic growth phenomenon measured by the positive and significant coefficient of the term $(X/Y\,.\dot{X}/X)$ or the product of the share of merchandise exports to GDP and the exports growth rate. The hypothesis that marginal productivities in exports sector are higher than in the non-export sector is validated. In the absence of externalities (the conventional neo-classical model), the computed differential marginal productivity parameter (δ) is 0.21 ($\delta/(1+\delta) = 0.172$) which indicates the existence of a substantial productivity differential between exports and non-exports sector.

At a second step, the reduced form equation of the basic dualistic growth model specifying the sector externality effect (associated to the dependent variable Exports real growth rate) separately is estimated. The results reported in Table 1 column (2) indicate that the inter-sector externality parameter (θ) is statistically significant and positive confirming the presence of beneficial spillover effects of exports on non-exports sector. However, the estimated coefficient $\hat{\delta}$ becomes insignificant in presence of externalities effects. It may also be noted that when the externality effect is introduced, the R^2 increases by 37 %. This suggests that the simple formulation inspired by the conventional neo-classical model of column (1) is misspecified.

Table 1
Fixed effects estimation of the classic dualistic growth model.
Dependent variable: real GDP growth.

	(1)	(2)
Employment growth	0.256*	0.252*
	(0.131)	(0.126)
Average years of schooling (variation)	-0.009	-0.007
	(0.008)	(0.009)
Gross domestic capital formation to GDP	0.202*	0.240**
	(0.095)	(0.084)
Exports growth x Exports to GDP	0.172**	0.059*
	(0.076)	(0.030)
Exports real growth	-	0.063***
		(0.010)
R^2	0.182	0.249

Note: Robust White heteroscedastic consistent standard errors in parentheses. Specific effects dummies, turmoil (years 2011, 2012 and 2013) and crisis (year 2008) dummies included but not shown. Hausman test for both (1) and (2) rejected the null and conclude that random effects is not appropriate but at 10% significance level only.
Values in (.) are the standard errors. "*", "**" and "***" represents the 10%, 5% and 1% significance levels, respectively.

In the third stage, the Feder extended parametric model taking into account the impact of FDI is estimated using random effects (RE) procedure and the results are reported in Table 2 column (1) and (2)[5]. RE estimates indicate that exports contribute to growth through increased productivity and also through the external effects.

However, it has also been found that the parameter of gross fixed capital formation to GDP variable is statistically insignificant in the sample countries when sectoral externality effect is not taken into account. After introducing the sectoral externality effect separately most coefficients change magnitude and significance level, an indication that the linear formulations could be misspecified. Not taking into account the potential non-linearity of FDI on economic growth could explains such results. In that sense, the estimation of the semi-parametric model presented in equation (13) is an attempt to explain such results.

The semi-parametric estimation results are reported in column (3) of Table 2. An improvement in the quality of the regression is noted compared to the RE results exposed in columns (1) and (2). Consistent with theoretical predictions, the results of the parametric part show that employment, domestic investment and FDI were individually, separately positively, and significantly correlated with economic growth in the considered sample of MENA countries.

Interestingly enough, the estimated impact of domestic investment on GDP growth rate is now 5.6 times larger than the estimated impact based on the linear specification with sectoral externality (Column (2) of Table 2). By contrast, in absolute terms the impact of FDI on economic growth is

[5] Hausman test favors the random effects over the fixed effects model.

relatively minor. Indeed, one percent increase in foreign investment rate (inward FDI flows to GDP), increases GDP growth by only 0.07 percent. It is also interesting to note that the estimated marginal impact of human capital quality (the average years of schooling variation) on growth is highly significant only when the semi-parametric approach is adopted. The estimated average returns to schooling $\widehat{\omega}$ deduced from $\hat{\beta} = \widehat{\alpha}\widehat{\omega}$ is around 4% (0.0394 = 0.011/0.279), which is very low by international standards. In a recent paper, Kingsbury (2018) provides several hypotheses for the low returns to education in MENA region citing such factors as corruption, natural resources and poor academic performance.

Table 2
Estimation of the extended Feder model.
Dependent variable: real GDP growth.

	Random Effects		Semi-parametric
	(1)	(2)	(3)
Employment growth	0.253**	0.252**	0.279**
	(0.133)	(0.126)	(0.136)
Average years of schooling (variation)	-0.005	-0.002	0.011***
	(0.006)	(0.003)	(0.003)
Gross domestic capital formation to GDP	0.083	0.111*	0.619***
	(0.069)	(0.065)	(0.143)
FDI to GDP	0.164***	0.189***	0.069*
	(0.070)	(0.059)	(0.035)
Exports growth x Exports to GDP	0.150*	0.037	-
	(0.081)	(0.029)	
Exports real growth	-	0.063***	-
		(0.009)	
R^2	0.222	0.302	0.361

Note: Robust White heteroscedastic consistent standard errors in parentheses. Specific effects dummies, turmoil and crisis dummies included but not shown. Hausman test for both (1) and (2) failed to reject the null at 30.1% and conclude that the preferred model is random effects. For the semi-parametric estimation results, standard errors are clustered by country.
Values in (.) are the standard errors. "*", "**" and "***" represents the 10%, 5% and 1% significance levels, respectively.

As far as the effect of the log of the real FDI inward stocks per capita is concerned, as an explanatory variable that enters the equation (13) according to a non-binding function $\phi(.)$, Figure 2 shows that it is clearly nonlinear. As long as the accumulated FDI per capita is below a threshold evaluated around 3000 USD, the country with the smaller inward FDI stocks per capita benefits more in terms of growth than the one with the bigger FDI stocks per capita. Equivalently, for countries endowed with more FDI stocks per capita, further increase in FDI results in lower impact on growth until the threshold is reached. Beyond the 3000 USD threshold, countries with higher level of FDI stocks per capita benefit more in terms of growth but with declining effect in absolute value.

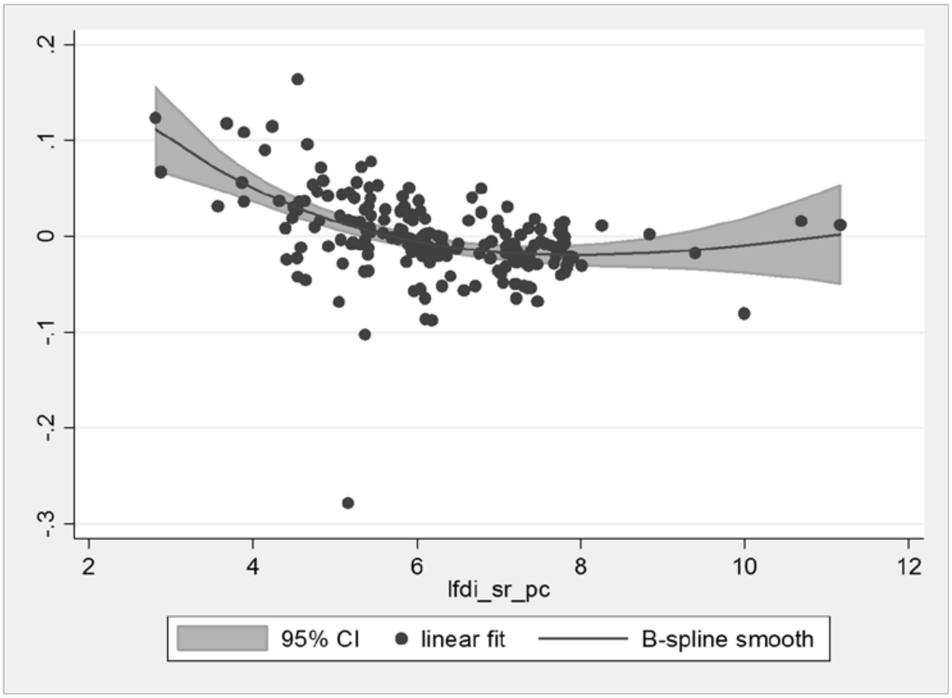

Figure 2. Nonlinear link between the real GDP growth rate and FDI inward stocks per capita in logs

5. Conclusion

The relationship between FDI and economic growth has long been a subject of great interest in the development literature. Despite the seemingly general agreement among international financial institutions advisors and policy-makers in many developing countries regarding the productivity and growth effects from FDI, there is no empirical consensus on a positive effect of FDI on host-country growth, nor on the direction of causation.

One of the reasons behind the wide range of contradictory empirical results is likely the presence of nonlinearities in FDI and growth relationship. This paper provides updated exploration of the impact of FDI in promoting economic growth in developing economies. Based on a dualistic growth model originally developed by Feder (1982) and partial linear regression approach, the theoretical framework allows capturing both direct and as well as indirect effects of FDI on economic growth across 8 MENA countries during the period 1990-2016. It contributes to the existing literature in two ways. Firstly, the linearity constraint in investigating the role of FDI on economic growth is released by using a nonlinear econometric model. Secondly, the adoption of the dualistic growth model framework allows identifying the spillover effects of FDI.

Consistent with theoretical predictions, the results of the parametric part show that employment, domestic investment and FDI were individually, separately positively, and significantly correlated with economic growth. Moreover, implementing semi-parametric fixed effects approach improves significantly the quality of the regression. This approach reveals a nonlinear threshold effect of FDI stocks per capita on the link between FDI inward flows and economic growth.

The findings of the present study tend to support the view that inward FDI plays an important role during the development process particularly in countries less endowed with FDI stocks. Firstly, as an important determinant of growth, secondly, by creating higher factor productivities in exports sector and finally, through spillover affects due to fostering the linkages between the foreign investors and their host country partners. Notwithstanding, however, in absolute terms the impact of FDI on economic growth is relatively minor as compared to the impact of domestic investment.

Appendix

Table A1: Countries covered and data averages

COUNTRY	Average (1990-2016)							
	Real GDP growth (%)	Real FDI inward Stocks per capita (US $)	FDI inflows to GDP (%)	Gross Fixed Capital Formation to GDP (%)	Mean years of schooling (years)	Employment growth rate (%)	Real Export goods growth rate (%)	Export of goods to GDP (%)
Algeria	2.9	272	0.9	29.5	6.25	3.3	4.3	31.1
Egypt	4.4	423	2.7	19.4	5.3	3.2	5.9	8.9
Iran	3.4	201	0.6	31.1	7.2	2.3	4.6	19.6
Jordan	4.7	1488	6.5	26.8	9.2	4.9	4.7	26.6
Morocco	3.9	690	2.5	28.9	3.7	2.9	5.7	17.9
Sudan	4.2	140	2.7	19.1	2.6	2.6	7.7	8.9
Tunisia	3.8	1819	3.1	24.6	5.4	2.2	3.9	31.1
Turkey	4.3	17622	1.2	26.7	6.0	2.0	9.1	13.0

Table A2: Descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observations	
Real GDP growth	**overall**	0.039	0.039	-0.273	0.134	N =	208
	between		0.006	0.029	0.047	n =	8
	within		0.039	-0.275	0.132	T =	26
Real FDI inward Stocks per capita (USD)	**overall**	2832	15569	17	181190	N =	216
	between		6008	140	17623	n =	8
	within		14515	-14405	166399	T =	27
FDI inflows to GDP	**overall**	0.025	0.033	-0.006	0.282	N =	216
	between		0.019	0.006	0.065	n =	8
	within		0.029	-0.046	0.242	T =	27
Gross Fixed Capital Formation to GDP	**overall**	0.258	0.067	0.055	0.426	N =	216
	between		0.045	0.191	0.311	n =	8
	within		0.052	0.122	0.418	T =	27
Mean years of schooling (variation)	**overall**	0.151	0.202	-0.500	2.100	N =	208
	between		0.044	0.081	0.215	n =	8
	within		0.198	-0.518	2.036	T =	26
Employment growth rate	**overall**	0.029	0.041	-0.160	0.229	N =	216
	between		0.009	0.020	0.049	n =	8
	within		0.040	-0.160	0.229	T =	27
Real Export goods growth rate	**overall**	0.057	0.198	-0.662	1.108	N =	208
	between		0.018	0.039	0.091	n =	8
	within		0.197	-0.681	1.088	T =	26
Export of goods to GDP	**overall**	0.196	0.099	0.026	0.467	N =	216
	between		0.092	0.089	0.311	n =	8
	within		0.049	0.074	0.352	T =	27

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