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*Impact of Foreign Direct Investments on Economic Growth in Africa: Evidence from  
Three Decades of Panel Data Analyses*

Steve Loris Gui-Diby<sup>1</sup>

**ABSTRACT**

This paper examines the impact of foreign direct investment (FDI) on economic growth in Africa and presents estimations based: on panel data of 50 African countries during the period from 1980 to 2009, and the system generalized method of moment (SYS-GMM) estimators as proposed by Blundell and Bond (1998). It finds that FDI inflows had a significant impact on economic growth in the African region during the period of interest. It also finds that while the low level of human resources did not limit the impact of FDI, and that the impact of FDI on economic growth was negative during the period from 1980 to 1994 and positive during the period from 1995 to 2009.

**Keywords:** Foreign direct investment, economic growth, absorptive capacity, panel data.

**JEL Classification:** F2, F4, O4.

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## 1. Introduction

Several studies have analyzed the impact of foreign direct investment (FDI) inflows on economic growth rates of different sets of countries over time. On one hand, it is assumed that FDI flows would have spillover effects on the host countries, such as enhancing job creation, capital accumulation, and knowledge transfer. In this regard, Crespo and Fontoura (2007) summarized five main channels of technological diffusion linked to FDI flows: demonstration or imitation, labor mobility, exportation, competition, and backward and forward linkages with domestic firms. These five channels, according to Crespo and Fontoura (2007), match, respectively, the following situations: (i) the efforts of domestic firms to adopt successful technology used by multinational enterprises (MNEs); (ii) the recruitment by domestic firms of workers with MNE experience who are able to use different technologies; (iii) the access to large distribution networks and the related gain due to a better knowledge of consumer tastes in foreign markets; (iv) a more efficient use of existing resources and technology, or the incorporation for domestic firms of new technologies in the production process to compete with MNEs; and (v) the relationships between MNEs and domestic firms, where the latter can be suppliers of MNEs (backward linkages) or customers of intermediate outputs of MNEs (forward linkages). On the other hand, according to new theories of economic growth and endogenous economic growth theories/models, the main determinants of economic growth, as summarized by Guellec and Ralle (2003), include investment in physical capital, technology, human capital, and public capital. The potential link between FDI and economic growth can, therefore, be established through human capital and technologies.

The majority of studies have focused on developing countries without, however, a particular emphasis on Africa. A particular attention to African countries may be interesting because FDI inflows to countries in this region have been increasing steadily over the past three

decades. However, the impact of FDI on economic growth can be limited by the absence of absorptive capacities (Borensztein, De Gregorio, and Lee, 1998), and it seems that, due to their deficiencies in adequate human resources, African countries did not have the best conditions to benefit from spillover effects. Furthermore, according to the ranking of African countries in several issues of the *Doing Business Report*, it seems that sufficient efforts have not been deployed by policy makers to attract foreign investors and create attractive business environments. Therefore, analyzing the impact of FDI inflows may reinforce the importance of establishing sound economic policies aiming at attracting more FDI to unleash the economic potential of African countries.

With respect to the need for this study, two specific facts can be highlighted regarding FDI and economic growth. First, FDI inflows towards Africa rose from an average of 41 million USD for the period from 1980 to 1985 to 1,064 million USD for the period from 2005 to 2009 (in nominal terms), which represents an average growth rate of 99% for the overall period. Second, the average economic growth rate of the region changed from -0.41% during the period from 1980 to 1985 to 3.28% during the period from 2005 to 2009. In this regard, this paper intends to fill the gap regarding FDI inflows towards Africa and present a better understanding of the inflows in relation to economic growth. Accordingly, the paper assesses the impact of FDI inflows on economic growth in the African region during the period from 1980 to 2009.

The paper is organized as follows: Section 2 presents a brief review of relevant studies in this area, Section 3 outlines the model specification, Section 4 highlights the data used for modeling and some methodological aspects related to the estimations, Section 5 presents the empirical results and their interpretation, and Section 6 summarizes the results from the study and presents conclusions.

## 2. Review of the literature

Two sets of broad approaches are described in the literature with respect to FDI and economic growth. The approaches in the first set are based on specific methods used for panel data, while the approaches in the second set use cross-section data with methods such as ordinary least squares (OLS), seemingly unrelated regressions (SUR) and cointegration, including country-by-country analysis. Within these sets of methods, the impact of FDI on economic growth is analyzed, with and without conditions or constraints.<sup>2</sup>

*Panel data specific methods: Generalized method of moments (GMM) estimations, random and fixed effects models*

In a complementary analysis that used results from a cointegration analysis in selected countries and from fixed effects models, De Mello (1999) concluded that the extent to which FDI has a positive impact on economic growth depends on the degree of complementarity and substitution between FDI and domestic investment. He also found that it is important to consider the heterogeneity of countries in the analysis as some results could change. The specificity of the approach is that control variables of economic growth are not used in the assessment of the impact of FDI on economic growth. Accordingly, this is a direct approach that has not been commonly used.

Using a panel of 85 countries, Azman-Saini, Baharumshah, and Law (2010) concluded that FDI, by itself, does not have positive effects on economic growth. Rather, the positive effects of FDI are observed if economic freedom is taken into account, specifically market regulation. In their analysis, they used GMM panel estimators, which were applied to panel dynamic models. In the estimated equation, they used FDI, economic freedom indicators and control variables to explain economic growth.

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<sup>2</sup> The reader can also refer to De Mello (1997) for a selective survey of the related literature.

Based on a panel of 57 developing countries over the period from 1980 to 1999, Yabi (2010) concluded that FDI flows do not always have an impact on economic growth. He found that, due to the heterogeneity of countries, the positive impact of FDI was observed in countries with high economic growth but not in countries with low economic growth. These results were based on estimations with instrumental variables that included control variables that explained economic growth, such as local investment, years of secondary schooling of the male population, inflation, fertility rate, government consumption, rule of law, the number of telephone lines per thousands of people, etc.

*Cross-section data: Ordinary least squares, SUR and cointegration*

Blomsröm, Lipsey, and Zejan (1992), on the basis of ordinary least squares (OLS) estimations with data for the period from 1960 to 1985, found that FDI contributed positively to economic growth in higher income developing countries but not in lower income countries. The results are based on an equation that incorporates the following variables in addition to FDI: the average ratio of the number of students enrolled in secondary education to the population of the appropriate age groups, a variable to assess the dynamics of prices, fixed capital formation as a percentage of the GDP, and the change in the labor force participation rate. Subsequent studies in this category used additional variables to assess FDI effects, namely, the strategy used to attract investment, the financial and institutional development, and the level of human capital.

Analyzing 46 developing countries over the period from 1970 to 1985 using the OLS method and generalized instrumental variable (GIV) estimations, Balasubramanyam, Salisu, and Sapsford (1996) concluded that FDI had a greater impact on countries that promote exports of products than on countries that have import substitution policies. The results are based on an

equation aimed at explaining growth using the following variables: labor input, domestic capital stock, stock of foreign capital and exports.

Borensztein, De Gregorio, and Lee (1998), upon examining a panel of 69 developing countries over the period from 1970 to 1989, concluded that FDI contributed to economic growth through the transfer of technology. However, they noticed that this positive impact was conditioned by the absorptive capabilities of advanced technologies that must be available in the host countries at a certain level. Their results are based on an equation that explains economic growth using the following variables: initial GDP, government consumption, black market premium on foreign exchange, measures of political instability and political rights, a proxy variable for financial development, inflation rate, measure of the quality of institutions, human capital, FDI, and an interaction term built with FDI and human capital.

These results are consistent with those of Durham (2004), who found that FDI effects are subject to the absorptive capacity of the host countries, specifically, financial and institutional developments. The estimations are based on equations that include initial GDP, human capital variables explaining economic growth rate, investment ratio, FDI, and different interaction terms with FDI. This constraint on financial development was also used by Alfaro et al. (2004). Using a panel comprised of OECD and non-OECD countries for the period from 1975 to 1995, these authors concluded that while FDI contributes significantly to economic growth, the local financial market is crucial to achieving these positive effects. The equations included dummy variables for sub-Saharan Africa and control variables such as initial GDP, human capital, population growth, and government consumption. These positive effect results, however, were not fully confirmed by studies based on cointegration methods, even under specific conditions.

Cointegration techniques have yielded mixed results. In a country-by-country study of 28 developing countries, Herzer, Klasen, and Nowak-Lehmann (2008) found neither a long-term nor a short-term effect of FDI on economic growth for a majority of the countries. Their analyses of long-term and short-term relationships between FDI and economic growth, however, did not include control variables, as in the above-mentioned studies. Using Granger causality tests, they found that there is no unidirectional long-term relationship between FDI and GDP.<sup>3</sup>

Based on a simple equation that uses capital investment and FDI variables to explain output growth, De Mello (1999) found that the long-term impact of FDI on economic growth in non OECD-countries may be either positive or negative as the results are explained by the macroeconomic instability and the severe international credit constraints for the period of interest (1970 to 1990). With respect to selected Asian countries, Baharumshah and Thanoon (2006) found that a long-term relationship exists between economic growth and the following variables: domestic savings, FDI, long-term debt, and short-term debt.

### 3. Specification of models

The objective of this study is to test the hypothesis of potentially significant effects of FDI on economic growth in the African region. Therefore, following approaches used in several of the above-mentioned studies, an augmented Solow model (Mankiw, Romer, and Weil, 1992), with control variables that have been widely used in the literature, is used as a basis.

The estimated equation is similar to the one of Azman-Saini, Baharumshah, and Law (2010):

$$Y_{i,t} = \alpha.Y_{i,t-1} + \beta_1.FDI_{i,t} + \beta_2.X_{it} + \eta_i + \varepsilon_{i,t} \quad (1)$$

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<sup>3</sup> Chowdhury and Mavrotas (2006) found contradictory results in selected economies.



where  $i$  and  $t$  represent respectively the country index, and the time index.  $Y$  and  $FDI$  represent respectively the logarithmic value of the purchasing power parity (PPP)- converted gross domestic product (GDP) per capita at 2005 constant prices, and foreign direct investment in percentage of GDP at current prices.  $X$  is the matrix of control variables, while  $\eta$  and  $\varepsilon$  stand respectively for the country specific effect, and the residual errors.

Following the comments of Perkins, Radelet, and Lindauer (2008), PPP data are used to take into account price differences between countries and to provide an assessment of the real volume of the GDP.

It is expected that the sign of the coefficients associated with FDI would be positive as spillover effects may have been observed in African countries.

The set of indicators considered in matrix  $X$  of Equation (1) consists of the following indicators:

- government consumption in percentage of PPP-converted GDP per capita at current prices (GOV);
- logarithm of the population size (POP);
- secondary gross school enrollment ratio (SEC); and
- a *proxy variable* representing the domestic investment (*INVEST*).

Many of the above mentioned variables were used by Borensztein, De Gregorio, and Lee (1995), Borensztein, De Gregorio, and Lee (1998), Garrison and Lee (1995), McGrattan and Schmitz (1999), Yabi (2010), and Savvides (1995). Government consumption was incorporated on the basis of Barro's argument (Barro, 1991; Garrison and Lee, 1995), which states that high level government consumption reduces economic growth by introducing distortions due to the resulting taxation or the government spending programs, which do not contribute to private sector productivity.

Population and gross secondary school enrollment are human capital variables that are integrated into the augmented Solow model analyzed by Mankiw, Romer, and Weil (1992), and Barro (1991). While the impact of the gross secondary school enrollment on economic growth is expected to be positive, the impact of population is expected to be negative according to the Solow model (Mankiw, Romer, and Weil, 1992; Azman-Saini, Baharumshah, and Law, 2010).

Having been widely used in several studies in past years, investment is a key variable in the Solow model (Solow, 1956; Mankiw, Romer, and Weil, 1992) and is a key determinant of economic growth.

Inserting separately the following interaction terms of  $FDI \times SEC$ , as proposed in Azman-Saini, Baharumshah, and Law (2010); Li, and Liu (2005); Borensztein, De Gregorio, and Lee (1995); and Borensztein, De Gregorio, and Lee (1998), has also been considered. The significance of the interaction terms implies that the marginal effect of FDI on growth depends on the level of SEC.

#### **4. Data and methodology**

##### **(a) Data**

The dataset comprised 50 African countries that were observed during the period from 1980 to 2009. This period was subdivided into six sub-periods of five years each, thus resulting in 300 observations. The simple mean of the variable was computed for each sub-period.

The following variables were extracted from the Penn Tables: PPP GDP per capita at 2005 constant prices, investment share of PPP-converted GDP per capita at current prices, government consumption share of PPP-converted GDP per capita at current prices, and

population size. The choice of this data source was driven by the availability of long series.

FDI inflows were extracted from the United Nations Conference for Trade and Development (UNCTAD) database. Data on the secondary gross school enrollment ratio were extracted from the World Development Indicators (WDI) database of the World Bank.

Due to the unavailability of variables in the African region during the last three decades, it was assumed that the difference between the investment share of PPP-converted GDP at current prices and the FDI as a percentage of GDP at current prices would represent the domestic investment as a *proxy variable*. This derived variable can be considered as an instrumental variable that is positively correlated to the domestic investment in percentage of the GDP at current prices. While it would have been preferable to disaggregate the investment share into domestic and foreign investments, it was not possible to do so.

As Azman-Saini, Baharumshah, and Law (2010) observed that the construction of the interaction variables may lead to multicollinearity, the interaction terms were orthogonalized by using the following two-step procedure, as presented in Azman-Saini, Baharumshah, Law (2010). First,  $FDI \times SEC$  was regressed on the FDI and SEC variables, and second, the residuals of the regression were used as interactions terms.

#### (b) Methodology

Generalized methods of moments (GMM)<sup>4</sup> were used to estimate the parameters of equation (1) even though methods such as two-stage least squares (2SLS) and three-stage least squares (3SLS) could have been used in a simultaneous equations framework. The decision to use GMM is justified by the fact that, according to Sevestre (2002), the 2SLS and 3SLS methods are particular cases of GMM. GMM controls simultaneity bias that may emerge from the existence of endogenous explanatory variables. For instance, we are aware of the following

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<sup>4</sup> All estimations were performed with the command *xtabond2* developed by Roodman (2009a).

issues: (1) economic growth is a determinant of FDI inflows in some studies (Habib and Zurawicki, 2002; Dabrek and Payne, 2002; Yabi, 2010); and (2) domestic investments depend also on cyclic conditions resulting from economic activity. The basic method is that developed by Arellano and Bond (1991), which uses internal instruments and independent variables used to perform the regression. Blundell and Bond (1998) contributed to the improvement of this method by proposing additional instruments as well as conditions of utilization based on the results of Arellano and Bond (1991) and Arellano and Bover (1995): the system generalized method of moment (SYS-GMM). It is the latter that has been used to estimate coefficients of equation (1) as this method has been found adequate for panel data with small  $T$  and large  $N$ . In our case,  $T = 6$  and  $N = 50$ .

Following the results of Roodman (2009b) on the number of instruments to be used for GMM, a limited number of instruments was used in a collapsed matrix format. Two-step and one-step estimator results are presented. For the one-step estimator, the Windmeijer correction was applied (Windmeijer, 2005). Globally, all variables were considered to be weakly exogenous or endogenous. The Sargan/Hansen test was performed to test the validity of sets of instruments, that is, the J-test of over identifying restrictions.

In equation (2), the variable  $FSEC_{it} = FDI_{i,t} \times SEC_{it}$  was considered as an exogenous variable.

$$Y_{i,t} = \alpha.Y_{i,t-1} + \beta_1.FDI_{i,t} + \beta_2.X_{it} + \beta_3.FDI_{i,t} \times SEC_{it} + \eta_i + \varepsilon_{i,t} \quad (2)$$

Arellano-Bond tests of autocorrelation of order one and two (Arellano and Bond, 1991) were performed to examine the hypothesis of no second-order and no first-order serial autocorrelations in the error term of the difference to exclude individual fixed effects.

## 5. Empirical results

Table 1 presents the simple averages of the variables during the six 5-year sub-periods.

*(Insert table 1)*

From table 1, it is evident that there is a structural break in the evolution of FDI in Africa as two sub-periods can be identified: 1980 to 1994 and 1995 to 2009. In fact, the absolute values of the FDI flows and the weight of FDI as a percentage of GDP more than doubled from the period from 1990 to 1994 to the period from 1995 to 1999.

Table 2 presents correlation coefficients for the variables that are analyzed, and suggests that there is a positive but weak correlation between FDI and PPP-converted GDP per capita for all 50 African countries for the period from 1980 to 2009. The variation of  $Y$  is more strongly correlated to secondary gross school enrollment and national investments.

*(Insert table 2)*

Based on the above descriptive analysis, the following preliminary results can be drawn:

- the variability of  $Y$  is mainly explained by the secondary gross school enrollment and domestic investment;
- the impact of the population size on economic growth may be negative or non-significant; and
- the impact of FDI on economic growth remains questionable as this variable does not necessarily explain a significant portion of the variability of the dependent variable  $Y$  given that the correlation coefficients and growth rates do not suggest such a conclusion.

An analysis of the above correlation matrix by sub-period does not yield results that are completely different from the ones above (see appendices). The only significant result is the

increase of the correlation coefficient between FDI and GDPCAP between the two sub-periods, the correlation was stronger during the period from 1995 to 2009 than during the period from 1980 to 1994.

Table 3 presents descriptive statistics for all variables, except population (a stock variable), used in the equation. The variations of the variables  $Y$ ,  $FDI$ , and FDI in the percentage of GDP are quite high as their standard deviations exceed the average and their related coefficients of variation are above 1.3.

*(Insert table 3)*

Table 4 presents the results of regressions based on the full sample of 50 African countries for the period 1980 to 2009. In table 4, columns (4.1) and (4.2) present results based on one-step estimators with Windmeijer correction, while columns (4.3) and (4.4) present results based on two-step estimators.

*(Insert table 4)*

Globally, the tests of Arellano-Bond indicate that there is no serial autocorrelation of order 1 or order 2 for all equations. Sargan/Hansen tests have not rejected the hypothesis regarding the validity of instruments used for estimations. Accordingly, from these two results, one can conclude that the estimated coefficients can be inferred. Generally, the signs of control variables, excluding domestic investment, are not significant. With respect to FDI inflows towards Africa, according to all four equations, the impact of the FDI inflows is significantly positive on economic growth. Accordingly, an increase in FDI would generate economic growth. Indeed, this impact is greater than that of domestic investment, a result that is not consistent with that of Yabi (2010), Herzer et al. (2008), or Durham (2004) regarding developing countries in general. However, it is consistent with the findings of Blomsröm,

Lipse, and Zejan (1992); Balasubramanyam, Salisu, and Sapsford (1996); Borensztein, De Gregorio, and Lee (1998); and Baharumshah and Thanoon (2006).

Moreover, the interaction term is not significantly different from zero, which means that there are no contingencies for positive effects of FDI on economic growth in Africa. This result contrasts the findings of Borensztein, De Gregorio, and Lee (1998).

By performing the above analyses over the two sub-periods, the above results change slightly. Table 5 presents the results of the estimations performed with the method of instrumental variables.<sup>5</sup> From these analyses, it is evident that secondary gross school enrollment had a positive impact on economic growth during the period from 1980 to 1994, but not during the period from 1995 to 2009. These disparities may be explained by the argument raised by Savvides (1995) on the poor quality of educational statistics in Africa, even though some improvements have been noticed due to different capacity building programs implemented by several international and regional organizations such as the United Nations Economic Commission for Africa (UNECA) and the African Development Bank (AfDB).

*(Insert table 5)*

Domestic investments had a positive impact on the economic growth rate for the period from 1995 to 2009. This was not the case, however, during the period from 1980 to 1994. In fact, during the period from 1980 to 1994, domestic investments had a positive impact only in equation (2) at the 10% significance level.

Table 5 indicates that the impact of FDI on economic growth was negative during the sub-period from 1980 to 1994 and positive during the period from 1994 to 2009. The conflicting impacts may be due to the nature of the FDI inflows received between 1980 and 1994, as it

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<sup>5</sup> This method was used because of the number of available periods that could be used to perform the analysis; three periods per cross-section. Therefore, it was not possible to apply the GMM or the SYS-GMM.

was marked by the implementation of structural adjustment programs and the Washington Consensus, which were launched at the end of the 1980s and included a component on the liberalization of economies in general. As a result, several state-owned enterprises were sold to foreign investors who then reduced the size of the labor force to improve the profitability of their acquisitions. Not surprisingly, unemployment rates increased and household consumption decreased.

Nonetheless, the impact of the absorptive capacity of countries (human capital) does not appear to be a key element in the spillover effects for the two sub-periods, a finding that confirms the results presented in table 4 based on the system GMM approach.

To explain the differences in results, three elements must be examined: methodological issues, the sectorial orientation of FDI inflows in Africa, and determinant factors of spillover effects.

First, with respect to methodology, several factors can explain the discrepancies between the conclusions from this study and those of other researchers: differences in methods used, differences in the time frame, and differences in the variables used to analyze the problem. For example, this study used PPP converted aggregates rather than current and/or constant price aggregates as national accounts variables because the use of PPP converted aggregates increases the comparability of countries and provides more information on the real purchasing power of households compared with current price aggregates. Furthermore, while aggregates valued at constant prices could provide a picture of the purchasing power of households, the results would not be comparable across countries.

Moreover, the population size may not be an appropriate variable to perform analyses in the African region because of the irregularity of censuses and surveys. Estimations of the size of the population are based on non-exhaustive data as countries face several challenges with



respect to the maintenance and the upgrading of their civil registration and vital statistics systems. Therefore, for a given country, the dynamics of the population are less likely to change from one year to the next. The method of estimation contributes also to the explanation of differences. In fact, there is an endogenous relationship between FDI inflows and the economic growth (Li and Liu, 2005; Borensztein, De Gregorio, Lee, 1998). This issue cannot be claimed to have been completely addressed by using SYS-GMM or instrumental variables estimators. Simultaneous equations could also have been used.

Second, with respect to the orientation of FDI in Africa and the explanation of the insignificance of the impact of human capital, it seems that FDI inflows have been oriented during the past three decades mainly towards companies in the primary sector with a low level of human capital requirement, or a high level of physical and financial capital intensity. This assumption is confirmed by Asiedu (2006) and Gui-Diby (2012). Asiedu (2006) and UNCTAD (2008) found that countries that have natural resources were more attractive than those without such resources, while Gui-Diby (2012) found that in the African region, FDI flows were mainly hosted by countries with low value added of the manufacturing sector. Moreover, multinational enterprises have been primarily involved in the extraction and the exportation of raw materials or commodities, that is, activities that do not require a high level of knowledge or huge absorptive capacity. As a result, the main elements contributing to economic growth and related to FDI may include revenues, income of workers in the primary sector, and expenditures of the government resulting from the exportation of natural resources. Furthermore, it must be considered that connections with local firms are weak and resource-seeking investments are less likely to generate a critical number of direct and indirect well remunerated jobs; through for instance backward and forward linkages.

Third, with respect to the determinant factors of spillover effects, the following elements may be raised as per the theoretical model developed by Markusen and Venables (1999): the

intensity of the use of local input by MNEs compared with local enterprises, the fixed cost for the creation of enterprises, and the degree of replacement of imports. The intensity of the use of local inputs and the fixed cost of the installation of enterprises determine the possibility for local firms to benefit from backward and forward linkages resulting from the entry of MNEs. Moreover, according to these authors, the impact is more likely to be positive if the MNEs are replacing imports, as doing so reduces the likelihood of crowd-out effects due to the surplus of supply. In the African context, access to long-term loans and a low level of saving have always been issues faced, respectively, by entrepreneurs and banks. For example, in 2012, the number of depositors with commercial banks stood at 149 per 1,000 adults according to the World Bank database (WDI). The positive impact of FDI inflows during the second sub-period (1995 to 2009) is mostly likely related to the improvement of the business environment, as reported by UNCTAD (2008), which was favorable to both FDI and local investments. This improvement could have contributed to the emergence of more responsive local firms with respect to issues and challenges related to both supply and competition. The above results may also raise the issue of the complexity of analyzing the impact of FDI on economic growth in the African region because of the lack of consistent long time series.

## **6. Conclusion and summary**

The objective of this paper was to assess the impact of FDI flows into 50 African countries during the period from 1980 to 2009. In this regard, panel data methods were performed. From the results of this study, it can be concluded that FDI inflows towards African countries have had a significant impact on economic growth during the past 30 years. However, this effect was not identical during the overall period. In fact, during the period from 1980 to 1994, the impact of FDI on economic growth was negative while it was positive for the period from 1995 to 2009. This suggests that the negative impact of FDI for the period from 1980 to 1994 may be linked to the implementation in many African countries of structural adjustment

programs, including privatization, the orientation of FDI in resource-seeking activities, weak economic links between multinational enterprises and local firms, and the low capacity of local enterprises to mobilize adequate resources to launch production. The positive impact for the period from 1995 to 2009 can partially be explained by the improvement of the business environment and the contribution of resource-based industries to economic growth due to the export of commodities.

Policy makers are therefore advised to design policies aimed at attracting foreign investors.

While human capital has not been found to be a contingency to the impact of FDI on economic growth, maximizing the benefits from FDI would still require governments to improve the availability of a well trained workforce, and to improve the business environment. In the long run, it should also help countries to diversify the nature of FDI inflows.

However, this paper presents some limitations related to the usage of a proxy variable for domestic investment, the unavailability of full annual time series for some indicators, and the lack of statistics to integrate other contingencies such as governance and the development of financial markets. The constraint on the availability of full time series for the secondary gross school enrollment was overcome by using the periodic averages of available data.

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Table 1: Evolution of variables during the period 1980-2009: averages for the six sub-periods

Period	FDI (1)	FDI/GDP (2)	Y (3)	SEC (4)	INV (5)	GOV (6)
<b>1980-1984</b>	41.0	0.0109	1889.0	21.8	22.4	13.9
<b>1984-1989</b>	57.4	0.0131	1920.6	25.9	19.5	13.6
<b>1990-1994</b>	85.5	0.0157	1992.7	27.9	21.3	13.6
<b>1995-1999</b>	182.0	0.0354	2173.3	31.3	22.1	12.6
<b>2000-2004</b>	357.5	0.0454	2483.3	35.9	20.4	12.4
<b>2005-2009</b>	1064.6	0.0604	3074.7	43.0	23.6	12.1

*Notes: FDI in millions of US Dollars (USD), Y is the GDP per capita in PPP-converted USD at 2005 constant prices, SEC in percentage, and INV and GOV in percentage of the PPP-converted GDP.*

Table 2: Correlation matrix of variables of interest [period: 1980-2009]

	Y	FDI	POP	GOV	INV	SEC
<b>Y</b>	1.00					
<b>FDI</b>	0.12	1.00				
<b>POP</b>	-0.10	0.43	1.00			
<b>GOV</b>	0.02	-0.06	-0.27	1.00		
<b>INV</b>	0.34	-0.02	-0.24	0.01	1.00	
<b>SEC</b>	0.68	0.23	0.08	-0.07	0.32	1.00



Table 3: Descriptive statistics for the 50 African countries during the period 1980-2009

Variables	Mean	Standard deviation	Minimum	Maximum
Y	2255.59	3095.27	155.44	24591.29
FDI	298.00	1015.55	-250.45	10781.23
FDI / GDP	0.03	0.05	-0.05	0.38
SEC	30.97	22.80	2.76	123.57
INV	21.55	11.85	-2.40	92.32
GOV	13.04	10.02	1.58	62.95

Table 4: Impact of FDI on PPP GDP per capita: panel of three decades (1980-2009)  
for 50 African countries

Independent variables	(4.1)	(4.2.)	(4.3.)	(4.4.)
	One-step	One-step	Two-step	Two-step
$Y(t-1)$	0.9386*** (0.1041)	0.8809*** (0.1032)	0.9587*** (0.0606)	0.9177*** (0.0545)
$FDI$	1.8524** (0.7771)	1.7536** (0.8626)	2.0056*** (0.3840)	1.8249*** (0.4127)
$INVEST$	0.0118** (0.0048)	0.0112** (0.0052)	0.0085*** (0.0022)	0.0089*** (0.0022)
$POP$	-0.0377 (0.0510)	-0.0646 (0.0582)	-0.0043 (0.0293)	-0.0245 (0.0320)
$SEC$	0.0003 (0.0033)	0.0016 (0.0032)	0.0010 (0.0019)	0.0020 (0.0016)
$GOV$	-0.0111 (0.0159)	-0.0124 (0.0172)	-0.0116 (0.0093)	-0.0112 (0.0098)
$FDI*SEC$		-0.0121 (0.0164)		-0.0118 (0.0089)
$A-B$ test for $Ar(1)$	-1.22 (0.224)	-1.10 (0.272)	-1.59 (0.113)	-1.56 (0.119)
$A-B$ test for $Ar(2)$	-1.27 (0.203)	-1.40 (0.160)	-1.33 (0.185)	-1.39 (0.164)
Number of instruments	21	22	21	22
Hansen test	14.11 (0.442)	13.20 (0.510)	14.11 (0.442)	13.20 (0.510)
Number of observations	250	250	250	250

Notes: \*\*\*, \*\*, and \* correspond, respectively, to 1%, 5% and 10% levels of significance. Standard errors of coefficients are in brackets below the values of the coefficients. For specification tests, p-values are under computed statistics tests. The  $A-B$  test denotes the Arellano-Bond test of serial autocorrelation.

Table 5: Impact of FDI on PPP GDP per capita. Analysis by sub-period of the three-decade panel of data (1980-2009) for 50 African countries

Independent variables	Period 1980-1994		Period 1995-2009	
	(1)	(2)	(3)	(4)
$Y(t-1)$	0.9631*** (0.0326)	0.9683*** (0.0341)	0.9550*** (0.0334)	0.9579*** (0.0336)
$FDI$	-2.1045*** (0.6632)	-2.0183*** (0.6751)	0.5131* (0.3006)	0.4967* (0.3015)
$INVEST$	0.0030 (0.0019)	0.0032* (0.0019)	0.0085*** (0.0018)	0.0086*** (0.0018)
$POP$	-0.0027 (0.0144)	0.0004 (0.0152)	0.0087 (0.0166)	0.0124 (0.0172)
$SEC$	0.0031** (0.0012)	0.0033** (0.0013)	0.0020 (0.0013)	0.0018 (0.0013)
$GOV$	0.0020 (0.0018)	0.0017 (0.0019)	-0.0026 (0.0027)	-0.0024 (0.0027)
$FDI*SEC$		0.0270 (0.0356)		-0.0104 (0.0121)
<i>Number of observations</i>	100	100	100	100

- Notes: \*\*\*, \*\*, and \* correspond, respectively, to 1%, 5% and 10% levels of significance. Standard errors of coefficients are in brackets below the values of coefficients. For specification tests, p-values are under computed statistics tests.

#### Highlights

- We assess the impact of FDI inflows on economic growth in the African region
- Data are of 50 African countries over the period 1980-2009
- We found that FDI inflows had a significant positive impact on economic growth
- The impact is positive over the period 1995-2009, and negative before this period
- The scarcity of qualified human resources did not limit the impact of FDI