

Foreign Direct Investment (FDI) and Economic Growth: an approach in terms of cointegration for the case of Tunisia

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Abstract

Throughout the last decades, the global economy has been completely sophisticated. It has evolved in an increasingly more and more complicated context, given the mechanism of free trade, free flow of capital and goods; investment has become important for developing countries. In this respect, it is necessary to study the impact of foreign direct investment (FDI) on the economic growth of the host country, especially in Tunisia.

By using recent techniques of time series analysis over the period 1975-2009. Our empirical results thus suggest that FDI could help boost the process of long-term economic growth.

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1 Introduction

In the 50s and 60s, foreign direct investment was looked at with great suspicion by some developing countries (DCs). FDI was seen as a dominating factor and multinational corporations (MNCs) were suspected of reducing social welfare by manipulating transfers prices and the formation of economic enclaves.

At present we are witnessing a radical change in the attitude of developing countries towards FDI. The behavior of suspicion is now replaced by a promoted attracting policy aiming at substantial inflows of FDI (Oman, 2000). This change in attitude was abundant in part made possible by a global economic environment increasingly liberal and an economic literature highlighting the virtues of FDI. Indeed, several scholars (Caves, 1996), (Dunning, 1993), (Moran, 1998), (Lall, 2000) grant to FDI an important role in economic development.

In the early 80s, research on the determinants of economic growth has attracted new interest among economists. Theories of endogenous growth have stimulated research that aimed at identifying the main factors explaining differences in economic growth rates between countries. Such research has shown that the accumulation of physical capital is one of the main foundations of economic growth. Although in the short term, the relationship between investment and economic growth tends to be low. In the long run however, the investment rate is found to be strongly correlated to economic growth. A country relies on foreign capital if domestic savings cannot finance domestic investment. This capital is then the financial surplus of the rest of the world, therefore foreign savings.

FDI is now considered as one of the strongest pillars for the economy and everything is done at the level of procedures, regulations and various obligations to attract them. Having recognized the growing role of FDI in economic development, it has become more and more difficult for governments to reverse that, taking advantage of the openness that was made to them, MNCs have significantly expanded the scope of their operations and that the same governments are themselves caught up in liberalization engaged in an increasingly fierce competition and have become open to each other (Baldwin, 1997).

As such, most countries seek to attract FDI through their attractive stocks. In this sense the attraction has become an explicit objective of economic policy both in developed and in developing countries (see Delapierre and Milelli, (1995)).

In this context, since the 70s, Tunisia has always adopted an approach that makes the IDE a major component of its development plan. Thus, a series of measures have been taken to make the country more attractive to FDI. This policy guarantees the country an average of annual flow of about 2634 MDT between 2005 and 2009. Therefore, if FDI inflows have actually contributed to economic growth, especially as the country recorded an average annual growth of around 4.5% over the period 2005-2009.

The objective of our research is to analyze the effect of FDI on economic growth in the Tunisian context. Specifically, a crucial question to ask: What's the effect of FDI on economic growth?

This paper is organized as follows: Section 1 presents a review of the literature on the impact of FDI on economic growth. Section 2 discusses our estimation method and Section 3 presents our empirical results.

2 Literature Review

2.1 Theoretical review

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 decrease in marginal productivity of capital, the host economy converges to steady-state and FDI had no permanent impact on economic growth. It is only through permanent technology shocks that FDI affects economic growth of the host country.

An additional feature of endogenous growth models is their importance. According to these models, the long-term growth may be affected by economic policies. A policy of openness on the outside world and thus promoting FDI which are justified by leading to a permanent increase in growth rate.

Thus, if the determinants of growth are endogenous and FDI is viewed as a composite of capital, "know-how" and technology Balasubramanyam et al. (1996), there are several channels through which FDI contributes to economic growth in the host country which we will try to present a theoretical model through explaining each of these channels. In general, FDI affects economic growth:

The accumulation of capital: FDI facilitates the incorporation of new inputs and new varieties of intermediate goods in production Feestra and Markusen (1994). From the side of new technologies FDI promotes technology transfer and appears as a potential source of productivity gains enjoyed by local firms.

Technology transfer: FDI increases the existing stock of knowledge of the host country. Indeed, the adoption of management practices and more effective organization, technical assistance and training of local staff can improve the productivity of local firms. Technological externalities associated with FDI: the externalities are varied and their effects on long-term growth are a common feature of models of endogenous growth Romer (1990). Thus, at the level of the firm, the presence of externalities reflects the difference between the performance of private and social investment, due to the decrease in marginal productivity as a result of capital accumulation. At a more aggregate level, the existence of several

forms of externalities prevents the decrease in the marginal productivity of capital and allows increasing the long-term growth. FDI can, therefore, be a catalyst for domestic investment and technical progress of externalities it generates.

In the 1990s, flows of foreign capital were more oriented towards the developed countries. The neoclassical theory of growth has been unable to explain this phenomenon because it assumes that capital should move from rich to poor countries. The endogenous growth theory (Lucas, 1990), whose objective is to seek an explanation of the fact back in human capital and shows that there will be no transfer of capital from rich countries to poor ones. Wang (1990), as part of an empirical verification of the FDI-growth relationship in china, found that there are two potential routes by which FDI affects economic growth namely: rate of physical capital accumulation and productivity growth. Thus, according to Wang (1990), FDI is not only an additional source of financing growth, but also helps increase productivity.

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 of growth rate depends on, the rate of time preference, and productivity of domestic capital and the degree of complementarity between domestic and foreign technologies.

Brensztein, De Gregorio and Lee (1998), using an endogenous growth model in which the rate of technical progress is considered as the main determinant of the long-term growth rate and highlighted the role of FDI in economic growth. In this model, it appears that the adoption of new technologies generated by the FDI and the presence of a sufficient level of human capital in the host country are two determinants of economic growth and a complementarity between FDI and capital is required for the human growth process.

2.2 Empirical review

Among the external sources of financing FDI is viewed as a valued source for DCs. FDI carries direct and indirect benefits. FDI is attributed to significant positive effects such as creating employment, increasing the rate of growth and technology transfer. In most cases, FDI is characterized by beneficial effect because it is a source of capital, a source of access to new technology, a transmission channel and marginal technical knowledge and finally a knowledge factor of marketing networks. The direct effects of FDI can be identified since their impact is significant and measurable (job creation...).

A number of studies have attempted to study the relationship FDI-growth rate of GDP. Some authors have shown that the correlation between FDI and economic growth can be negative. Indeed, Saltz (1992) shows that FDI can increase the overall level of investment, productivity, but can also increase the growth rate. To confirm his findings, Saltz (1992) studied the relationship FDI-growth rates on a sample of several countries that are divided into two groups according to the

amount of FDI attracted. He concluded that the correlation between FDI and growth is still negative in developing countries that have eliminated constraints on repatriation of profits.

Conversely, a study by Borensztein, De Gregorio and Lee (1998) to test the effect of FDI on economic growth in 69 developing countries. This study finds a positive correlation between growth rate and FDI and shows that the contribution of FDI in economic growth depends on the capacity of assimilation of technology by the host countries. And complementarity between human capital and FDI is considered as being necessary.

In this context, Balasubramanyam et al. (1996) show that the expected beneficial effects of FDI on the economy of the host country depend on the development strategy that is either oriented towards import substitution or towards the exports promotion. However, empirical studies testing this relationship between FDI and economic growth find different results reflecting inherent characteristics of the host country (level of local development, level of infrastructure, level of education of the workforce, degree of openness...). Some studies show a negative correlation Haddad and Harrison (1993). Other studies show a positive correlation (see, Borensztein et al. (1998), Balasubramanyam et al. (1996)).

Another line of research carried out by Bouoiyour and Yazidi (2001), points out that the countries of North Africa have not benefited enough from their proximity to Europe to attract FDI and to increase exports. The industrial sector remains weak and oriented towards the petroleum (Algeria and Egypt) or fragile for both Tunisia and Morocco and activities are centered on textile.

In the same vein, an econometric study conducted by Yao and Wei (2007) and test the effect of FDI on economic growth in a newly industrialized economy. This study finds a positive effect. In the same vein, Kottaridi and Stengos (2010) found that there is a positive relationship between FDI and economic growth.

3 Methodology

3.1 Estimation Method

There are many econometric models studying the effect of FDI on economic growth. The choice of our model is based on the existence of variables. To empirically analyze the effect of FDI on economic growth in Tunisia, we cover the period from 1975 to 2009 for which data are available. Estimates and tests based on modern analysis of time series (stationary tests, co-integration tests, error correction models). We built a model based on that of Enisan Akinlo (2004).

The structure of our model, which assumes a logarithmic form, is:

$$\text{LogGDP}_t = \alpha_0 + \alpha_1 \text{LogFDI}_t + \alpha_2 \text{LogSEC}_t + \alpha_3 \text{LogOPEN}_t + \alpha_4 \text{LogDF}_t + \varepsilon_t$$

with

Endogenous variables: GDP

GDP: Real gross domestic product

Exogenous variables: FDI, SEC, OPEN, DF

FDI: The entries of foreign direct investment relative to GDP

SEC: The human capital (proxied by school enrollment rates at secondary level)

OPEN: Economic openness (ratio of exports plus imports to GDP)

DF: Financial development (report of exports plus imports to GDP)

ε : The error term

3.2 Empirical results

To study the effect of FDI on economic growth, variables stationary should be checked.

3.2.1 Stationary test

A time series is considered stationary if its expectation and its covariance are constant and independent of time on the one hand, and its variance is finite and independent of time on the other. Formalized manner, the stochastic process y_t is stationary if:

- $E(y_t) = E(y_t + m) = \mu$
- $V(y_t) < \infty$
- $Cov(y_t, y_t + k) = E(y_t - \mu)(y_t + k - \mu) = \gamma k$

Thus, a method to verify the existence of unit root (no stationary) in a time series is to use the Dickey-Fuller simple (DF) (1979) or Dickey-Fuller (ADF). Alternatively, one can follow the approach of Phillips-Perron (1988) to test the unit root hypothesis. In our study, we use the ADF test as it is frequently used in recent empirical studies. Furthermore, the hypotheses of unit root test that will test are:

- $H_0: \sigma = 0$ (unit root)
- $H_1: \sigma \neq 0$ (stationary)

In case we accept the null hypothesis H_0 , we say that the series is no stationary. In this case, we talk of regression fallacy and therefore cannot interpret the meaning of the economic regression results. We must differentiate the series (first difference).

To test the stationary, we exposed the series (LGDP, LFDI, LSEC, LOPEN and LDF) for unit root tests. The results are listed in the table below.

Table 1: Testing stationarity level

Variables	ADF test in the level 5%	ADF critical
LGDP	-2,49	-3,548
LFDI	-1,705	-1,951
LSEC	-1,599	-2,967
LOPEN	1,147	-1,951
LDF	1,987	-1,951

From the results conducted by the ADF test, we find that all variables are no stationary in levels since the calculated value is greater than the ADF critical values therefore we accept the hypothesis H_0 presence of unit root. In order to make these series stationary, we have differentiated to order one, the results are presented in the table below.

Table 2: Testing for stationary in first differences

The variables	Test ADF in first difference	ADF critical 5%
DLGDP	-6,837	-2,954
DLFDI	-7,314	-1,951
DLSEC	-14,046	-3,574
DLOPEN	-4,332	-1,951
DLDF	-4,431	-2,954

From the above, we note that the ADF statistics are below critical values. So we can conclude that the variables are integrated of order one since they are not stationary in levels and stationary in first difference. What is interesting about the use of cointegration technique is to study the long-run relationship between non-stationary variables in level and we need to estimate an error correction model to test the possibility of existence of short term relationship.

3.2.2 Test for cointegration

The theory of cointegration proposed by Engel and Granger (1987), is considered as one of the most important new concepts in the field of econometrics and time series analysis. The cointegration test clearly identifies the real long-term relationship between the variables in the model. Most financial variables are not stationary, this implies that the statistical estimation may sound good but in reality it is incorrect. Cointegration therefore allows estimating the long-term relationship between non-stationary variables integrated of same order. Furthermore, the Johansen (1988) test is preferred to test the existence and number of cointegration between variables in the model.

Table 3: Testing for cointegration

Hypothesis N, relationship cointegration	Maximum likelihood	Statistics		
		of the trace	Critical value at 5%	Probability
No relationship	0,626	76,308	69,818	0,013
At most 1	0,534	43,781	47,856	0,114
At most 2	0,239	18,519	29,797	0,527
At most 3	0,182	9,465	15,494	0,324
At most 4	0,081	2,813	3,841	0,093

We found that the variables in the estimation are integrated of order one, so we can conclude that there is a possibility of existence of a co-integration between the variables. At this level, we must verify the existence of the relationship of cointegration by Johansen method, which calculated two statistics to determine the number of cointegration relationship, the test of trace and maximum eigenvalue. The results of test are presented in the Table 3 above.

The results of the estimate contained in the table above, we reject the hypothesis H_0 of no cointegration relationship between variables estimation because the statistical values are greater than their critical values. So we see that the trace test indicates the existence of one co-integration relationship between variables at the 5%, against the test by the maximum eigenvalue implies no cointegration relationship. The cointegration relationship is as follows:

Table 4 : Relationship of cointegration

GDP	FDI	SEC	OPEN	DF
1	0.052541	0.483485	0.673518	0.639981
	(0,035)*	(0,072)*	(0,252)*	(0,307)*

*Student's error

From test results of the trace shown in the table above, equation cointegration is as follows:

GDP =	0,052	FDI	0,483	SEC	0,673	OPEN	0,639	DF
	(0,035)*		(0,072)*		(0,252)*		(0,307)*	

* Student's error

This relationship is called cointegration of long-term relationship between the coefficients of financial development, FDI, human capital, trade openness and real GDP of the Tunisian economy.

Following the existence of cointegration relationship, it is obvious to estimate error correction model (ECM), since the variables are integrated of order one.

3.3.3 The error correction model (ECM)

The error correction model proposed by Engel and Granger (1987), describes a process of adjustment by contributing two types of variables, the level variables that measure long-term fluctuations and first difference variables that measure changes on the short term. The error correction model is as follows:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta x_{1t} + \alpha_2 \Delta x_{2t} + \dots + \alpha_k \Delta x_{kt} + \gamma e_{t-1} + \nu_t$$

The coefficient γ (force towards the long-run equilibrium) must significantly be negative.

The equation that relates the short run dynamics of economic growth based on the explanatory variables in this model is as follows.

$\Delta(\text{GDP}_t) =$	$-1,198\hat{\gamma} +$	$0,329\Delta(\text{GDP}_{t-1})$	$+ 3,805\Delta(\text{SEC}_{t-1})$
	$(-5,732)^*$	$(2,489)^*$	$(2,530)^*$
	$+0,433\Delta(\text{FDI}_{t-1})$	$38,211 \Delta(\text{DF}_{t-1})$	$-4,013\Delta(\text{OPEN}_{t-1})$
	$(2,960)^*$	$(4,389)^*$	$(-2,876)^*$

*Values in parentheses are the t-statistics

Looking at the t-statistics we could see that all coefficients are statistically significant ($|t| > 1,96$).

According to estimation results, we note that the coefficient associated with the restoring force toward equilibrium is negative ($-1,198$) and statistically significant at 5%. Therefore the error correction mechanism, that is to say the catch can tend towards the long-term relationship, has been validated. Therefore, the change in the inward FDI directly affects real GDP, the same for the other explanatory variables.

This result also shows that real GDP in the year prior to a positive and significant effect on the current real GDP. ΔGDP_{t-1} to the coefficient of (0,329). The significance of real GDP could be due to the fact that real GDP in Tunisia is a true proxy for economic growth and/or the size of the internal market. The high demand caused by the decline in unemployment experienced in the country. Indeed, strong economic growth leads to increase of income per capita and to the improvement of the well-being of the population. The wealth thus generated allows the state to invest more in social sectors (education, health, and housing), creating employment and infrastructure.

In addition, the relationship between trade openness and economic growth, we find that this variable has a negative impact ($-4,013$) on economic growth. Examination of the coefficient associated with the variable ($\Delta OPEN_{t-1}$) can draw up the following conclusions:

Trade liberalization has negatively affected the real sector in Tunisia, since the majority of Tunisia's exports are composed of natural raw materials and agricultural products.

The financial system has not benefited so far from the commercial openness of Tunisia on the outside, as it has a negative impact on growth in Tunisia. And this can be explained by the fact that the trade volume is still modest due to ignorance expressed by investors to the various services performed to facilitate exchanges and to delineate the associated risks.

Similarly for the FDI variable to a positive impact on economic growth. ΔIDE_{t-1} to the coefficient ($0,433$). This can be explained by some political and economic factors which are widely cited in the literature on FDI and enhance the natural interest of foreign investors in Tunisia. Indeed, Tunisia is investing a lot to improve the attractiveness of FDI and Tunisian legislation continues to encourage FDI by tax incentives and support the state social insurance contributions. The state provides substantial bonuses to export-oriented investments. From a tax perspective, foreign investors are fully exempted from income tax during the first ten years of their activities and a reduction of 50% for the next years. Similarly, political stability in Tunisia also plays a key role in attracting FDI; this stability is synonymous to trust in business.

Moreover, economically there is a positive relationship between human capital and economic growth. ΔSEC_{t-1} to the coefficient of ($3,805$). This variable is statistically significant in explaining the evolution of real GDP. This may be due to the national policy on human resources development for the improvement of skills and know-how to better exploit the technological potential. Two main underlying orientations:

- (a) improving employability which should result in increased internal and external efficiencies of educational system and training, and
- (b) the development of knowledge economy with all the means it requires.

On the basis of these strategic objectives, the reform process currently engaged that affect all segments of the educational system were defined. This shows that Tunisia considers that human resources are its greatest asset and its greatest asset in economic development.

Finally, the coefficient of financial development in a positive ($38,211$) and significant. This can be explained by the fact that Tunisia has a stable macroeconomic environment (this condition implies in government deficits and a reasonable external low inflation).

4 Conclusion

In this empirical study, we showed that Tunisia's real GDP is a dynamic equilibrium with long term foreign direct investment (FDI), this explains the significance of residue recovered in the estimation. Thus, FDI in Tunisia has played an important role in economic growth.

In addition, the error correction model, we showed that there is a short term relationship between model variables and valid error correction to enhance the long run equilibrium.

In conclusion, foreign direct investment (FDI) is an integral part of an open and effective international economic system which constitutes a major catalyst to development. Its benefits, however, do not appear automatically and are distributed unevenly across countries, sectors and local communities.

For two decades, governments of developing countries have entered a competition to attract FDI on their territories. This craze of FDI to development countries due to various reasons: job creation, capital accumulation, export promotion, the possibility of technological diffusion in industry, etc...

The results of our model suggest that despite the significant positive effect of FDI on a few variables driving growth namely human capital and financial development.

The empirical study is performed on a model of time series of annual data covering the period 1975 to 2009 for Tunisia. The results of our model suggest that the significantly positive effect of FDI on a few variables driving growth namely human capital and financial development. Our empirical analysis focuses on three steps.

The first step is to test the stationary of the variables studied (real gross domestic product, FDI, trade openness, human capital and financial development). The result found is that all variables are no stationary in level which is to repeat this test in first difference and found that the variables are stationary.

The second step is to test existence of such a relationship of co-integration between variables, and it was concluded that there is one co-integrating relationship; this relationship is described as long term coefficients between FDI, trade openness, human capital, financial development and real GDP of the economy of Tunisia. We found that there is a positive relationship between explanatory variables and the dependent variable in Tunisia.

The third step, based on the analysis of model error correction. This model allows modeling the adjustments that lead to a situation of long-term equilibrium. We conclude that this error correction specification is acceptable and we can say that the relationship between real GDP and FDI taking into account other explanatory variables in our regression may make sense in the short run.

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